G. H. RAISONI COLLEGE OF ENGINEERING, NAGPUR
(An Autonomous Institution affiliated to RTM Nagpur University, Nagpur)
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# G H RAISONI COLLEGE OF ENGINEERING
(An Autonomous Institute affiliated to Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur)

Accredited by NAAC with ‘A+’ Grade

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# COURSE-BOOK-2018-19

UNDER GRADUATE PROGRAMMES

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# DEPARTMENT OF CIVIL ENGINEERING

## SCHEME OF B.E. THIRD SEM (2012-2013)

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*Open Electives

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*Indicates Elective II and Elective III

## Elective II
- BCEL402 Artificial Neural Networks & Fuzzy Logic
- BCEL427 Matrix Method Of Structural Analysis
- BCEL428 Advance Concrete Design
- BCEL429 Pavement Design
- BCEL441 Advanced Hydraulics
- BCEL431 Soil Dynamics
- BCEL432 Green Building
- **BCEL443** Modeling of 3D Structure (by using STADDpro)

## Elective III
- BCEL433 Advanced Transportation Engg.
- BCEL434 Municipal & Industrial Water Treatment
- BCEL435 Remote Sensing & Gis
- BCEL436 Advanced Steel Design
- BCEL437 Earth And Earth Retaining Sturcture
- BCEL438 Computational Fluid Dynamics
- BCEL 439 Disaster Management
SEMESTER -III

BAML 205 : MATHEMATICAL APPLICATIONS IN CIVIL ENGINEERING
(3-1-0- 4)
Course-Prerequisites: XII Mathematics
Co-Requisites: ---
Course Objectives:
1. Learning periodic functions and their Fourier expansion.
2. Learning partial differential equation and calculus of variation and its relevance in engineering.
3. Introduction to optimization method
Course Outcome:
Student shall be able to
1. Use the concepts of Fourier Series to solve Matrix analysis in civil engineering problems.
2. Understand and be able to apply all the mathematical aspects that contribute to the solution of heat conduction of a rod problem with constant boundary conditions (the method of separation of variables, as well as the specific solution) and its relevance in Fluid Mechanics- 1, and Structural Analysis 1
3. To extend the basic ideas of calculus of one variable to the functions that have two or more variables. As the functions with two or more variables appear more often in science than functions with single variables, their study will help the students in better understanding the related concepts in the field of Fluid mechanics.
4. Implement variety of Numerical techniques to solve various transcendental and simultaneous equations in Fluid Mechanics II.
5. Numerical methods and techniques for solving initial boundary value problems in continuum mechanics (from heat conduction to statics and dynamics of solids and structures) also in water distribution system
6. Apply basic concepts of Optimization Techniques to Transportation Engineering.

Unit -I: Fourier Series.
Periodic functions and their Fourier expansion, even and odd function, change of interval, half range expansion.

Unit -II: Partial Differential Equation.
Partial Differential Equation of 1st order 1st degree i. e Langrange's form, Linear homogeneous p. d. equation of nth order with constant coefficient, method of separation of variables. Application to simple problems of variation of strings and beams, elementary concept of double Fourier series and their application to simple problems of vibration of rectangular membrane.

Unit -III: Calculus of variations.
Maxima and minima of function, variation and its properties, Euler's equation, functionals dependent on 1st and 2nd order derivatives, The Rayleigh-Ritz method, simple application.

Unit -IV: Numerical Methods (Equations)

Unit -V: Numerical Methods (Differential Equations)

Unit -VI: Introduction to Optimization Techniques.
Linear programming, mathematical model formulation, Solutions by Graphical & Simplex method.

Text Books:

Reference Books:
3. Advanced Mathematics for Engineers and Scientists by Spiegel M. R.

BCEL211 :BUILDING CONSTRUCTION & MATERIALS
(3-0-0-3)
Course-Prerequisites: ---
Co-Requisites: ---
Course Objectives:
1. To understand the concept of sub-structure and super-structure.
2. To know the different types of building, elements of building and material widely used in building construction.
3. To design and execute the infrastructure projects as per specifications.

Course Outcome:
Student shall be able to
1. To select types of foundation depending upon its utility and bearing capacity of soil.
2. Identify and characterize various building element/component.
3. Design simple building component and able to laid down specification.
4. Use suitable conventional & non-conventional materials.
5. Identify the methods for preservation of timber and metals.
6. Understand the use of water proofing and flooring materials.

Unit 1: [6 Hrs]

2. **Brickwork**: Qualities of good bricks. Terms used in brickwork, commonly used types of bonds in brickwork, principles of construction. Reinforced brickwork, Parapets, coping, sills and corbels, introduction to cavity walls, load bearing and partition walls. Masonry construction using cement concrete blocks and clay walls, load bearing and partition walls.

3. **Stone Work**: Stone masonry, principles of construction, and joints in masonry. Lifting heavy stones.

**Unit II** [6 Hrs]
1. **Arches and Lintels**: Terminology in contraction, type’s chajjas and canopies, pre cast Lintels & Arches.
3. **Floors And Roofs**: General principle, types and method of construction upper floors finishing quality. Flat and pitches roofs, types and their construction features.
4. **Stairs**: Types of stairs, functional design of stairs.

**Unit III** [7 Hrs]
1. **Doors and Windows**: Purpose materials of construction and types.
2. **Plastering and Pointing**: Necessity, types and methods.
3. **Temporary Timbering**: Centering and formwork shoring, underpinning and scaffolding.
4. **Painting**: White washing, colour washing and distempering new materials & Techniques.

**Unit IV** [8 Hrs]
1. **Building stones**: Introduction, requirement of good building stones, testing of stones, quarrying of stones, dressing of stones, artificial stones, common building stones in India.
2. **Brick & clay products**: Introduction, Brick earth, manufacturing of clay bricks, properties of burnt bricks, new trends in brick, manufacturing building tiles.
3. **Lime**: Classification of lime, field slaking of lime, preparation of putty, properties of lime, use of lime of construction.

**Unit V** [7 Hrs]
1. **Timber & Wood based Product**: Introduction, sources of timber, identification of timber felling & conversion, moisture in timber, defects in timber, decay of timber. Different type of timber used in building construction, wood base product such as plywood, particle board, veneer, sunmica and their manufacturing process.
2. **Plastics**: Classification, advantages, properties, modern development in plastics.
3. **Glass**: Ingredients, properties, types of glass, selection of glass, glass fibre.
4. **Asphalt and Bitumen**: IRC specification, physical properties & its use in construction.

**Text Book**

**Reference Books**

**BCEL212:STRENGTH OF MATERIALS THEORY**

(3-1-0- 4)

**Course-Prerequisites**: Engineering Mechanics

**Co-Requisites**: Strength of Materials (PR)

**Course Objectives**:
1. To study the various mechanical properties of materials.
2. To provide systematic methods for solving engineering problems in solid mechanics.
3. To use the fundamental concepts of stress, strain and elastic behavior of materials.

**Course Outcomes**:
Student shall be able to
1. Calculate simple and temperature stresses in composite sections
2. Draw the shear force and bending moment diagrams
3. Plot the bending stress and shear stress distribution
4. Design the springs and circular sections subjected to torsion
5. Evaluate the slope and deflection of beams subjected to loads
6. Determine the principal stresses and principal planes

**Unit I**: Mechanical Properties and Uniaxial Problems [7 Hrs]
Types of force distribution. Concept of stress and strain, Stress strain behavior of ductile and brittle material in uniaxial state of stress. Elastic, Plastic and strain hardened zones stress - strain relations, Elastic constants, Relation between elastic constants.Uniaxial loading and deformation of
simple cases of statically indeterminate problems under axial loading. Thin walled pressure vessel, Cylindrical and spherical subjected to internal pressure.

**Unit II Axial Force, Shear Force & Bending Moment Diagrams** [8 Hrs]

Concept of free body diagram, Types of loads, Determination of axial forces and Bending moment at a section, Axial forces SF and BM diagram in beams and simple frames, Differential relation between shear force and bending moment, Relation between load and shear force.

**Unit III Stresses in Beam** [8 Hrs]

Bending stresses in simple beam, Assumptions and derivation of simple bending, Theory relation between bending moment, Bending stress and curvature. Homogeneous and composite beams. Shear stresses in simple beams, Shear flow and shear stress distribution, Shear Stress in composite beams.

Combined effect of bending and axial force.

**Unit IV Torsion of Shafts** [6 Hrs]

Torsion of circular sections, Assumptions and derivation of relations between torsional moment, Shear stresses and angle of twist. Torsional stress in solid and Circular sections, Torsion in thin walled hollow section, Closely coiled helical springs. Leaf spring.

**Unit V Deflection of Beam** [8 Hrs]

Derivation of differential equation of moment curvature relation, Differential equation relating deflection and moment shear and load, Deflection of simple beams by integration.

**Unit VI State of Stress In Two Dimensions** [8 Hrs]

State of stress in two dimensions, Differential equation of equilibrium, Transformation of stresses, Principal stresses, Maximum shear stresses, Mohr’s circle, Combined bending and torsion, Combined effect of Torsion and Shear.

Shear flow in thin walled sections, concept of shear center of thin walled section, Unsymmetrical bending.

**Text Books:**

**Reference Books:**

<table>
<thead>
<tr>
<th>BCEL 213 : GEOTECHNICAL ENGINEERING I</th>
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</thead>
<tbody>
<tr>
<td>(3-1-0-4)</td>
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</tbody>
</table>

**Course-Prerequisites:** Applied Mathematics -II

**Co-Requires:** Geotechnical Engineering- I (PR)

**Course Objectives:**
1. To provide basic knowledge for determining various soil parameters.
2. To understand stress characteristics and their distribution in soil.
3. To determine the various engineering properties and their impact on the design and construction of various civil engineering structures.

**Course Outcomes:**
Student shall be able to
1. Characterize and classify soils
2. Use different methods for determination of soil properties and different types of classification systems
3. Apply concepts of flow of water through soil
4. Use and apply the concept of consolidation, compaction on field
5. Identify shear strength parameters for field conditions
6. Describe Stress Distribution and Advance methods for soil stability

**Unit I** [4 Hrs]

**Introduction:** Formation of soil, residual & transported soils, soil, generally used in practice such as sand, gravel,organic silt, clay, Bentonite, black cotton soil etc.

**Soil Formation:** Phases of Soil : Various soil weight & volume inter-relationship. Density Index, methods of determining in situ density. three phase relations.

**Unit II** [8 Hrs]

**Physical Properties:** Specific gravity, water content, shape and size, grain size distribution

BCEP212 : STRENGTH OF MATERIALS (0-0-2-1) 0-0-2-4

List of Practical:

<table>
<thead>
<tr>
<th>(Any Ten from the following list)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To determine Tensile strength of different metals</td>
</tr>
<tr>
<td>2. To determine the hardness of different metals</td>
</tr>
<tr>
<td>3. To determine Impact strength of different metals by Izod Impact Test</td>
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<tr>
<td>4. To determine Impact strength of different metals by Charpy Impact Test</td>
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<tr>
<td>5. To determine the shears strengths of different metals</td>
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<tr>
<td>6. To determine the stiffness and modulus of rigidity of the spring</td>
</tr>
<tr>
<td>7. To determine the flexural strength of wooden and concrete beams</td>
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<tr>
<td>8. To determine the Torsional strength of different metals</td>
</tr>
<tr>
<td>9. To determine the compressive strength of concrete blocks</td>
</tr>
<tr>
<td>10. To determine the transverse strength of flooring tiles</td>
</tr>
<tr>
<td>11. To determine the compressive strength of wet and dry bricks</td>
</tr>
<tr>
<td>12. To determine the compressive strength of wooden block ( Parallel &amp; Perpendicular to the grains)</td>
</tr>
<tr>
<td>13. To find the values of bending stress and Young’s modulus of elasticity of simply supported beams carrying concentrated load at centre</td>
</tr>
</tbody>
</table>
curves, relative density, consistency of soils, Unified soil classification system, IS soil classification system, field identification tests.

**Unit III** [8 Hrs]

**Permeability** : Darcy’s law, determination of permeability, equivalent permeability in stratified soils, in situ permeability test, 1-D flow, Laplace’s equation, flow nets, method to draw flow nets, Their characteristics & seepage, uplift pressure, confined and unconfined flows, piping, filter criteria. Preliminary problems of discharge estimation of homogeneous soils. Effective, Neutral and total stresses in Soil mass.

**Unit IV** [8 Hrs]

**Compaction and Consolidation** : Compaction: General principles, tests, factors affecting compaction, field compaction, compaction techniques. Consolidation: Fundamentals, 1-D consolidation, normally and over-consolidated clays, void ratio – pressure relationships, compressibility characteristics, time rate of consolidation, coefficient of consolidation, curve fitting techniques, settlement, secondary consolidation, 3-D consolidation, vertical sand drains.

**Unit V** [7 Hrs]

**Shear Strength of Soil** : Principle of effective stress, Mohr-Coulomb failure criterion, direct shear test, unconfined compression test, Triaxial shear test: consolidated drained, consolidated undrained, unconsolidated undrained, vane shear test, shear strength of clays and sands, critical void ratio, stress path, pore pressure coefficient.

**Unit VI** [10 Hrs]

**Stress Distribution and Advance methods for soil stability** : Stress distribution in soil mass, Boussinesque’s, Theory point & Uniformly loaded rectangular & circular areas, Newmark’s charts. Soil nailing, geo membrane, chemical and mechanical stabilization.

**Text Book:**

**Reference Books:**

**BCEP 213 : GEOTECHNICAL ENGINEERING I**

(0-0-2-1) Evaluation scheme: Practical [2P]

**List of Practical:**

<table>
<thead>
<tr>
<th>Any ten may be performed</th>
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<tbody>
<tr>
<td>1. Determination of Moisture content of given soil sample.</td>
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<tr>
<td>2. Determination of Specific gravity of soil</td>
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<tr>
<td>3. Grain size Analysis – (Sieve Analysis)</td>
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<tr>
<td>4. Determination of Liquid Limits of given soil sample</td>
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<tr>
<td>5. Determination of Plastic Limit of given soil sample</td>
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<tr>
<td>6. Determination of Shrinkage Limit of given soil sample</td>
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<tr>
<td>7. Determination of Permeability by constant head method.</td>
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<tr>
<td>8. Determination of Permeability by falling head method.</td>
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<tr>
<td>10. Modified Proctors test.</td>
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<tr>
<td>11. Determination of Field Density by sand replacement method.</td>
</tr>
<tr>
<td>13. Consolidation Test</td>
</tr>
<tr>
<td>14. Open Ended Experiment</td>
</tr>
</tbody>
</table>

B) Field visit is compulsory (Soil exploration or compaction)

**BCEL 214 : FLUID MECHANICS –I** (3-1-0-4)

**Course-Prerequisites:** Engineering Mechanics

**Co-Requisites:** Fluid Mechanics - I (PR)

**Course Objective:**
1. To study the basic behavior of fluids and fluid system and the laws governing this behavior
2. To understand and apply the basic concepts of Fluid Mechanics to carry out professional engineering activities in the field of fluids.
3. To apply scientific strategies to analyze qualitatively and quantitatively the problems and give solutions.

**Course Outcomes:**

1. Describe various properties of fluid and its behavior
2. Identify type of flow for compressible and incompressible fluid
3. Compute hydrostatic forces in submerged bodies
4. Apply the concepts of dynamics of fluid flows and the governing non-dimensional parameters,
5. Apply concepts of mass, momentum and energy conservation to flows
6. Grasp the basic ideas of turbulence.

**Unit-I** [6 Hrs]

**Introduction:** Fluid and continuum, Physical properties of fluids, Rheology of fluids.

**Unit-II** [6 Hrs]

**Kinematics of Fluid flow:** Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows,
compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.

**Unit-III** [8 Hrs]

Fluid Statics: Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

**Unit-IV** [8 Hrs]

Dynamics of Fluid Flow: Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hotwire anemometer, notches and weirs, momentum equation and its application to pipe bends.

**Unit-V** [8 Hrs]

Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies.

**Unit-VI** [9 Hrs]

Laminar and Turbulent Flow:

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow.


BCEP 214: FLUID MECHANICS –I

Evaluation scheme: Practical [2P]

3-1-0-4

List of Practical:

Any ten may be performed

1. To verify Bernoulli's theorem
2. To determine co-efficient of discharge of Venturimeter.
3. To determine co-efficient of discharge of Orificemeter.
4. To determine co-efficient of discharge of Rectangular Notch.
5. To determine co-efficient of discharge of Triangular Notch.
6. To determine co-efficient of discharge, contraction & velocity of an orifice.

7. To verify momentum equation using the experimental set-up on diffusion of submerged air jet
8. To determine friction factor for pipes of different sizes
9. To find a critical Reynold's number for a pipe flow
10. To determine the metacentric height of a floating body
11. To determine flow rate using Rotameter.
12. To determine pressure head of water in pipe line by means of pizometer tube
13. To determine pressure head of water in pipe line by means of U tube

BCEL215: WATER RESOURCE ENGINEERING-I (3-1-0-4) Total Hrs.: 45

Course-Prerequisites: ---

Co-Requisites: ---

Course Objectives:

1. To study the different hydrological parameters.
2. To understand hydrological statistics and design.
3. To characterize and mitigate natural and man-made hazards.

Course Outcomes:

Student shall be able to

1. Analyse hydro-meteorological parameters & estimate abstractions from precipitation
2. Apply the mechanism of Evaporation, Transpiration and Evapotranspiration in real life situation
3. Develop rainfall-runoff models and analysis of hydrographs
4. Formulate stastical model and solve hydrologic flood routing models
5. Use the knowledge of Geohydrology to solve problems related to hydraulic well & ground water.
6. Apply the concept of rain water harvesting

Unit I: [7 Hrs]

Introduction.


Unit II: [7 Hrs]


Unit III: [7 Hrs]

Run off Source components of run off, classification of streams, factors affecting. Estimation of discharge and Measurement methods, numerical.

Unit IV [10 Hrs]
Statistical methods

Flooding
Causes and effects, factors affecting Flood routing and flood forecasting, numerical.

Unit V: [7 Hrs]
Geohydrology
Introduction: occurrence and distribution, Ground water exploration techniques, Introduction to hydraulics of well, Numerical. Ground water quality, geomorphic and geologic control, Ground water province of India.

Unit VI: [7 Hrs]
Ground water recharge

Project planning for water resources
Introduction: Water resource planning

Text Books:

Reference Books:

MBL 102: General Proficiency:-II:
German / French / Spanish Language
Course-Prerequisites:
1) GP -I
2) Communication Skills

Co-Requisites: ---

Course Objectives:
1. To help the students in improving their interpersonal skills with global standards.
2. The students will have easier access to valuable literature, so that language will not be a barrier for them.
3. The student will be in a position to interact at international Era.
4. The student may develop liking for foreign languages, which will be also helpful for them in shaping their carrier at international level.

Course Outcomes:
1. Read, write and understand the literature in the foreign language studied by them.
2. Interact with foreigner in his language

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning Goals</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Alphabets and accents</td>
<td>Pronunciations techniques</td>
<td>Worksheet and charts</td>
</tr>
<tr>
<td>Greetings &amp; Salutations</td>
<td>Articles , Personal Pronoun</td>
<td>Day timing , Daily routines forms of respects , Vocabulary</td>
</tr>
<tr>
<td>Family and relations</td>
<td>Shapes and colors , Possessive Pronouns , Gender , Negative Sentence</td>
<td>Relations , Day of week</td>
</tr>
<tr>
<td>Weather and Seasons</td>
<td>Climate , Fabrics &amp; Clothes &amp; sizes , Interrogatives , Basic verbs</td>
<td>Group Activities , Paragraph writing including , Names of months , Seasons , Sky , Stars</td>
</tr>
<tr>
<td>House &amp; Household things</td>
<td>Describing neighborhood. Present Tense</td>
<td>Furniture , Household articles , Colors</td>
</tr>
<tr>
<td>Visit to supermarket</td>
<td>Learning the shopping etiquettes , vocabulary of food items , conversing with shopkeepers etc. Plurals</td>
<td>Project on vocabulary of vegetables and fruits , Bakery products , Group Activity / Role play</td>
</tr>
<tr>
<td>Timing , Telephonic Conversions</td>
<td>How to Ask time , converse on telephone</td>
<td>Timing and clock ( Hours &amp; Minutes )</td>
</tr>
<tr>
<td>Visit to city , Prominent places and park</td>
<td>Nature , Directions , Means of transportations , Tenses contd....</td>
<td>Self introductions , Role-play , preparing charts</td>
</tr>
<tr>
<td>In Restaurant / Hotel</td>
<td>Ordering eatables , Table manner . Verbs</td>
<td>Enhancing vocabulary of food Dishes , cutlery</td>
</tr>
<tr>
<td>Visit to Doctor</td>
<td>Health matters , Illness. Commonly used verbs contd..</td>
<td>Worksheets , projects</td>
</tr>
<tr>
<td>French / German / Spanish culture – monuments , delicacies , wines visa vis Indian culture</td>
<td>Vocabulary of clothes , Accessories , Cuisines , Beverages , Adjectives</td>
<td>Presentations by students , situation based conversations</td>
</tr>
<tr>
<td>Receiving Guests/ Entertaining people / Good Bye's</td>
<td>Customs , Traditions , Manners , welcome &amp; Audieu's</td>
<td>Activities , Role play , Assignments</td>
</tr>
</tbody>
</table>
SEMMESTER- IV

BCEL 216 : CONCRETE TECHNOLOGY (3-0-0-3) Total Hrs.: 40

Course-Prerequisites: Building Construction & Materials

Co-Requisites: Concrete Technology (PR)

Course Objectives:

1. To understand the properties of concrete ingredients.
2. To study the compressive, flexural, split strengths etc and other non-destructive tests.
3. To learn mix design of concrete and its application in construction work.

Course Outcomes:

Student shall be able to
1. Identify Quality Control tests on concrete making materials
2. Understand the behavior of fresh and hardened concrete
3. Understand Mechanical properties of concrete
4. Use various additives & admixtures of concrete
5. Design concrete mixes as per IS and ACI codes
6. Understand the durability requirements of concrete

Unit I  

[8 Hrs]


Unit II  

[7 Hrs]


Unit III  

[8 Hrs]

Strength of concrete- Gain of strength, w/c ratio. Factors affecting compressive strength, w/c ratio, type of cement, air entrainment, aggregate, mixing water, admixtures, curing conditions. Tensile and flexural strengths, relation between compressive and tensile strength. Failure modes in concrete, cracking in compression. Impact strength, fatigue strength, shear, elasticity, poisson’s ratio.


Non Destructive test- significance, rebound hammer, ultra sonic pulse velocity test.

Unit IV  

[8 Hrs]

Additives and admixtures- Types of admixtures, natural products, diatomaceous earth, calcined clays of shale’s, volcanic glasses, byproducts – pozzolans, fly ash, silica fume, rice husk ash, metakaoline, G.G. blast furnace slag, admixtures-air entraining, water reducing, accelerators, retarders, plasticizers and superplasticizers, permeability reducing, grouting agents, surface hardeners.

Shrinkage- early volume changes, drying shrinkage, mechanism of shrinkage, factors affecting shrinkage, influence of curing and strong conditions, differential shrinkage, carbonation, creep- factors influencing, relation between creep and time, nature of creep, effect of creep.

Unit V  

[8Hrs]

Mix Design- Process, statistical relation between main and characteristic strength, variance, standard deviation, factors affecting mix properties, grading of aggregates, aggregate/cement ratio etc. Degree of quality control, design of mix by Road Note No. [04] (BS), ACI method.

Unit VI  

[4 hrs]

Durability of concrete- Significance, water as an agent of deterioration, permeability of concrete, air sulphate attack and control, sea water attack, acid attack, efflorescence, resistance of corrosion, abrasion and cavitation, process of rusting of steel.

Text Books:
Course-Prerequisites: Applied Mathematics -I
Co-Requisites: Surveying - I (PR)
Course Objective:
1. To understand the basic principles of surveying.
2. To study the coordinate systems and measuring techniques.
3. To study different types of survey and instruments used.
Course Outcomes:
Student shall be able to
1. Use basic principles of survey
2. Take linear measurements.
3. Take bearings & angular measurements.
4. Calculate elevation of various points
5. Prepare contour & topographical maps.

6. Use modern instruments in surveying work.

Unit -1 Introduction Surveying-Necessity & purpose, Geodetic & Plane Surveying,
Classification of survey, Principles of Surveying,
Division of Survey, Instruments and Measurement:
- Linear measurements, Corrections to field measurements, ranging out, Direct & Indirect ranging. Use of Distomat. Chain surveying:
- Basic definition, Principle of Chain Surveying, Survey station, Cross Staff Survey, Chain Traversing, Optical Square, Line Ranger, Prism Square, Obstacles in Chaining, Plotting of Chain Survey Work, Errors – Sources & Types. (08 Hrs)

Unit –II Instruments for measurement of angles: -

Unit-III Instruments for measurement of elevation:
- Dumpy level, Tilting level & Automatic level. Details of their construction. Adjustments of Levels:
- Temporary & Permanent adjustments of Dumpy & Tilting levels. Principle axes of Dumpy level, Relationship, Testing and adjustment of bubble axis and line of collimation. (05 Hrs )

Unit – IV Leveling: Definition of terms, Principle of leveling, Reduction of levels, Classification of leveling, Profile leveling, Longitudinal sectioning, Cross Sectioning, Reciprocal leveling, Distance to vertical horizon, leveling methods, Leveling staves, Booking & reduction of field notes, curvature & refraction. Sensitivity of bubble tube. Errors in leveling.
Contouring:
- Definition, Characteristics & uses of contour maps, methods of contouring. Interpolation of Contours, Computation of area and volume – Trapezoidal and Simpson’s Rule, Planimeter, use theory, Zero Circle. (10Hrs )

Unit – V
Theodolite: - Introduction, Type of theodolite, Temporary & Permanent adjustment, Measurement of Horizontal & Vertical angles, Magnetic Bearing, Prolonging a line, Lining in. Other uses of theodolite.
Theodolite
- traverse : - Consécutive & Indépendant Coordinates, Adjustment of Closed traverse, latitude & departure, Gale’s traverse table, area calculation by coordinates. (06 Hrs )

Unit VI Plane table Surveying:
- Equipments, methods two point & three point problems, Advantages & disadvantages of plane tabling. Lehman’s rules. Construction & use of Major & Minor instruments like EDM, Total Station, Abney level, Box sextant Planimeter Tangent Clinometer, Ghat Tracer (06 Hrs)

Text Books:

Reference Books:

BCEP 207 : SURVEYING-I  (0-0-2-1)
A) List of Practical
1. Use of major Equipments. (Cross Staff, Prismatic Compass & Surveyors Compass, Dumpy Level, Transit Theodolite)
3. Chain and Compass Surveying.
   i) Measurement of distance by Ranging and Chaining.
   ii) Locating various objects by Chain & Cross staff surveying.
   iii) Determination of area of polygon by Chain and Cross staff survey.
   iv) Measurement of bearings of sides of traverse with Prismatic Compass and computation of correct included angle.
   v) One full size drawing sheet locating given building by Chain and Compass traversing.
4. L – Section and C – Section of Road.
   i) Determination of elevation of various points with dumpy level by Collimation Plane Method and Rise & Fall Method.
   ii) Determination of elevation of various points with Dumpy Level by keeping staff inverted. Fixing Bench Mark with respect to Temporary Bench Mark with Dumpy Level by Fly leveling and Check leveling.
   IV) One full size drawing sheet on L – section and C – section of Road.
   v) One full size drawing sheet Contour Plan of given area.
5. Plane Table Survey.
   i) One full size drawing sheet locating given building (traverse) by Radiation Method by Plane Table Traversing.
   ii) One full size drawing sheet locating given building (traverse) by Intersection Method by Plane Table Traversing.
   iii) Three point problem in Plane Table Traversing.
6. Theodolite Traverse.
   i) Measurement of horizontal angles with Theodolite by means of Repetition Method.
   ii) Measurement of vertical angles using theodolite.
   iii) One full size drawing sheet locating given building (traverse) by Theodolite traversing.
7. Use of minor instruments (Planimeter, Box Sextant, Abney Level)
8. Measurement of area of irregular figure by using Planimeter.

B) SURVEY DRAWING SHEET (FULL SIZE)
1) Traversing Locating given building by chain and compass traversing.
2) L-Section and cross section of road.
3) Locating given building by theodolite traversing.
4) Locating given building by plain table traversing.
5) Three point problem in plane table traversing.
6) Contour plan of given area.

C) SURVEY CAMP (ON ANY OF FOLLOWING TOPICS)
1) Road Project  2) Contour Project

BCEL 218 : COMPUTER APPLICATION IN CIVIL ENGINEERING  (2-0-0-2)
Total Hrs.:30

Course-Prerequisites: Basics of the Computing
Co-Requisites: Computer Application in Civil Engineering (PR)
Course Objectives:
1. To understand the concept and terminologies used in computer programming.
2. To develop interactive computer programs.
3. To use programming language for solving Civil Engineering problems.
Course Outcomes:
Student shall be able to
1. Develop algorithms for mathematical and scientific problems
2. Use various control statements and write program based on control statements
3. Design programs using Functions, Storage class, Arrays, Pointers, structures.
4. Provide solutions programs using various numerical/computational techniques
5. Provide solutions using interactive computer programs

Unit I : Introduction  [5 Hrs]
C-Fundamentals , CHARACTER SET data type constant and variables , Declaration of constants & variables , Expression, Statements , Symbolic constants.
Operator and Expression , Arithmetic operator , Unary operator , Relation and Logical operator, Assignment operators , the conditional operator, Library functions.
Data input & output Interactive programming preparing & running a complete simple program.

Unit II : Control Statements  [5 Hrs]
Control statement , the WHILE statements , do-while , for nested loop , if –else , switch break, continue , goto statement , comma operator.

Unit III : Advance Topics  [5 Hrs]
Functions , Storage class , Arrays , Pointers, structures and Unions , Data files , File Handling , Link list.
Unit IV [5 Hrs]
Fundamental of Numerical Methods, Interpolation & extrapolation. Numerical Integration (Simpsons method, Trapezoidal method, Newtons Gauss Quadrature method), Interactive Computer Program Development

Unit – V [5 Hrs]
Solution of Linear Algebraic Equations, Gauss quadrature method, solution errors. Interactive Computer Progm Development

Unit – VI [5 Hrs]
Solution of non Linear Equations (Newton Raphson Schemes), Initial & Two point boundary value problem, Euler’s Runge-kutta Milnes etc, Interactive Computer Program Development

Text Books:

Reference Books:

BCEP 218 : COMPUTER APPLICATION IN CIVIL ENGINEERING (0-0-2-1)
Total Hours: 20
List of Practical:
1. Program for Sum of Three Integers.
2. Program for finding the average value of three Numbers.
3. Program for Interchanging Two Values.
4. Program for finding the Number is Even or Odd
5. Program for finding the Number is Positive or Negative
6. Program to decide Profit or Loss.
7. Program for finding the given year is Leap year or not.
8. Program for finding the number is Perfect Square or Not.
9. Program for Shear Force & Bending Moment for beam carrying UDL.
10 Program for Shear Force & Bending Moment for beam carrying Point Load.
11 Program for Bisection Method
12 Program to find the Root of an equation using Newton Rapson Method.
13 Program to Find Integral of given function by using Simpson’s 1/3rd Rule.
14 Program to Find Integral of given function by using Simpson’s 3/8th Rule.
15 Program to solve equation by using Euler’s Method.
16 Program to solve the system of Linear Equation Using Gauss Elimination Method.
17 Program to solve equation by using Second Order Runge-kutta Method.
18 Program to solve equation by using Fourth Order Runge-kutta Method.

BCEP 312 : FLUID MECHANICS-II (3-1-0-4)
Course-Prerequisites: Fluid Mechanics-I
Co-Requisites: Fluid Mechanics –II (PR)

Course Objectives:
1. To understand the flow pattern in the open channels, pipes and immersed body.
2. To understand hydraulic models.
3. Study different types of pumps and turbines to know their characteristics.

Course Outcomes:
Student shall be able to
1. Solve problem on Drag and Lift force and boundary layer theory
2. Derive the governing equations of transients in pipes and channels
3. Identify channel type and solve problems on economical depth calculation of channel.
4. Solve problems on gradually varies flow and Rapidly varied flow.
5. differentiate between model and prototype also can solve problems related to it
6. Solve problems on hydraulic pumps and turbines.

UNIT I: [8 Hrs]
1. LAMINAR FLOW: Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen - Poiseuille equation.
2. BOUNDARY LAYER THEORY: Nominal thickness, displacement thickness, momentum thickness of the boundary layer. Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer, laminar sub layer; Separation of boundary layer on plane and curved surfaces.
3. REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: In general definition of drag and lift; Flow past plates, cylinders and spheres; darg on sphere, cylinder and flat plate.

Unit II [8 Hrs]
4. FLOW THROUGH PIPES: Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade’s experiment; Moody’s chart, Darcy-Weisbach & Hazen William’s equation for frictional head loss; Hydraulic gradient and energy gradient; Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy – Cross method of pipe networks; Water hammer pressure head due to sudden closure of valve.

Unit III [7 Hrs]
5. FLOW THROUGH OPEN CHANNEL: GENERAL: Types of channel and their geometrical properties; Types of flow in open channel

UNIFORM FLOW: Chezy’s and Manning’s equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal
depyh of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

**CRITICAL FLOW**: Specific energy and its diagram; alternate depths; Computations of critical depth section factor for critical flow, critical slope, normal critical slope; Specific force and its diagram; Conditions of critical flow.

**Critical Flow**

**Unit IV**: 
6. APPLICATIONS OF SPECIFIC ENERGY, GRADUAL TRANSITIONS OF CHANNELS:

**G R A D U A L L Y V A R I E D F L O W**: Dynamic equation for GVF; Classification and characteristics of surface profile; Direct Step method of computing profile length.

**R A P I D L Y V A R I E D F L O W**: definition of hydraulic jump; equation of hydraulic jump in horizontal rectangular channel; length & height of jump; energy loss in jump; classifications of jump

**Unit V**: 
7. HYDRAULIC MODELS:

Difference between model and prototype; Similarity-type of similarities; Model laws Reynolds model law and Froude’s model law; Types of model – distorted, undistorted; Froude’s method of determining resistance to partially submerged objects like ship.

**FLUID MACHINERY**:

**IMPACT OF JET**: Impact of Jet on stationary and moving curved vanes TURBINES: Definition; Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

**Unit VI**: 
9. CENTRIFUGAL AND RECIPROCATING PUMPS

**CENTRIFUGAL PUMP**: Component parts; Working principle; Static and manometric heads; different efficiencies; Specific speed; Theoretical aspect of multistage pump; pump in parallel; Priming devices; Trouble & remedies; Main & operating characteristics curves. Selection on basis of operating characteristics.

**RECIPROCATING PUMPS**: Components parts; Working principle; Work done of single & double acting pumps; Negative slip; Air vessels – Working principle and necessity.

**HYDRAULIC TURBINES**: Introduction; Impulse and reaction turbine, pelton turbine, Francis turbine.

**Text Books**:


**Reference Books**:


**BCEP 312: FLUID MECHANICS-II**

(0-0-2-1)

**Total Hours: 20**

**List of Practical**:

1. To determine streamline patterns of streamline flow around immersed bodies.
2. To determine friction factor for given pipes and to verify Darcy-Weisbach equation.
3. To determine performance characteristics of Centrifugal Pump.
4. To determine performance characteristics of Reciprocating Pump.
5. To determine performance characteristics of Francis Turbine.
6. To determine performance characteristics of Pelton Turbine.
7. To determine Manning’s or Chezy’s constant for Open Channel.
8. To determine Froude’s number by Hydraulic Jump in a horizontal rectangular channel.
9. To determine minor losses for flow through pipes.
10. To determine Gradually Varied Flow profiles.
11. To determine velocity distribution in a given pipeline and verify momentum equation.
12. To determine co-efficient of discharge of venturiflume.

**BCEL 318 : GEOTECHNICAL ENGINEERING – II**

(3-1-0-4)

**Total Hrs.: 45**

**Course Prerequisites**: Geotechnical Engineering- I

**Co-Requisites**: Geotechnical Engineering- II (PR)

**Course Objectives**:

1. To learn soil exploration, planning and methods of exploration
2. To design different types of foundations and retaining structures
3. To learn ground improvement methods and soil stabilization techniques

**Course Outcomes**:

Student shall be able to

1. Plan and execute the soil exploration
2. Perform Field Tests on soil & Calculate the bearing capacity of soils and foundation settlements
3. Analyze deep foundations
4. Analyze shallow foundations
5. Determine the earth pressures on foundations and retaining structures
6. Plan and execute the methods of Ground Improvement

**Unit I**

**Chapter**: Soil exploration, planning, objectives and methods of exploration, soil borings, spacing and depth of boring, boring log, hand augers, wash boring, percussion drilling, rotary
drilling, Type of samples and samplers, area ratio, inside and outside clearance, Soil investigation report

Chapter: 2 Field Tests: Plate load test, Standard Penetration test (SPT), Static Cone Penetration Test (SCPT) and Dynamic Cone Penetration Test (DCPT), Field California Bearing Ratio test, Field vane shear test, geophysical methods such as electrical resistivity and soil refraction methods.

Unit II: [10 Hrs]  
Chapter: 3 Bearing Capacity: Bearing capacity, its criteria, factors and various methods. Analytical Methods: Terzaghi’s, Skempton’s, Meyorhoff, BIS method for bearing capacity, Effect of water table, contact pressure distribution diagram below the base of footing. Bearing capacity based on plate load test results, SPT value, SCPT test results, Pressuremeter test.

Chapter: 4 Settlement: Evaluation of soils settlement: immediate, primary and secondary settlement for footing resting on homogenous, isotropic, cohesive and cohesionless soils related to single footing, combined footing, raft foundation etc, concept of differential settlement, factors and causes for differential settlement, standard requirement of total as well as differential settlement, service loads, proportioning of footing for uniform settlement.

Unit III: [7 Hrs]  
Chapter: 5 Pile foundation: Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sand and in clay, dynamic pile formula, Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, settlement ratio, behaviour of group of pile in sandy and in clayey solids, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for under-reamed pile in clay and sands, Total and differential settlement related to single pile and group of piles in sandy and in clays soils.

Unit IV: [7 Hrs]  
Chapter: 6 Well foundation: Component and their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting of wells, methods of correcting tilting and shifting. Bearing capacity of well foundation as per IS method. Cofferdam: Its purpose, various types, their suitability.

Chapter: 7 Raft foundation: Its purpose, advantages, situation, classification of raft, criteria for rigid and flexible raft, design of raft foundation, concept of floating foundation.

Unit V: [8 Hrs]  
Chapter: 8 Slope Stability: Slopes, uses and failure of slope, stability analysis of infinite and finite slope in sand, clay and cohesive soil; Tailors stability number, Swedish circle method, Friction circle method, Bishop Method, Concept of effective stress analysis.

Chapter: 9 Earth Pressure: Earth Pressure at rest, active and passive, Stages of plastic equilibrium Rankin’s and Coulomb’s theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhann and Culmanns simple graphical methods.

Unit VI: [6 Hrs]  
Chapter: 10 Ground Improvement: Methods of soil stabilization use of admixture (lime, cement, fly ash) in stabilization, Basic concept of reinforced soil, use of Geosynthetics material as a reinforcement, Geo-textiles, Vibro-flotation, sand column / stone column, preloading.

Text Books:

BCEP 318: GEOTECHNICAL ENGINEERING – II  
(0-0-2-1) Total Hours: 20
Evaluation scheme: Practical [2P]
List of Practical:  
(Any Ten from the following List)
1. Auger boring and soil sampling
2. Standard Penetration test
3. Dynamic cone penetration test
4. Determination of pore water pressure
5. Panning site investigations for a real life problem- project mode tests.
6. In situ permeability test
7. Determination of Free swell index and swell potential
8. Determination of Swelling pressure of given soil sample.
9. Unconfined compression test
10. Direct shear test.
13. Vane Shear Test
14. Opened Ended Experiments

BCEL 321: STRUCTURAL ANALYSIS-I  
THEORY (3-1-0-4) Total Hrs.:45

Course-Prerequisites: Strength of Materials  
Co-Requisites: ---

Course Objectives:
1. To study basic concepts of analysis of structural components.
2. To study the behavior of structural components under the various combination of loads.
3. To study various methods for the analysis of indeterminant structure.

Course Outcomes:
Student shall be able to
1. Identify the basic concept used in the analysis of indeterminate structure.
2. Understand the concept of Strain energy for the analysis of different structures.
3. Understand the theories involved in the analysis of columns.
4. Analyzed the continuous beam with effect of sinking of support.
5. Analyzed the Non Sway and sway frames by different methods.
6. Understand the slope and deflection of structural components under the various combinations of loads.

Unit – I [7 Hrs]
Static determinacy of structure Analysis of loads on simply supported beams with concentrated and uniformly distributed loads, maximum B.M. and S.F.
Influence lines for reactions, bending moments and shear forces in simply supported beams, cantilevers and beams with overhangs.
Influence lines for forces in members of simple trusses and for BM and SF in panels of simple trusses.

Unit – II [8 Hrs]
Strain energy method as applied to the analysis of redundant frames and redundant trusses up to two degrees. Determination of deflection of trusses, Willot Mohr diagram, Castiglianos theorems, Maxwells reciprocal theorem, Battis theorem.

Unit – III [9 Hrs]
Buckling of Columns and beams, columns, Eulers and Rankines formula.
Analysis of Two- Hinged arches, S.F. and normal thrust, parabolic arches

Unit – IV [7 Hrs]
Analysis of fixed and continues beams by theorem of three moments effect of sinking of support.

Unit – V [7 Hrs]
Analysis of continues beams and simple portals (Non sway) using Moment Distribution methods.
Introduction flexibility method and compatibility method for trusses, beams and frames.

Unit- VI [7 Hrs]
Slope deflection method as applied to indeterminate beams & continues beams portal frames, frame with inclined legs up to 3 degrees of freedom.

Text Books:

Co-Requisites: ---
Course Objectives: To identify one’s special capabilities in activities like sports, drama, singing etc. Through this activities the students will grow in a broader sense. Options like Pranayam, Trekking, Guitar, synthesizer dancing, English drama, sketching, kathak, photography, professional ethics, horse riding, volleyball, etc are offered.

Course Outcomes: Sharpen their extracurricular skills for overall development.

SEMESTER -V

BCEL219 : ENVIRONMENTAL ENGINEERING – I (3-0-0-3)
Total Hrs: 44 Hrs

Course-Prerequisites: Applied Chemistry
Co-Requisites: Environmental Engineering- I (PR)

Course Objectives:
1. To understand various parameters and treatment units
2. To learn different types of water demand, sources and intake structures
3. Learning about water quality and water treatment processes

Course Outcomes:
Student shall be able to
1. Identify & calculate the water demand, source of water to meet the future needs
2. Specify certain components of water supply systems and design rising main
3. Analyse the water quality and design the primary treatment units of water treatment plant
4. Design the sedimentation and filter treatment units of water treatment plant
5. Apply the concept of disinfection and distribution system
6. Use concept of municipal solid waste management.

Unit I [10Hrs]
Introduction Importance and necessity of water supply scheme.

Water demand: Types of demand, empirical formulae, factors affecting per Capita demand, variation in demands, design period and population forecasting methods and examples.
Sources of water: rain water, Ground water – springs, infiltration galleries, Dug wells, tube wells, Surface water – stream, lake river, impounding reservoirs, ponds.
Intake structures: Location types – river, lake, canal reservoir etc.
Unit II: Conveyance of water: types of pipes, joints, fittings. Hydraulic design aspects: Losses due to Friction Darcy – Weisbach, Mannings, Hazen William formulae and problems on these. Rising main and pumps: Classification working merits and demerits selection of pumps.


Coagulation and Flocculation: Definition, Principals, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices.


Unit V: Disinfection: Purpose Mechanism, criteria for good disinfectant various disinfectants their characteristics, disinfection by chlorination using different forms of chlorine Distribution systems: Requirements for a good distribution system, methods of distribution systems distribution systems and layouts of DS, appurtenances in water distribution system Storage reservoirs for treated water: Types, capacity of reservoir, mass curve

Unit VI: Municipal solid waste management: Generation sources, composition, Quality, Methods of Collection, transportation, treatment and disposal, Recycle, Reuse Examples on simple hydraulic design of pipes, estimation of population and water quality, plain sedimentation tanks, cascade. Only simple sizing of units no detailed design.

Text Books:

Reference Books:

BCEP219: ENVIRONMENTAL ENGINEERING–I
(0-0-2-1)
Total Hrs: 20 Hrs
List of Practical:
(Any Ten from the following)
1. Determination of pH of given water sample
2. Determination of Conductivity of given water sample
3. Determination of Chloride in given water sample
4. Determination of Solids in given water sample
5. Determination of Turbidity of given water sample
6. Determination of Alkalinity – Acidity of given water sample
7. Determination of Dissolved Oxygen of given water sample
8. Determination of Hardness of given water sample
9. Determination of Available Chlorine in given water sample
10. Determination of Residual Chlorine in given water sample
11. Determination of sulphates by spectrophotometer.
12. Determination of optimum dose of coagulant by performing jar test.
13. To perform Bacteriological Plate count and MPN tests for given water sample
14. Determination of COD value for given wastewater sample
15. To Design water treatment Unit by using software.

BCEL313: SURVEYING-II
(3-1-0-4)
Total Hrs: 45Hrs
Course-Prerequisites: Surveying- I
Co-Requisites: Surveying- II (PR)
Course Objective:
1. To determine horizontal and vertical distances of points at angular observations
2. To design the curve when change of directions takes place in roads, railways
3. To prepare plans or maps from photographs taken at suitable camera station

Course Outcomes:
Student shall be able to
1. Calculate angles, distances and points of elevation
2. Design the different curve in roads and railways
3. Understands the procedure of triangulation system and base line measurement
4. Understand procedure of Photogrammetric & Field Astronomy
5. Understand the principle of Remote sensing, GIS & GPS
6. Design of Hydrographic and Underground survey

Unit-I Tacheometry:
Stadia method, fixed hair and movable hair and tangential method, formulae for distance and reduce level determination.
Theory of anallatic lens. Beaman’s stadia arc, Auto reduction tacheometer such as Jeffcot Hammer fennel.

Unit-II
Curves: Classification, degree of curves, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves, vertical curves, their types and setting out method of vertical curves.

Transition Curves: Ideal transition curves, characteristics methods of determination of length, Elements of different type and method of setting out.

Unit-III
Triangulation: Principle, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, Reconnaissance, Indivisibility, angular measurement
Base line and its measurement, Basenet, extension of Basenet, corrections to base line measurement, adjustment of field observation, errors in observation, method of least square, weighted observation, figure adjustment (Triangle only)

Unit-IV
Element of Photogrammetry: Basic definition, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, height from parallel measurements, fights planning, photographs required.
Field Astronomy: Elements of spherical trigonometry, Napier’s rules of circular parts, celestial sphere, ecliptic, circumpolar stars, astronomical terms, Astronomical triangle, coordinate systems.

Unit-V
Remote sensing: Introduction, definition, remote sensing system, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics.
GIS & GPS: Components of geographical information system (GIS), advantages and disadvantages, global positioning system (GPS), Introduction, definitions, GPS receivers, antenna, advantages of GPS.

Unit-VI
Hydrographic Surveying: necessity, sounding equipments and procedure of taking soundings, method of location of sounding, three point problem in hydrographic surveying, analytical and graphical methods, station pointer.
Underground Surveying: Surface alignment, correlation of surface and underground surveys; weisbach triangle transferring levels underground.

Text Books:

Reference Books:
2. Dr.A.M.Chandra, Surveying, 5th Edition, New age international limited, 2005

BCEP 313: SURVEYING-II LAB.
List of Practical:
1. Use of equipments
2. Determination of constant of Tacheometer.
3. Determination of elevation of point by Tacheometric surveying.
4. Determination of elevation of point and horizontal distance between them by Tacheometric survey.
5. Determination of gradient of given length if road by Tacheometric survey.
6. Setting out of simple circular curve by offset from chord produced method.
7. Setting out of simple circular curve by Rankine method of tangential angle.
8. Setting out of simple transition curve by tangential angle method.
9. Based line measurement.
10. Use of Total Station.
11. A) SURVEY CAMP (On any of the following topics)
   1. Road Project with horizontal curves.
   2. Irrigation Project
   3. Water Supply Project

BCEL420: STRUCTURAL DESIGN-I
(4-0-0-4) Total Hrs: 45
Course-Prerequisites: Concrete Technology
Co-Requisites: Structural Design- I (PR)
Course Objective: -
1. To understand phenomenon’s of design concepts and learning various codes related to RCC design.
2. To determine the structural behavior of steel and concrete.
3. To apply conventional methods for design of structural components of building.

Course Outcomes:
Student shall be able to
1. Apply the fundamental concepts of working stress method as per IS 456-2000 and Pre-stressed concrete method.
2. Apply the fundamental concepts of limit state method on limit state of Serviceability.
3. Apply the fundamental concepts of limit state of collapse in flexure and in Shear & Bond as per IS 456-2000.
4. Apply the fundamental concepts of limit state of collapse in Compression and design of footing as per IS 456-2000.
5. Solve the design of circular rectangular water tank.
6. Design of one–way, cantilever slabs, continuous and two way slab

UNIT I :

UNIT II :
4. Limit State of serviceability:
   (i) Causes and control of cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, cracks due to loading. Needs for crack width control.
   (ii) Moment – curvature relationship, deflection control of beams and one way slabs. (no numerical calculations)

UNIT III :
5. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode.
6. Limit state of Collapse in Flexure: Analysis & design of the Tee & L-beam section.
7. Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and axial force. Check for bond.

UNIT IV :
8. Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uni-axial bending, use of interaction curves.

UNIT V :
10. Design of circular water tank with roof slab/dome resting on ground by Approximate method/IS code method.
11. Design of rectangular water tank with one–way roof slab resting on ground by approximate method/IS code method.

UNIT VI :
12. Design of one–way, simply supported, single span and cantilever slabs and continuous slab / beam with IS coefficients.
13. Design of two way slab (For discontinuous edged only)
14. Design of Dog Legged / Open Well Staircases

BCEP420: STRUCTURAL DESIGN-I

List of Practical:
(Any Six from the following)
1. Stress strain behavior of RCC Section by LSM
2. Design of One way Continuous slab
3. Design of two way slab (For discontinuous edged only)
4. Design of Rectangular pad / slopped footing
5. Design of Circular water tank with roof slab/dome resting on ground.
6. Design of Rectangular water tank with one – way roof slab resting on ground.
7. Dog- legged / Open well staircase.
8. One field visit and its report in the journal

Text Books:

Reference Books:

BCEL315: Building Design and Drawing (2-0-0-2)

Course Prerequisites: Building Construction & Materials
Co-Requisites: Building Design & Drawing (PR)

Course Objective: -
1. To understand importance of Building drawing as engineers language
2. To plan building as per owner’s requirements and Building byelaws
3. To develop drawings to scale with location site and block plan with AutoCAD software

Course Outcomes:
Student shall be able to
1. Understand the commands of Auto cad.
2. Develop various plans in AutoCAD software.
3. Read and understand civil engineering drawings.
4. Draw building drawing as per functional requirements.
5. Understand the norms of planning as per bays and byelaws.
6. Understand the planning & drawing with appropriate scales using AutoCAD software’s.

Unit I: [05Hrs]
Auto CAD (Computer Aided Drafting)
 a) Specifying Distance and coordinates. Polar coordinates, relative Cartesian coordinates. Interpreting curser modes and understanding prompt, choosing commands options, selecting objects, editing and grips. Setting up work area, measurement systems, scales factor mode as drafting tools. Symbols, blocks layers. Templates copying object, editing lines, changing length of object. Geometric construction of line and point parallel line, perpendicular lines, breaking lines, dividing lines, fillets, chambers, circles, tangent, arcs, curves through points, breaking polygons, solid shape ellipse.

Unit II: [05Hrs]
Hatch patterns boundary, adding text, Text formatting styles, size of text and scale of drawing, dimensions style, unit heights, locations, arrow style Polyline, editing, creating splice curve, dividing in segments, filling in solid area. Printing and plotting drawing, out put device paper size, orientation, control on scale and location.

Unit III: [04Hrs]
Method of Drawing:
Importance of Building drawing as Engineers language in construction & costing
Selection of scales for various drawings. Thickness of line Dimensioning, first angle and third angle method of projection, Abbreviations and conventional representations as per IS 19 [06]2.
Free hand dimensioned sketches stones of various building elements Importance in Civil Engineering.

Unit IV: [04Hrs]
Developing working drawings to scale as per IS 19 [06]2 from the givens sketch design and general specifications for terraced and pitched roofs in AutoCAD.
Developing submission drawings to scale with location site and block plan complete in AutoCAD.

Unit V: [06Hrs]
Designing of Buildings

Introduction: Site requirements, requirements of owner and Building byelaws. Climate and design consideration, orientation, recommendations of CBRI, General principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

Unit VI: [06Hrs]
Perspective Drawing:
Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.

BCEP315: BUILDING DESIGN & DRAWING
(0-0-4-2) Total Hrs : 20

Course Objective:
1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One assignment)
3. Working drawing of multi storied Public / Educational / Health / Community / Industrial building including structural details and layout of services. (One assignment).
4. Two point perspective of the single Residential building neglecting small building elements. (Two assignment – pitched & terraced roof)
5. Minimum 30 free hand self-explanatory dimensioned sketches of various building elements in sketchbook.
6. Line plans of various types of buildings e.g. public / educational / industrial / hospital / community on graph papers (Eight assignments)
7. Submission drawing of 02 (G+1) storied residential building framed structure including all details and statements as per the local bye laws. (One assignment)
8. One compulsory field exercise.

Text Books:

Reference Books:
2. George Omura, Mastering Autocad 1, 1st Edition, BPB Publications, New Delhi, 2004

BCEL 220: BASIC TRANSPORTATION ENGINEERING
(3-0-0-3)
Course-Prerequisites: ---
Co-Requisites: Basic Transportation Engineering (PR)

Course Objective: -
1. To understand the various modes of transportation & the transportation system
2. To identify all elements of a highway cross-section and effect of each element on highway design
3. To understand various types of pavements, their structures, and pavement design procedures as per IRC guidelines.

**Course Outcomes:**
Student shall be able to
1. Understand basic concept of highway engineering.
2. Design highway geometrics.
3. Design flexible and rigid pavements & understand maintenance of highways.
4. Understand the concept of bridge loading.
5. Understand various stresses considered in design of bridge superstructure.
6. Identify factors governing railway infrastructure.

**Unit I:** [05Hrs]
History of road development, Classification, alignment and surveys
Historical development of road construction, Fields of Transporations Engineering: Role of transportation in society; Modes of transportation.
Highway Engineering: Road types and pattern; Road alignment; Controlling factors and surveys for road alignment. -Classification of highways –al cross section of roads in urban and rural areas - definitions of various cross sectional elements - requirements and factors controlling alignment of roads, engineering surveys for highway location.

**Unit II:** [08Hrs]
Geometric design of highways:

**Unit III:** [10Hrs]
Pavement Design:
Types of Pavements & characteristic, Design parameters, Axel & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & CBR method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, joints.
Materials: Subgrade Soil – AASHO Classification, group index, Subgrade soil stabilization. CBR, aggregates physical & Mechanical properties & tests bituminous materials classification sources properties and tests. Cutback & Emulsions ,IRC/IS standards, Introduction to Geotextiles.

**Construction & Maintenance:**
IRC , MOST specifications for quality & quantity of materials, techniques, tools and plant for the Earthwork, sub base, base and wearing/surfacing course of flexible pavements with gravel, WEM, stabilized Bituminous & Concrete as
Construction materials, Drainage, shoulders, maintenance & repairs, Choice of construction.

**Unit IV:** [10Hrs]
Bridges – General Components, classification and identification, Data Collection site selection, Economic Span
Hydrology: Estimation of flood, discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board.

**Bridges: Loads, Forces, Stresses:**

**Unit V:** [04Hrs]
Bridges Superstructure
Different Structural Forms, culverts, causeway, minor and major bridges, suitability, precast post tensioned and segmental construction, launching operation, systems, bearing, Architecture. Methods & Techniques of rating of existing bridges, Inspection, Repairs, maintenance, corrosion causes and prevention, Aesthetics.

**Unit VI:** [08Hrs]
Railways
Railways Transportation and its development, Classification of Railways: Lines and their trac classification, Abutment, piers & Wing walls and their types. Definition of softening point on bituminous sample.

**List of Practical:**

**BCEP220: BASIC TRANSPORTATION ENGINEERING** (0-0-2-1)

## A. Test on aggregates (Any 05)
1. Determination of flakiness index of aggregate.
2. Determination of elongation index of aggregate.
3. Determination of specific gravity of aggregate.
4. Determination of crushing value of aggregate.
5. Determination of abrasion value of aggregate.
7. Determination of crushing value of aggregate.

## B. Tests on Bituminous Materials (Any 05)
8. Determination of softening point on bituminous sample.
9. Determination of penetration on bituminous sample.
10. Determination of stripping on bituminous sample.
11. Determination of ductility of bituminous sample.
12. Determination of viscosity of bituminous sample.
13. Determination of flash point of bituminous sample.
14. Determination of fire point of bituminous sample

MBL104: GENERAL PROFICIENCY-IV
(ADVANCED COMMUNICATION SKILL)
Course-Prerequisites: ---
Co-Requisites: ---
Course Objective:

1. To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking, one to one interaction and social ethics.

Course Outcome:
1. Deliver the thoughts in an effective way.
2. Understand the social ethics and implement them to become a more acceptable professional by the industry, institute and society in general.
SEMESTER VI

BCEL 314: STRUCTURAL ANALYSIS-II
Course-Prerequisites: Structural Analysis- I
Co-Requisites: Basic Structural Analysis- II (PR)
Course Objective: -
1. To understand the principles involved in the analysis of indeterminate structures
2. To study the analysis of continuous beams and frames subjected to lateral sway
3. To study approximate methods of analysis for portal frames

Course Outcomes:
Student shall be able to
1. CO1: Analyze the frames using Kani's Method
2. CO2: Apply different Approximate methods for analysis of 2D frames subjected to horizontal & vertical loads
3. CO3: Analyze non-prismatic beams
4. CO4: Analyze indeterminate beams using Flexibility methods
5. CO5: Apply Strain energy method for composite sections
6. Analyze the frames subjected to lateral sway using moment distribution method

UNIT I: [8 Hrs]
Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay single storey)

UNIT II: [7 Hrs]
Approximate method of Structural analysis for multi-storeyed frames with lateral loads (Portal and Cantilever method). Approximate methods for vertical loads i.e. Substitute frame method etc. (Max. three bay three storey)

UNIT III: [8 Hrs]
Column Analogy method, Application to beams, Calculations of Stiffness factors and carry over factors for non-prismatic method, Analysis of non-prismatic fixed beams.

UNIT IV: [8 Hrs]
Introduction to Flexibility Method of structural analysis, influence coefficient, Choice of base, determine structure and redundant forces, compatibility equations. Hand solution of simple beam problems.

UNIT V: [8 Hrs]
Strain energy method applied to simple composite structures (Simple problems), Introduction to basic theory of elasticity, Concept of stress, strains, strain displacement relationship, equation of equilibrium, boundary conditions, generalized Hook's law, plane stress and plane strain problem. Theory of photo elasticity applied to beams. Study of various types of strain gauges, Analysis of strains by stain gauges.

UNIT VI: [6 Hrs]
Moment distribution applied to frames with sway (up to single storey two bay)

Text Books:

Reference Books:

BCEP314: STRUCTURAL ANALYSIS-II
(0-0-2-1)

List of Practical:
(Any ten from the following List)
1. To calculate & compare the buckling loads for each column model with different end conditions
2. To determine experimentally the horizontal displacement of the two hinged arch and verify the same with theoretical value
3. To determine the sway of a fixed end portal frame under different loading conditions
4. To find the value of flexural rigidity (EI) for a given beam and compare it with theoretical value
5. To verify Clerk Maxwell's reciprocal theorem for beam
6. To determine the deflection of a pin connected truss analytically & graphically and verify the same experimentally
7. To determine material fringe value by using diffused light research polariscope
8. To verify the moment area theorem regarding the slopes and deflections of the beam
9. To determine the moment required to produce a given rotation (rotational stiffness) at one end of the beam when the other end is pinned
10. To determine the horizontal thrust and to draw the ILD for horizontal thrust
11. To verify Clerk Maxwell's reciprocal theorem by means of the truss
12. To verify the Muller Breslau theorem by using Begg's deformator set.
13. To verify strain in an externally loaded beam with the help of a strain gauge indicator and to verify theoretically
14. To measure the strain in the simply supported beam with the help of Electrical resistance strain gauge
15. To determine the stress pattern and material fringe value of beam using Photo elastic method.

BCEL316: STRUCTURAL DESIGN-II
(4-0-0-4) Total Hrs: 50
Course-Prerequisites: Structural Analysis-I
Co-Requisites: Structural Design -II (PR)
Course Objective: -
1. To understand the concepts and different aspects to be considered for design of steel structures.
2. To study the IS 800 specification s used in steel designing
3. To design the various structural components as per the codal provision.

**Course Outcomes:**
Student shall be able to
1. Understand design philosophies according to IS 800:2007 & behavior of structural steel
2. Understand wind load concept as per IS Code
3. Design various structural components of steel structure.
4. Apply relevant IS code provisions to ensure safety & serviceability of structural steel elements.
5. Design bolted & welded connections for tension & compression members
6. Familiarity with professional & ethical issues & the importance of lifelong learning in structural engineering

**UNIT I:** [10 Hrs]
A) Steel as a structural material, various grades of structural steel, properties, various rolled steel sections (including cold formed sections, structural pipe tube sections) and their properties.
   Introduction to I.S. 800-2007.

**UNIT II:** [10 Hrs]
A) Design of axially loaded members (a) Tension members (b) Compression members
   B) Moment resistant bolted and welded connection. (bending and torsion)
   C) Design of connection Beam to beam, beam to column-framed connection

**UNIT III:** [15 Hrs]
A) Design of simple built up beams : Laterally restrained and Laterally unrestrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates.
   B) Design of welded plate girder, concept of gantry girder.

**UNIT IV:** [15 Hrs]
Design of single rolled steel section column subjected to axial load and biaxial moment including base design.
Design of axially loaded built up columns. Laced and Battened (Column bases slab base gusseted base moment resistant bases)

**Text Books:**

**BCEP316 : STRUCTURAL DESIGN-II**
(0-0-2-1) Total Hrs : 20

**List of Practical:**
Any Six Design with A2 Size Sheet
1. Design of Tension Member
2. Design of Compression Member
3. Design of Laterally Restrained Beam.
4. Design of Laterally Unrestrained Beam.
5. Design of column with lacing (Single Lacing & Double Lacing).
6. Design of column with Battening.
7. Design of Plate Girder.
8. Design of connection Beam to beam, beam to column-framed connection.

**BCEP 317: ENVIRONMENTAL ENGINEERING-II**
(3-0-0-3) Total Hrs: 41Hrs

**Course Prerequisites:** Environmental Engineering - I
**Co-Requisites:** ---

**Course Objective:**
1. To learn wastewater treatment design and storm water, domestic sewage etc. flow system.
2. To understand wastewater characteristic, sampling of sewage, physical, chemical a[06] biological characterization.
3. To learn latest trends in environmental management and air pollution

**Course Outcomes:**
Student shall be able to
1. To define objectives, explain collection and conveyance and to estimate quantity of wastewater.
2. To describe wastewater characteristics; explain preliminary and primary treatment processes and its design along with effluent standards.
3. To explain the processes of biological treatment units for wastewater
4. To describe low cost treatments, disposal methods and self purification capacity of the steam
5. To explain air pollution sources, effects and control measures.
6. To define Environmental Impact Assessment, explain its methods and understand latest trend

**Unit I:** [06Hrs]
Introduction and objective of Waste water treatment, Quantity of storm water, domestic sewage, variation of sewage flow systems of sewerage - separate combined and partially combined layouts of sewerage system, capacity of sewers, design of sewers. Laying out of circular
Course Objective:
1. To understand necessity and importance of irrigation Engineering.
2. To learn about different types of spillway with their working operations and general principles of design reservoirs and dams.
3. To study various canals and design of canal structures

Course Outcomes:
Students shall be able to
1. Apply a sound knowledge of hydrology, meteorology, geology, conservation and resource management in day to day life.
2. Apply knowledge of reservoir planning and dams during execution of hydraulic structure
3. Determine various forces acting on rigid as well as non rigid dams.
4. Use skills for design of spillways & diversion head works etc.
5. Demonstrate components of canals.
6. Design, analyze and prepare model of canal structures from very small to very large extent.

Unit I: GENERAL: Necessity and importance of irrigation Engineering; Benefits & ill effects of irrigation; Classification of irrigation; General principles of flow, lift, perennial, inundation irrigation systems; Comparative study of sprinkler and drip irrigation systems. Lift Irrigation, components and general layout.

WATER REQUIREMENT CROPS: Suitability of soils for Irrigation; Standards of irrigation water; PET-R method of crop water requirements; Depth & frequency of irrigation; definitions of field capacity, wilting point, available moisture, duty, delta, GCA,CCA, k or depth, base period, outlet factor, capacity factor, time factor, root zone depth: Relation between duty & delta; Factors affecting duty; Principal crops in India; Crop layout.

Unit II: RESERVOIR PLANNING: Selection of site for Reservoirs: Engineering surveys, Geological and Hydrological investigations; Fixing of LWL, FTL, HFL, TBL; Different storage zones, in reservoirs; Determination of storage capacity by mass curve method; Reservoir sedimentation; life estimation of reservoir by Brunes method; Organization & Administration of irrigation projects. Reservoir operation and scheduling.

DAMS:Classification of Dams as per use, hydraulic design and materials; Factors governing selection of type of Dams.

Unit III: GRAVITY DAM: Definition; forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

EARTHEN DAMS: Types of earthen dam; Description of component parts of earthen dams
foundation, cut of trench, rock toe, heating, central impervious core, pitching and chipping turfing; Seepage through body of earthen dam and drainage arrangements; Failure of earthen dams, plotting of phreatic line for homogeneous earthen dams with horizontal filters; Stability of foundation against shear. Barages, Types of Barages, Advantages/Disadvantages.

Unit IV: [10Hrs]

SPILLWAYS: Types of spillway with there working operations; General principles of design of ogee spillway; Spillway gates – Vertical lift, radial, rolling and drum; Energy dissipation methods d/s of spillways, Hydraulic jump, deflating high velocity flow.

DIVERSION HEAD WORKS: Component parts of diversion headwork’s – Fish ladder, guide wall, devide all, silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Bligh’s Creep theory; dr. khosla’s theory for design of weirs on permeable foundations.

Unit V: [08Hrs]

CANALS
(A) GENERAL:
Types of canal; Alignment of canal; Cross section of irrigation canals; balancing depth; Schedule of area statistics; Losses in canals.

(B) CANALS IN ALLUVIAL, SOILS:
Kennedy’s silt theory – Design procedure, silt supporting capacity , drawbacks; Lacey’s Regime equation, channel design procedure, drawback’s ; Garret’s diagram for channel design.

(C) LINED CANALS:
Design procedure; Types of lining; relative merits and demerits of canal lining; Economics of canal lining.

(D) Introduction to Computational Fluid Dynamics.

Unit VI: [09Hrs]

CANAL STRUCTURES:
(A) CANAL REGULATION WORKS:
Only theoretical aspects of location, objects, classification, components and schematic section of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

(B) CROSS DRAINAGE WORKS:
Only theoretical aspects of location, objects, classification, components and schematic section of aqueducts, siphon aqueducts, super passage, canal siphon, inlets outlets and level crossings.

WATER LOGGING AND LAND DRAINAGE:
Causes, effects, preventive measures of water logging, Types of drains, Layout of tile drain systems: flow of groundwater to drains.

RIVER TRAINING WORKS:
Definition; Classification; theoretical aspects of river training works like as Guide banks, Groynes and Spurs, Bank protection.

Course Outcomes:
1. Understanding of water (as a natural resource) collection and management.
2. Knowledge of hydrology, environmental science, meteorology, geology, conservation, and resource management.
3. Ability to design, analyze and model very small to very large areas of the earth to predict the amount and content of water as it flows into, through, or out of a facility.
4. Ability to design of pipelines, water supply network, drainage facilities (including bridges, dams, channels, culverts, levees, storm sewers), and canals.

Text Books:

Reference Books:

BCEP319: WATER RESOURCES ENGINEERING-II (3-0-0-3) Total Hrs: 20

List of Practical:
1. To determine Capacity of reservoir by reservoir planning.
2. To determine Life of reservoir.
3. Design of Gravity Dam.
4. Design of Earthen Dam.
5. Design of Lined canals.
7. Design of Lift Irrigation Scheme.
8. Drawing of various canal structures.
9. Site visit to irrigation project – Detail report should be submitted.

BMEL 318: ELECTIVE I- OPERATIONS RESEARCH & MANAGEMENT (3-0-0-3)

Total Hrs: [50]

Course Prerequisites: Mathematics - III

Co-Requisites: ---

Course Objective: -

1. To study operational research methodology and its application to engineering.
2. To introduce students to use quantitative methods and techniques for effective decisions-making;

Course Outcomes:
Student shall be able to
1. CO1: Ability to apply Operation Research methodology to solve industrial problems.
2. CO2: Ability to convert the real world problem into a mathematical form and provide an optimum solution for implementation.

3. CO3: Ability to formulate the real world Assignment and Transportation Models and provide an optimum or feasible solution.

4. CO4: Able to apply the concept and knowledge of project management to achieve the project goals.

5. CO5: Able to build the network and analyze it for improvement in project or task.

6. CO6: Able to apply the inventory and simulation tools to investigate and control the uncertainty of resources.

Unit I: [07Hrs]
Introduction
OR methodology, Definition of OR, Application of OR to engineering and Managerial problems, Features of OR models, Limitation of OR.

Unit II: [08Hrs]
Linear Programming
Definition, mathematical formulation, standard form, solution space, solution – feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy, Graphical and simplex methods, Big M Method, formulation of Dual of LPP.

Unit III: [07Hrs]
Transportation & Assignment Problems

Unit IV: [08Hrs]
Project Planning
Project Management : Drawing of Network, CPM & PERT, Probability of completion of project, Cost analysis of project, Allocation & updating of Network.

Unit V: [08Hrs]
Inventory control & simulation

Unit VI: [07Hrs]
Queuing Theory
Waiting line situations, introduction & application of queuing models, classification of queuing models, problems on Single Server Queuing models (M/M/1) model.

Text Book:
1. Operation Research by Ashkhedkar & Kulkarni

Reference Books:
1. Operation Research by Hira & Gupta

**BCEL424: EARTHQUAKE RESISTANT STRUCTURES**
(3-0-0-3) Total Hrs: 35
(ELECTIVE-I)
**Course-Prerequisites:** Structural Design-I
**Co-Requisites:** ---

**Course Objective:**
1. To understand earth geology, movements of the plates, earthquakes
2. To Predict the Dynamic Behavior of simple structural systems,
3. To understanding of structural dynamics of simple systems subject to harmonic, impulse and/or arbitrary loading

**Course Outcome:**
Student shall be able to:
1. Understand earth geology, movements of the plates, earthquakes
2. Calculate the magnitude & intensity of the earthquake
3. Understand the concept of Earthquake resistant design of structures
4. Perform the seismic analysis of multistoeryed building
5. Understand the impact of special aspects of building on seismic response
6. Understand the requirement of ductile detailing in frame members

**UNIT – I:**
[5 Hrs]
The Earth and its interior, Circulations, plate tectonics, faults, seismic waves, Strong ground motions, characteristics of strong ground motions.

**UNIT - II:**
[5 Hrs]
Magnitude, Intensity, Richter scale measurement of earthquake, other modern methods of earthquake measurement, Numerical Problems

**UNIT – III:**
[5 Hrs]
Concept, Seismic zones in India, Seismic design philosophy for buildings. Earthquake Resistant Planning of structures: Guidelines for achieving efficient earthquake resistant building, I.S. selection of sites, importance of architectural features in earthquake resistant building, twisting of building, geotechnical design considerations.

**UNIT – IV:**
[5 Hrs]
Introduction to IS 1893-2002, Structural response to earthquake, Seismic analysis of multistoried frames by equivalent static analysis method, Introduction to IS 13920, design strategy, strength, ductility of reinforced concrete members

**UNIT – V:**
[8 Hrs]
Special aspects in Multi-storey buildings, Effect of torsion, flexible first story, P-delta effect, soil-structure, interaction on building response, drift limitation

**UNIT – VI:**
[7 Hrs]
Seismic effects, resistance and ductile detailing in RC building elements: Beams, Columns, Beam-Column joints, footing, shear walls, seismic design considerations for open ground storey, short column effect

**Text Books:**

**BCEL421: GEOLOGY & EARTH SCIENCE**
(ELECTIVE-I)
(3-0-0-3) Total Hrs: 45Hrs
**Course-Prerequisites:** ---
**Co-Requisites:** ---

**Course Objective:**
1. To understand processes of Rock weathering, formation of soils and different profiles of soil and rocks
2. To study methods of determining intensity and magnitude of earthquakes

**Course Outcome:**
Student shall be able to
1. Study of various terminologies in geology & soil formation.
2. Understand the concept of plate tectonics & dynamic geology.
3. Characterization of minerals & their occurrence.
4. Study engineering properties of rock & their formation
5. Analyze the effect of fold & fault on engineering structures.

**Unit I:**
[08Hrs]

**Physical Geology:**
Geomorphic processes-Rock weathering-Formation of soils soil profiles-soils of India – Geologic work and engineering significance of rivers and oceans

**Unit II:**
[08Hrs]

**Plate tectonics:** Lithospheric plates-diverging, converging and transform boundaries-their
characteristic features--mid-oceanic ridge, benioff zone and transform faults--significance of plate tectonic concept.

**Earthquake:** Elastic rebound theory--types of seismic waves--cause of earthquake intensity and magnitude of earthquake--Locating epicentre and hypocenter--effect of earthquake--distribution of earthquake--earthquake resistant structures.

**Unit III:** [06Hrs]

**Unit IV:** [06Hrs]

**Unit V:** [08Hrs]
**Structural Geology:** Definition--outcrop--strike and dip. Folded definition--parts of fold--classification--recognition of folds in the field. Faulted definition--parts of a fault--classification recognition in the field--effects of faulting and subsequent erosion on outcrops. Joints--definition--classification. Unconformites--definition--classification recognition in the field. Effects of all the 70 above described structures in the major engineering projects like reservoirs, dams, tunnels and other important structures.

**Unit VI:** [09Hrs]

**Hydrogeology:** Groundwater table--abundance and advantages--aquifer--aquiclude--aquifuge--artesian conditions and artesian wells--cone of depression--perched water table.

**Recommended field work:** Field trip to quarries or geologically significant places to learn--in site character of rocks in quarries/outcrops--measuring strike and dip of a formation--tracing of outcrops.

**Text Books:**

**Reference Books:**

**BCEL423: GROUND WATER MANAGEMENT (ELECTIVE-I)** (3-0-0-3)

**Course-Prerequisites:** Geotechnical Engineering--II and Water Resources Engineering I

**Co-Requisites:** ---

**Course Objective:**
1. To study well hydraulics and various types of flows
2. To study methods of ground water replenishment
3. To study the methods for ground water recharge

**Course Outcome:**
Student shall be able to
1. To understand various terminologies in ground water
2. Demonstrate ground water movement using various laws
3. Understand concept of well hydraulics.
4. Use different methods of ground water recharge
5. Design infiltration galleries and ground water replenishment
6. Understand control & management of ground water

**Unit-I** [09 Hrs]
Introduction: occurrence of ground water, geological formations as aquifers, types of aquifers

**Unit-II** [09 Hrs]
Ground water movement, Darcy’s Law, permeability and its measurement, tracing of ground water movement, fundamental equations for steady and unsteady ground water, flow, flow-nets.

**Unit-III** [09 Hrs]
Well hydraulics; steady flow in confined, semi--confined and unconfined aquifers, radial flow, superpositions; method of images, multiple well system.

**Unit-IV** [07 Hrs]
Different method of well constructional, construction of well casings and screens natural and artificial gravel packed wells, safe yields, estimation, pumping recuperation tests.

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Unit-V [06 Hrs]
Two dimensional flow, method of solution, infiltration galleries, Ground-water replenishment, Recharge of ground water, different methods.

Unit-VI [05 Hrs]
Salt water instruction, concept, interface and its location, control of intrusion.

Text Books:

BCEL425: ENVIRONMENTAL MANAGEMENT (3-0-0-3) Total Hrs: 30 (ELECTIVE-I)

Course-Prerequisites: ---
Co-Requisites: ---

Course Objective:
1. To create environmental awareness
2. To understand impact of environmental degradation
3. To understand principle, laws, methods of environmental management

Course Outcome:
Student shall be able to
1. Develop environmental awareness and various policies.
2. Suggest and implement various air pollution control techniques.
3. Create interest in society for sustainable development.
4. Sustain enough for risk assessment and its techniques.
5. Design the environmental management plan
6. Use the knowledge of environmental legislations and environmental acts

Unit I: [08Hrs]
General: - Global and Indian scenario, National environmental policy

Unit II: [06Hrs]
Air Pollution and Control, Climate Change.

Unit III: [08Hrs]
Public Private Participation Model, ISO Certification, EHS, EDM, Environmental organizations for planning and implementation sustainable development Preventive and reactive strategies for environmental pollution control

Unit IV: [10Hrs]
Environmental impact and risk assessment Methodologies: Adhoc, checklist, network, matrix etc. Typical case studies of environmental impact assessment

Unit V: [06Hrs]
Environmental impact statements, Environmental Audit Environment management Plan

Unit VI: [06Hrs]
Environmental Legislation, Air, water and Environmental acts.

Text Books:

OPEN ELECTIVES
For syllabus of open elective subjects, please refer syllabus provided in the last
Solid wastes - sources, types, composition, physical, chemical and biological properties of solid wastes, sources and types of hazardous and infectious wastes in municipal solid wastes. Solid waste generation and collection, Handling, storage, processing, transportation Treatment and disposal methods - Physico-chemical and biological. Stabilization and Solidification, thermal methods, land disposal, site remediation.

**Unit -3 Energy Efficiency**


**UNIT-4: CITY DESIGN**

- Introduction to city designing
- Scope and purpose of various plan types: Perspective plans, regional plans / structure plans, and master plans / comprehensive development plans, local are plans, special purpose plans, annual plans, projects / schemes
- Emerging design strategies and concepts: the land pooling, urban renewal, conservation and redevelopment processes
- Public private and people partnerships; resource mobilization;
- Spatial patterns of urbanisation, settlement systems, classification of cities; Character of Indian cities and challenges involved in planning;
- Master planning process in India
- Concepts of smart growth, transit oriented design, growth management strategies, transit metropolis, new urbanism, advocacy planning, smart city etc
- Analysing and evolving proposals for urban components like streets, public open spaces, public gathering places
- Compact City

**UNIT 5: SMART TRANSPORTATION**

- Measures to promote non-auto modes; Pedestrianisation;
- Bicycle Transportation - advantages; Planning Bicycle Facilities - class I, Class II and Class III bikeways;
- LOS criteria for Pedestrian and bicycle Facilities. Traffic And Transport Management In Urban Areas,
- Intelligent Transportation System; Mass Transportation Planning; Para-Transits
- Rapid Transportation System; New technologies – METRO, LRT, Monorail, BRT, Automated Highways
- Smart parking, Advance Safety control, Sustainable and efficient public transportation
- Citywide wireless networks, Wide Wireless connectivity in city, Smart monitoring
- Smart cards and other applications, Sensors, smart devices like routers, modem and other
- GIS system, Mobile apps and other relevant devices

**Unit -6: Smart Materials and Structures**


**Unit -7: Smart Technologies**

**Smart Transportation with Urban Planning**

Intelligent Traffic Management, Smart parking, Advance Safety control, Sustainable and efficient public transportation, Clean energy and environment, Renewal energy sources and system, Green building infrastructure, Energy efficient facility, Smart grid system and metering.

**Project Governance's Requirements**

Citizen interaction and engagement, Public information facilities, monitoring system for execution of projects, financial framework for development of the tiny cities.

**Water Distribution and Waste Management**

Sustainable water management facilities, System for Water quality monitoring, Drainage system Waste disposal, Sewage treatment system, System for recycling e-waste, Advance waste collection.

**Smart Communication Techniques**

Citywide wireless networks, Wide Wireless connectivity in city, Smart monitoring, Smart cards and other applications, Sensors, smart devices like routers, modem and other, GIS system, Mobile apps and other relevant devices.

**Reference Books:**


MBL105: GENERAL PROFICIENCY –V
Course-Prerequisites: ---
Co-Requisites: ---
Course Objectives:
1. To develop the technical presentation
2. An ability to perform better in group discussion and interviews
Course Outcomes:
1. An ability to write a technical report in an effective way
3. On report writing, GD, Interview Techniques.
5. A 3 to 5 days workshop shall be conducted.
6. Syllabus to be approved by Board of Studies for Interdisciplinary Courses.

MBL106: GENERAL PROFICIENCY -VI
Course Objectives:
1. To orient the students for research in the area of their interest and introduce them the step wise procedure for carrying out the research.
2. To introduce various mathematical and simulation tools useful for research activity
3. To introduce the methods for safeguarding the intellectual property rights.
Course Outcomes:
1. Understand the need and importance of research
2. Use different analytical and simulation tools for research
3. To carry out literature survey
4. To Present results and write a project report
5. On Research Methodology.
7. A 3 days workshop shall be conducted.
8. Syllabus to be approved by Board of Studies for Interdisciplinary Courses.
SEMESTER VII

BCEL320: PROJECT PLANNING & MANAGEMENT (3-1-0-4)
Total Hrs.: 45
Course-Prerequisites: ---
Co-Requisites: ---
Course Objectives:
1. To learn elements of management in civil engineering projects, organization structure and quality control.
2. To study project planning, project monitoring, cost planning, and resource allocation through network techniques.
3. To understand engineering economics and laws related to contracts, labor safety etc.
Course Outcomes:
1. Understand the project life cycle and organization.
2. Solve problems related to Network and total duration of the project using different network techniques.
3. Apply effectively the principles of scheduling techniques in projects.
4. Understand legal aspects of contract and their types.
5. Calculate operational cost, owning and hiring cost of the equipment.
6. Understand various acts related to the project.

Unit I: Elements of Management [4 Hrs]
Project cycle, Organization, planning, scheduling monitoring updating and management system in construction, Quality Control.

Unit II: Network Techniques [10 Hrs]
Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique

Unit III: Engineering Economics [9 Hrs]
Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis.

Unit IV: Contract Management [9 Hrs]
Legal aspects of contraction, laws related to contracts, land acquisition, labor safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project.

Unit V: Equipment Management [4 Hrs]
Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling.

Unit VI: Industrial Relations [9 Hrs]

Text Books:

Reference Books:

BCEL322: ESTIMATING & COSTING (3-1-0-4)
Total Hrs.: 45
Course-Prerequisites: Building Design & Drawing, Surveying-I, Surveying-II
Co-Requisites: Estimating & Costing (PR)
Course Objectives:
1. To understand the purpose of quantity estimates and methods of cost estimates.
2. To learn quantity estimates of various materials and techniques required for construction.
3. To study about valuation and purpose of valuation.
Course Outcomes:
Student shall be able to
1. Write specification related to building, irrigation & road work
2. Use knowledge of purposes & methods of estimates.
3. Calculate quantity estimates of various materials.
4. Calculate quantity of estimates for road irrigation & other items.
5. Effectively valuate the properties of civil engineering aspects.
6. Perform site administration for organization as construction industry.

Unit I: [8 Hrs]
General: Importance of the subject, purpose of quantity estimates, Modes of measurement and units of measurements IS1200. Methods of cost estimate in general, various methods of stage-I (approximate) estimates. Specification: Purpose and principles of specification writing, types of
specification writing and developing detailed specification of a few items related to building, Irrigation Work, Road work.

**Unit II:**
Cost Building up: purpose and principles, importance of Schedule of Rates in cost estimates, factors affecting analysis of rates. Fixed, variable prime and supplementary cost, overhead costs and its allocation. Recommendations from N.B.O. for Task work, No. of workman etc., Schedule of rates, market rate analysis of some specific items including transportation cost.

**Unit III:**
Cost & Quantity Estimate: Methods of detailed estimates, forms used, detailed estimates of Civil Engineering works, Building, Quantity estimates: Working out quantities of various materials required for construction, such as cement, steel, bricks, aggregates, timber.

**Unit IV:**
Earth work estimates in Roads including hill road .Cost Accounting, Various methods, classification of cost, direct & indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

**Unit V:**
Valuation - Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value, etc. Real estate, Guilt edged security. Net & gross return, Tenure of land, frees hold & lease holds property. Sinking f Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation tables. Valuation of a old building

**Unit VI:**
Organization for construction industry specific to Construction Industry. Organization Site administration.

**Text Books:**

**Reference Books:**

**BCEP322: ESTIMATING & COSTING LAB.**
(0-0-2-1)

**List of Practical:**
1. Specification for TEN items (Building works –6 items, road work –2 items, irrigation work –2 items).
2. Detailed estimate of a building, single storied with minimum four rooms with flat roof load bearing type structure
3. Detailed estimate of a building, single storied with minimum four rooms with flat roof frame type structure
4. Detailed bar bending schedule of components of building in experiment No. 3
5. Detailed estimate of road of minimum 1 km length with hot mix coat.
6. Detailed estimate of any two of the following: a) Septic tank for a colony b) R.C.C framed structure residential building c) Culvert
7. Analysis of Rates for Eight items.
8. Problem of valuation of existing residential building
9. Tender documents for the Experiment No. 2
10. Submission of detailed estimate of building using Qe-Pro software.

**BCEL426: REHABILITATION OF STRUCTURES**
(3-0-0-3)
Total Hrs: 42

**Course-Prerequisites:** Concrete Technology
**Co-Requisites:** ---

**Course Objective:**
1. To understand the quality of concrete, durability aspects, causes of deterioration.
2. Assessment of distressed structures, repairing of structures and demolition procedures.

**Course Outcomes:**
students will be able to:
1. Assess the quality aspects of existing building, various types of maintenance in building, Carry out inspection and evaluation of damaged structures
2. Identify strength, durability and thermal properties of concrete, weather effect on structure.
3. Assessment of repair by different materials like cement and concrete.
4. Identify the Repair work of various components in existing masonry building and concrete structure.
5. Applying principles of Retrofitting and Rehabilitation of structure to overcome deficiency of structure.
6. Understand demolition techniques for structures and dismantling of buildings so that maximum reuse value material is generated.

**UNIT-I**
[7 Hrs]
**REPAIR STRATEGIES AND MAINTENANCE**
Importance of Maintenance various aspects of Inspection. Assessment procedure for evaluating a damaged structure, causes of deterioration. Corrective & preventive maintenance of foundation as sub-structures.

**UNIT-II**
[7 Hrs]
**SERVICEABILITY OF CONCRETE**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete – Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness.
UNIT-III [7 Hrs]
REPAIR BY DIFFERENT MATERIALS
Special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

UNIT-IV [7 Hrs]
TECHNIQUES FOR REPAIR
Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

UNIT-V [7 Hrs]
REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES
Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

UNIT VI [7 Hrs]
DEMOLITION AND DISMANTLING TECHNIQUES
Non Engineering Demolition, Mechanical Method of demolition, Dismantling of building and reuse of material and fittings. - case studies.

Text Books:

Reference Books:

BECL 402 : ARTIFICIAL NEURAL NETWORK & FUZZY LOGIC (3-1-0-4)
Elective – II
Total Hrs.: 45

Course-Prerequisites: ---
Co-Requisites: ---
Course Objectives:
1. To cater the knowledge of Neural Networks and Fuzzy Logic Control
2. To provide comprehensive knowledge of adaptive fuzzy logic and design of the fuzzy control using genetic algorithm

Course Outcomes:
Student shall be able to
1. to obtain the fundamentals and types of neural networks.
2. a broad knowledge in in developing the different algorithms for neural networks.
3. analyze neural controllers
4. a broad knowledge in Fuzzy logic principles
5. able to determine different methods of Defuzzification

Unit-I: Fuzzy Set Theory [10 Hrs]

Unit-II: Fuzzy Arithmetic & Fuzzy Relations [10 Hrs]
Fuzzy numbers, Arithmetic operations, Projections and Cylindric Extensions, Binary fuzzy relations, Binary fuzzy relations on a single set, Fuzzy Equivalence relations , Fuzzy Ordering relations

Unit-III: [6 Hrs]
Features of Membership function, Fuzzification, Defuzzification methods, Extension principle

Unit-IV:Fuzzy Rule –Based Systems [12 Hrs]
Canonical rule forms, Decomposition of compound rules, Likelihood and Truth Qualification, Aggregation of fuzzy Rules, Graphical Techniques of Inference, Fuzzy Decision Making

Unit-V: Applications [10 Hrs]
Fuzzy pattern recognition, feature analysis, partitioning of feature space, single sample identification multi feature pattern recognition, simple fuzzy logic controller: control system design stages, assumptions in a fuzzy control system design, general fuzzy logic controllers, simple examples.

Unit- VI: Neuro-Fuzzy Controller In Engineering Applications [12 Hrs]

Text Books
1. Fuzzy Sets and Fuzzy Logic theory and applications,George J.Klir & Bo Yuan

BCEL428: Advanced Concrete Design (ELECTIVE-II) (3-1-0-4)
Total Hrs: 42
Course-Prerequisites: Structural Design – I
Co-Requisites: ---
Course Objectives:
1. To understand the philosophies of design of reinforced cement concrete and to justify this is the best
2. To know design of advanced structural elements with safety, stability and economical way
3. To study of provisions in IS 1893 and IS 456 for design of structures

**Course Outcomes:**
Student shall be able to
1. Design overhead circular service reservoirs.
2. Design Highway Bridge Slab and Girder type as per IRC loading
3. Design building frames using Limit state Method.
4. Design cylindrical shells by beam theory.

**UNIT-I**

**[10 Hrs]**
Design of overhead circular service reservoirs.
Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes.

**UNIT-II**

**[10 Hrs]**
Design of highway bridge with IRC loading and equivalent UDL. Slab type, Two/Three girder type

**UNIT-III**

**[10 Hrs]**
Design of building frames up to two bay/two storey, including design of foundation. Using Limit state Method.

**UNIT-IV**

**[6 Hrs]**
Design of cylindrical shells by beam theory, advantages, assumptions, ranges of validity and beam analysis. Design of shells with or without edge beam.

**UNIT-V**

**[6 Hrs]**
Design of Silos. (Using Limit state Method)

**Text Books:**

**Reference Books:**

**BCEL427: MATRIX METHOD OF STRUCTURAL ANALYSIS (ELECTIVE — II )**

**(3-1-0-4)**

**Total Hrs. : 45**

**Course Prerequisites:** Structural Analysis- II

**Course Objectives:**
To introduce stiffness method for analysis of statically indeterminate structures.
To develop a computer program for structural analysis based on the matrix stiffness method
global/structure stiffness Matrix, full storage, banded storage, band Minimization.

Unit –VI [5 Hrs]
Introduction to finite Element method, basic concept, discretization of structure, Rayleigh Ritz member for bar elements (prismatic / Non prismatic) Displacement based Bar elements (prismatic / non-prismatic) and Bean elements (prismatic) Displacement based bar elements (prismatic / Non-prismatic) and Bean element (prismatic), Load, Matrix for body forces.

Text Books:

Reference Books:

BCEL429: PAVEMENT DESIGN (ELECTIVE-II)
(3-1-0-4) Total Hrs.:45

Course-Prerequisites: Basic Transportation Engineering
Co-Requisites: ---

Course Objectives:
To make the students fully conversant with the latest methods of analysis and design of flexible and rigid pavements along with their strengthening techniques.
To study importance and functions of various component of pavements,
To study stresses developing in flexible pavements

Course Outcomes:
Student shall be able to
1. Calculate load on flexible & rigid pavement.
2. Identify various properties of material to analyze flexible & rigid pavement.
3. Analyze flexible & rigid pavement for roads & air field pavement.
4. Design flexible & rigid pavement for roads & air field pavement.
5. Test pavement for various evolutionary properties.
6. Review Indian and other standards for flexible & rigid pavement.

Unit –I [7 Hrs]
GENERAL:

DESIGN PARAMETERS:
Standard Axile load and wheel assemblies for road vehicles. Under carriage system for aircraft, Type & contact pressure, contact area imprints, Computations of ESWL for flexible and rigid pavements. Load repetition and distribution of traffic for highway and airfield pavement, airport traffic areas.

Unit – II [7 Hrs]
MATERIALS CHARACTERISTICS:

ANALYSIS OF FLEXIBLE AND RIGID PAVEMENTS:
Stress, Strain deflection analysis for single, two three and multi layered flexible pavement systems. Stress and deflections for rigid pavements due to load and temperature, influence Charts, unlimited load analysis joints.

Unit – III [8 Hrs]
HIGHWAY PAVEMENT DESIGN:
Flexible: North Dakota cone, Group index, CBR, IRC –37, Brumister, Triaxial (Kansas), AASHO methods of design.

Unit – IV [8 Hrs]
AIR FIELD PAVEMENT DESIGN:
Flexible: U.S.Corp of Engineering, CBR, FAA, Mcload(Canadian)
Rigid PCA,FAA & LCN, ultimate load Analysis yield lines patterns, methods.

Unit –V [7 Hrs]
PAVEMENT TESTING AND EVALUATION : Field Density, CBR, Plate load Test, Condition surveys and surface evaluation for unevenness, rut depth, profilometers, Bump integrators, Benkalman Beam Deflection study.

Unit – VI [8 Hrs]
STRENGTHENING OF PAVEMENTS:
Design of flexible, composite and rigid overlays for flexible and rigid pavements. Repairs, Maintenance and rehabilitation of pavements.

SPECIFICATION AND COST ESTIMATES:

Pavement Systems Management: Systems management, case studies of Highway and Airfield pavement projects.

Text Books:
2000

Reference Books:

BCEL441: ADVANCED HYDRAULICS (ELECTIVE-II) (3-1-0-4) Total Hrs: 45

Course-Prerequisites: Fluid Mechanics – II
Co-Prerequisites: ---
Course Objectives:
To understand the flow pattern in the open channels.
To understand the criteria for formation hydraulics jump.
Study different types of GVF profiles and apply various methods to determine the length of GVF profiles.

Course Outcomes:
Student shall be able to
Understand the flow pattern in the open channels.
Understand the criteria for formation hydraulics jump.
Identify different types of GVF profiles and methods
Computation of water hammer pressures in pipe
Understand causes of water hammer
Design of penstocks and surge tanks

Unit-I [8 Hrs]
2) Theory of gradually varied flow. Analysis of surface profile of gradually varied flow.

Unit-II [8 Hrs]

Unit-III [8 Hrs]
4) Theory of Hydraulic jump, Location of hydraulic jump, application of hydraulic jump in design of hydraulic jump type stilling basin with horizontal apron.

Unit-IV [8 Hrs]
5) Equation of unsteady flow in a pipe line for incompressible fluid. Time of flow establishment. Rigid water column theory of water hammer and computation of water hammer pressures

Unit-V [8 Hrs]
6) Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, computation of water hammer pressure of frictionless flow in horizontal pipe for sudden and slow closer of valve, Application of alienvi’s method and charts approximate pressure. Water hammer pressures in pumping systems. Method characteristics
7) Computation of water hammer pressures in oranconed pipe system and surge tank system. Various devices. Used for protection from water hammer pressures.

Unit-VI [5 Hrs]
8) Function of surge tank and different type of surge tanks. Equation governing the flow in the simple surge tank system. Analysis of flow in a simple surge tank system. Computation of maximum surges in surge tank system.

Text Books:

Reference Books:

BCEL431: SOIL DYNAMICS (ELECTIVE-II) (3-1-0-4) Total Hrs.: 45

Course-Prerequisites: Geotechnical Engineering-II
Co-Prerequisites: ---

Course Objectives:
Understand the concept of behavior of soil under the dynamic loading
To study soil settlement characteristics under dynamics load
To study and understand strength and deformation of characteristics of soil.

Course Outcomes:
Student shall be able to
Understand the elastic properties of soil
Understand and assess the dynamic characteristics of soil
Understand the concepts of soil liquefaction
Access the soil settlement due to dynamic loading
Analyse the effects of vibration on various soil properties
Design the appropriate machine foundation

Unit I [6 Hrs]
Elastic properties of soil, applicability of Hook’s Law to soil, elastic contents of soil and their determination,
Coefficient of elastic uniform compression and shear, cyclic plate load test

Unit II [10 Hrs]
Unit III [6 Hrs]
Strength and deformation characteristics of soil under dynamic loads, liquefaction are soil, criteria of liquefaction, field and laboratory assessment of liquefaction.

Unit IV [6 Hrs]
Residual soil settlement under dynamic loads, damping properties of soil, effects of vibration on internal friction, cohesion, viscosity, porosity and permeability, vibroviscous soil resistance.

Unit V [10 Hrs]
Earthquake soil settlement under dynamic loads, damping property of soil, effects of vibration on internal friction, cohesion, viscosity, porosity, & permeability, vibroviscous soil resistance. Propagation of elastic waves in isotropic materials, application to dynamic problems, and energy transmission from machine foundation in elastic half space.

Unit VI [7 Hrs]

Text Books:

Reference Books:

BCEL432: GREEN BUILDING (ELECTIVE II)
(3-1-0-4) Total Hrs.: 45
Course Prerequisites: Building Const & Materials/Environmental Engineering - II
Co-Requisites: ---
Course Objectives:
To understand the concept of high performance green buildings and sustainability
To study the various existing rating systems for sustainable building design
To study various methods of energy and water conservation
Course Outcomes:
Student shall be able to
gain a broad understanding & explain the basic concepts of Green Building
Identify, formulate & explore use various green construction materials, processes and systems
Apply knowledge of local, national and international rating systems while designing green buildings
Apply modern green engineering tools, techniques & skills necessary for engineering practice in energy efficiency concept during execution.
Use various methods of energy and water conservation for development of sustainable building.
Explain the contemporary issues and development associated with green building

Unit – I [9 Hrs]

Unit – II [8 Hrs]
The green building process and assessment Phases of sustainable development: site planning and evaluation, construction, commissioning, and occupancy phases; site selection and location of building on a site; building design: orientation, components, systems, integrated design, scale; material selection, historic, present, properties, how they work, efficiency; construction: phasing, sequencing, minimization of erosion; occupancy – proper use; reuse; building lifecycle Ecological design

Unit III [4 Hrs]
Introduction and description of existing rating systems for sustainable building design and construction (both new construction and renovations) at local, national, and international level; BEEs, LEED, CHPS, ASHRAE Green Guide, Energy Star Homes, international: BREEAM, BEPAC, Green Star Certification, CASBEE, World Green Building Council.

Unit IV [8 Hrs]
Energy Considerations in Green Building, Buildings’ contribution in environment devastation – why the way we build is so critical for sustainable development; electricity consumption per capita in houses. Creating a low energy profile

Unit V [6 Hrs]
Building systems: lighting – day lighting; ventilation – natural ventilation; indoor air quality; heating/cooling – geothermal; passive and active systems for energy production and conservation; water conservation – grey water reuse, water saving plumbing fixtures. Sustainable features in buildings – case studies of interesting items related to topic.

Unit VI [9 Hrs]
Construction Operations and Building Commissioning. Economic issues and future directions in green building. Proper way to promote sustainability, western world as a role model; how to stop it, motivation for conservation, marketing, tax incentives, corporate and government Environmental responsibilities

Text Books:
Sustainable Construction : Green Building Design

Reference Books:
Hard book on functional Requirements of Buildings (SP41)

ELECTIVE III
BCEL433: ADVANCED TRANSPORTATION ENGINEERING (ELECTIVE-III) (3-1-0-4)
Total Hrs. :45

Course-Prerequisites: Basic Transportation Engineering
Co-Requisites: ---
Course Objectives:
1. To introduce the advances in transportation engineering and to make the students conversant with traffic flow theory as well as analytical techniques in estimation of flow variables.
2. To understand traffic safety, causes of accidents, interpreting accident data.
3. To understand the concepts of air transportation, including air traffic control and operation, and runway configuration and length

Course Outcomes:
Student shall be able to
1. Measure and calculate different traffic parameters like speed, flow, travel time and delay.
2. Apply appropriate statistical methods while dealing with different types of traffic data collected during traffic studies and must have a understanding of measures for traffic safety.
3. Plan the urban transportation System for Indian Cities and must have a understanding of rules of Motor Vehicle Act.
4. carryout the geometrical design of the airport infrastructure
5. Implement different visual aids required at airport.
6. carryout design of tunnels for various rock types

Unit –I [10 Hrs]
Objective and scope of traffic engineering, intelligent transport, tunnel, and airport engineering. Traffic Engineering: 3E's of traffic characteristics, road vehicle characteristics, Traffic on Indian roads. Traffic surveys: Speed, Journey time and delay studies, methods of measurement of spot speed headways gaps volume/ capacity surveys speed, volume density interrelations, measurements of running and journey speeds
Origina Destination surveys necessity, surveys necessity, survey methods sample size, data analysis & Presentation, Highway capacity, level of service concepts. Traffic Flow measurement and automatic incident detection using video camera. Collision avoidance system.

Unit –II [9 Hrs]
Traffic Events:
Statistical method for interpretation regression application of Binomial, Normal Poisson distributions, Discrete and continuous distribution to traffic flow, Test of significance – Chi square & 'T' test.

Traffic Safety:
Driver error, vehicle & road surface Laws and enforcement traffic accident conditions in India Collection and interpretation of accident data and recording in Std. from skidding speed and weather effects on accidents, Analysis of accidents. Pedestration cyclist & auto vehicle driver's safety. Traffic regulation 3R and 5E’s of traffic management. Traffic signal control system. Dynamic traffic light signals.

Unit –III : [8 Hrs]
Motor Vehicle act and Rules, Education, need and Methods, Air pollution & Noise Pollution by traffic.

Urban Traffic:
Urban transportation problems and Analysis of characteristics of mixed traffic flow, head and administrative set up of traffic colls at various levels, co-ordination with other transport modes, traffic organization. General principles of urban transport planning in context to India cities (Specially metropolitan). Parking guidance and information system, bridge deciding system. Electronic toll system.

Unit –IV: Airport: [7 Hrs]
Runway And taxiway design: Windrose, cross wind component, Runway Orientation and configuration. Basic runway length and corrections, runway geometric design standards. Taxiway layout and geometric design standards. Exit Taxiway.

Unit – V [6 Hrs]
Airport layout, Airport classification. Terminal Area, Aircraft parking and parking system. Unit Terminal concept, Aprons, Hangers, International Airport layouts, phase development, helipads and heliports.
Visual Aids: Airport marking and Lighting for runway, Taxiway and other areas.
Air traffic control: Need, Network, control aids, Instrumental landing systems, Advances in Air-traffic control.

Unit – VI: Tunneling [6 Hrs]
1. Tunnel alignment Tunnel Surveys, Cross section of Highway & Railway.
2. Tunneling methods in Hard rock and Soft Grounds, Tunnel lining.
4. Advances in Tunneling, Tunnel boring Mechanics, Case studies.

Text Books:

Reference Books:

BCEL 434: Municipal and Industrial Water Treatment (ELECTIVE-III) (3-1-0-4)
Total Hrs.: 45

Course-Prerequisites: Environmental Engineering - I
Co-Requisites: ---
Course Objectives:
1. To understand the basic concept and requirement of treatment for municipal and industrial water.
2. To study theory and design of various filters
3. To study various theories and methods of adsorption

Course Outcomes:
Student shall be able to
1. Use concept and requirement of treatment for municipal and industrial water
2. Apply the principles of sedimentation & coagulation process
3. Design & operate the units of filters
4. Apply the concept of disinfection
5. Apply knowledge of adsorption for taste, odour and color removal
6. Use concept and requirement of treatment for removing heavy elements from water

Theories of chemical coagulation, common coagulant in water. Factors affecting coagulation, determination of coagulant doses, perikinetic and orthokinetic coagulation, theory and use of coagulant aids, design, construction. and operation of flocculators, design of clariflocculator.

Unit-III [12 Hrs]
Theory of filtration design construction and operation of filters – hydraulics of filtration and filter back washing. Performance of slow and rapid sand filters. High rate and variable rate filtration. Two layer filter pressure filters diatomaceous earth filters. Modern developments in filtration

Unit IV [4 Hrs]
Factors affecting disinfect ion – free and combined available chlorine, ultraviolet irradiation, ozonization disinfection of new mains – emergency chlorination.Water treatment for swimming pools

Unit V [8 Hrs]

Unit VI [8 Hrs]
Softening by ion exchange. Natural and synthetic media, capacity, regeneration. Ion exchange demineralization. Miscellaneous method of water treatment, iron and removal, desalination, nitrate, phosphate and arsenic removal and recent advances.

Text Books:

Reference Books:

BCEL435: REMOTE SENSING &GIS (Elective-III) (3-1-0-4)
Total Hrs.: 45
Course-Prerequisites: Surveying - II
Co-Requisites: ---
Course Objectives:
1. To study the basic concepts and uses of GIS and remote sensing
2. To study working of various elements of remote sensing
3. To use GIS to create and depict digital representation of the earth’s surface.

**Course Outcomes:**
Student shall be able to
1. Understands basic concept and uses of Remote Sensing
2. Understands different elements of remote sensing
3. Retrieve information of remotely sensed data
4. Apply problem specific remote sensing data for civil engineering applications
5. Carry out mapping and digital elevation modeling or digital terrain mapping
6. Understand the software/hardware requirements for implementing a GIS Project

**Unit-I**
REMOTE SENSING [9 Hrs]

**Unit-II**
EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS [9 Hrs]

**Unit-III**
OPTICAL AND MICROWAVE REMOTE SENSING [9 Hrs]
Satellites Classification Based on Orbits and Purpose, Satellite Sensors, Resolution, Description of Multi Spectral Scanning, Along and Across Track Scanners, Description of Sensors in Landsat, SPOT, IRS series, Current Satellites, Radiometer, Back Scattering, Side Looking Airborne Radar, Synthetic Aperture Radar, Radiometer, Geometrical characteristics; Sonar remote sensing systems.

**Unit-IV**
GEOGRAPHIC INFORMATION SYSTEM [9 Hrs]
GIS – Components of GIS, Hardware, Software and Organisational Context, Data, Spatial and Non-Spatial, Maps, Types of Maps, Projection, Types of Projection, Data Input, Digitizer, Scanner, Editing, Raster and Vector data structures, Comparison of Raster and Vector data structure, Analysis using Raster and Vector data, Retrieval, Reclassification, Overlaying, Buffering, Data Output, Printers and Plotters.

**Unit-V**
MISCELLANEOUS TOPICS

**Text Books:**

**BCEL 436: ADVANCED STEEL DESIGN**
(Selective-III) (3-1-0-4)
Total Hrs. :45

**Course-Prerequisites:** Structural Design – II

**Co-Requisites:** ---

**Course Objectives:**
1. Understanding the concepts of analysis and design of advanced steel structures like bridges, storage vessels and towers

**Course Outcomes:**
Student shall be able to
1. Design the gantry girder as per IS codes.
2. Analyze the industrial building as per forces.
3. Understand design of different types of bridges.
4. Design the different storage vessels.
5. Design the open web section as per the requirements
6. Analyze different special structures related to the field of steel design.

**Unit-I**
Gantry Girders [6 Hrs]
Cranes- Hand operated, Electrically operated overhead, Design considerations, Crane girder and Gantry girder design.

**Unit-II**
Industrial Building frames [9 Hrs]
(i) Up to two bay single storied, foundations, connections, detailing of steel connections.

(ii) North light trusses and lattice girders for industrial buildings.

Unit – III : Bridges [10 Hrs]
Types of bridges, Foot Bridge, Road Bridge, Railway Bridge.
Rolled beam bridges, Plate girder bridges, trussed bridge, through type, deck type bridges.
Weight of bridge truss by empirical formulae.
Loading on foot ways, IRC loading, loading on railway bridges.
Design of foot bridge, Design of components of railway and road bridges.
Bearsings
Types of bearings, bearing pads, design of rocker and roller bearings.

Unit – IV : Storage Vessels: [5 Hrs]
General concepts, design of bunkers,Circular and rectangular, including oil tanks.

Unit – V : Open Web Sections [5 Hrs]
Introduction, design of web sections.

Unit – VI : Composite construction. General Concepts. [5 Hrs]
Properties, Steel-Concrete composite design of encased beams, columns, shear connectors.

Text Books:

Reference Books:

BCEL437 : EARTH & EARTH RETAINING STRUCTURE (Elective-III) (3-1-0-4)
Course-Prerequisites: Geotechnical Engineering-II
Co-Requisites: ---
Course Objectives:
1. To introduce slope stability analysis, foundation design and retaining wall design.
2. To study the soil properties required for different types of earth retaining structures
Course Outcomes:
   Student shall be able to
1. Have knowledge about different types of retaining systems
2. Estimate lateral earth pressure for design of retaining system
3. Analyze and design simple retaining walls with basic analytical skills
4. Analyze and design complex retaining systems.
5. To describe the main concepts related with the behaviour of flexible earth retaining structures.
6. To identify the appropriated methods of analysis and design and to select the adecuated constructive solutions

Unit – I : EARTH PRESSURE ON RETAINING WALLS : [08 Hrs]
Rankines & Coloumb's earth pressure theories Poncelets and Culman's graphical construction for active and passive pressures. Effects of wall movement, Wall friction, type of slip surface. Wall angle, backfill slope angle, surcharges & line loads on lateral earth pressure. Direction & point of earth force application.

UNIT-II : STABILITY OF EARTH RETAINING STRUCTURES:[5]
Types of Walls: gravity, cantilever walls, walls with counter forts and relief shelves, their typical dimensional details. Stability requirements for overtaking, sliding, bearing capacity failure, overall stability against shear failure in backfill & foundation soil, application of geosynthetics in earth retaining structures

Unit – III : SHEET PILE RETAINING STRUCTURES: [08]
Sheet piles walls bulk heads. Types of sheet piles, constructional features cantilever & anchored walls, their suitability. Analysis for design of cantilever walls in cohesion less and cohesive soils, approximate analysis, Analysis for anchord sheet pile with free end & fixed end support condition. Blum’s criteria. Deadman and anchors: location and design principles

Unit – IV : COMPSCTED EMBANKMENTS:[06]
Compaction control in field compaction, consideration of placement moisture content during field compaction, over compaction, effects of compactive effect on compaction of clayey and sandy soil, effects of lifts in deep compaction, correction for excluded grain sizes in laboratory compaction Tests Theories of compaction: water film and lubrication concept, microstructure concept.

Unit – V : STABILITY OF SLOPES: Friction circle methods, factors of safety, stability numbers and use of stability charts, base failure, stability of earth dam slopes, for steady seepage and sudden draw down approximate analysis for plain slip surface, bishop’s method for slope stability. [06]

Unit – VI : COFFERDAMS: Types, suitability, stability analysis of cellular and diaphragm type cofferdams, TVA method, interlocked stresses [04]

Text Books:

Reference Books:

BCEL438 : COMPUTATIONAL FLUID DYNAMICS
  (Elective-III) (3-1-0-4)    Total Hrs.: 45
Course-Prerequisites: Fluid Mechanics – II
Co-Requisites: ---

Course Objectives:
1. To understand the various mathematical models to fluid dynamics problems
2. To develop formulating of flow problems using mathematical equation and to understand formulation of 2 D and 3D problems

Course Outcomes:
Student shall be able to
1. Understand finite difference method, finite volume method, and FEF method and governing equations applicable for flow analysis
2. To understand solution methods of elliptical and parabolic equations.
3. Formulation of incompressible viscous flow by various implicit and explicit schemes.
4. Interpretation of various mathematical equation like Euler’s equation, Navier-stokes equation to various problems
5. Apply knowledge of computational methods to find out solutions of numerous problems of fluid dynamics
6. Analyze different special structures related to field of steel design.

Unit I    [7 Hrs]

Unit II    [7 Hrs]

Unit III    [7 Hrs]

Unit IV    [10 Hrs]
Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods. Treatment of compressible flows: potential equation, Euler equations, Navier-stokes system of equations, flowfield-dependent variation methods, boundary conditions, example problems.

Unit V    [7 Hrs]
Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

Unit VI    [7 Hrs]

Text Books:

Reference Books:

BCEL439 : DISASTER MANAGEMENT
  (Elective-III) (3-1-0-4)    Total Hrs.: 45

Course Objectives:
1) Understand various types of disaster situation to mitigate related work
2) To know basics of rescue and relief during pre/post disaster periods.
3) To identify the various processes of risk management

Course Outcome:
Upon successful completion of the course, students shall be able to -
1. Affirm the usefulness of integrating management principles in disaster mitigation work.
2. Analyze the statistical approach for disaster preparedness.
3. Distinguish between the different approaches needed to manage pre- during and post-disaster periods.
4. Analyze different methods to prevent land sliding.
5. Explain the process of risk management.
6. Use modern tools usage to solve the global construction methods with sustainable technology.

UNIT-1
Concept of disaster management, types of disasters, disaster mitigating agencies and their organizational structure at different levels.
Overview of disaster situations in India: vulnerability profile of India and vulnerability mapping including disaster – prone areas, communities, places.

UNIT-II
Disaster preparedness – ways and means, skills and strategies, rescue, relief, reconstruction and rehabilitation.. Case studies: Lessons and experiences from various important disasters in India. Seismic vulnerability of urban areas

UNIT-III
Seismic response of R.C. frames buildings with soft first storey. Preparedness for natural disasters in urban areas. Sulbh technology for sanitation improvement in urban habitat. Landslide hazards zoning mapping and geo-environmental problems associated with the occurrence of landslides.

UNIT-IV

UNIT-V

UNIT-VI
Disaster resistant construction role of insurance sector. Response of buried steel pipelines carrying water subjected to earthquake ground motion. Preparedness and planning for an urban earthquake disaster. Urban settlements and natural hazards. Role of knowledge based expert systems in hazard scenario.

Text Books:
Iyengar, C.B.R.I, Natural Hazards in the Urban Habitat, Tata McGraw Hill
Jon Ingleton(Ed), Tulor Rose, Natural Disaster management, Tulor Rose, 1999.
R.B. Singh (Ed), Disaster Management, Rawat Publications, 2000

Reference Books:
Sachindra Narayan, Anthropology of Disaster management, Gyan Publishing House, 2000

Guidelines for the students:
1. A group of students (maximum four) shall select project topic from the above list of Project topics and has to present a Power point presentation.
2. Student will submit the detailed report starting from foundation of project, Building plan, working plan, Structural Analysis, Structural Design, complete Budget, Cost of project, actual cost of the work and supervision for a period of three month on ongoing construction and submit audio visual recording date wise.
3. At the end of every two months progress seminar will be conducted in presence of industrial expert. In first progress seminar student shall submit foundation details and working drawing, structural analysis element/ item wise, estimated cost for ongoing projects.
4. Second progress seminar will be conducted after Four months where student shall submit complete audio visual details of first stage (two month supervision) ongoing of project.
5. At the end of six month student shall submit the complete details in the form of draft thesis with audio visual details and the forms of certificate from the project Engineers through guide and student shall appear for pre submission seminar where in if it is observed that student has not understood the concept, extension may be given for one/two months.

Final Thesis shall be submitted as per the institute guideline issued time to time.

BCEL 440 : SELF STUDY*
(0-0-0- 2)
Course-Prerequisites: 141 Credits & Internship
Co-Requisites: ---
Course Objectives:
1. To identify smart materials and techniques used in civil engineering
2. To identify the different failures and causes of failures in civil engineering structures
3. To study advanced techniques in disaster management and eco-friendly buildings

Course Outcomes:
Student shall be able to
1. Use various smart materials and advanced techniques in construction of structures
2. Identify causes of failure and suggest remedial techniques
3. Prepare mapping of disaster management

Content:
1. Study of various smart materials used in Civil Engineering.
5. Advance Water & Waste water technology.
6. Disaster Management.

References Recommended:
1. CDEEP Remote Centre, GHRCE, Nagpur
2. Various Journals
3. Text Books and Articles in related topic
4. Internet Wikipedia and other relevant websites.

NOTE:- The student shall prepare a detailed report of the above work and submit to the respective Teacher’s for evaluation.

BCEP 323 Computer Aided Design (0-0-0-2)

Course Prerequisites: 141 Credits & Internship

Course Objectives:
1. To understand the basics of design with the help of computer aided design software’s
2. To prepare complete working drawing as well as structural drawing of different civil engineering structure

Course Outcomes:
Student shall be able to
1. Analyze & design civil engineering structures using software’s
2. Prepare the detailed working & structural drawing for civil engineering structures

References:
7. Handbook of seismic analysis and design of structure, Farzad Neam
8. www.nicee.org

Term Work
1) Analysis of multistoried frames by Equivalent Static Analysis Method using IS 1893:2002
2) Seismic Analysis & Design of multistoried building using softwares SAP2000 / STAAD Pro and check by any of analytical methods including Equivalent Static Analysis Method.
3) Seismic Analysis & Design of Elevated Service Reservoir using SAP2000 / STAAD Pro. and check by any of analytical methods

NOTE:- The student shall prepare a submission of the above work in Hard and Soft copy and submit to the respective Teacher’s for evaluation.
## DEPARTMENT OF ELECTRICAL ENGINEERING

### SEMESTER-III

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### ELECTIVE -I

- BEEL401  Industrial Instrumentation and Automation
- BECL303  Microprocessor Based Systems
- BEEL402  Electrical Energy Management
- BECL405  Digital Signal Processing

*OPEN ELECTIVES*
## SEMESTER-VII

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**Elective – II**

- BEEL409  OPTIMIZATION TECHNIQUES
- BEEL410  ELECTRICAL INSTALLATION & DESIGN
- BEEL411  EHV-AC & HVDC TRANSMISSION.
- BEEL501  ADVANCED POWER SYSTEM STABILITY
- MBAL101  ENTREPRENEURSHIP DEVELOPMENT

**Elective – III**

- BEEL502  ADVANCED ELECTRICAL DRIVES
- BEEL503  ELECTRIC VEHICLES
- BEEL504  ADVANCED POWER ELECTRONICS
- BEEL505  MODERN CONTROL SYSTEMS
- BEEL506  FUZZY & NEURAL APPLICATIONS
- BEEL405  FLEXIBLE AC TRANSMISSION SYSTEMS
- BEEL507  SMART GRID TECHNOLOGIES AND APPLICATIONS
THIRD SEMESTER

BAML 202: APPLIED MATHEMATICS-III[3-1-0-4]
Total Hrs: 45

Pre-requisite: - Applied Mathematics – II (BAML 201)
Co-requisite: -

Course Objectives:
1. To introduce the concepts of Laplace transforms, Fourier series, Partial differential equations, Matrices, Numerical methods and Z Transform.
2. To explain the physical significance and applications of above mathematical tools in electrical engineering.

Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. CO1: Use of differential calculus in solving engineering problems.
2. CO2: Use the concepts of Partial differentiation to solve the engineering problems.
3. CO3: Apply applications of partial differentiation.
4. CO4: Use concepts of integral calculus in engineering problems.
5. CO5: Use concepts of matrix algebra for solving problems.
6. CO6: Apply applications of matrices for solving engineering problems.

UNIT I: LAPLACE TRANSFORMS:
(7 Hrs)
laplace transformer and their simple properties, simple application of laplace transform to solve ordinary differential equation including simultaneous equations, salutation of one dimensional partial differential equation by transform method.

UNIT II: FOURIER SERIES AND SIGNAL SPECTRA: (7 Hrs)
Intraduction, The fourier theorem, evaluation of fourier coefficient, consideration of symmetry (odd, even, rotational), exponential form: Fourier series, integral theorem, fourier transform and continues spectra.

UNIT III: PARTIAL DIFFERENTIAL EQUATION: (6 Hrs)
Partial Differential Equation of first order and first degree-Lagranges form, linear homogenous equations of higher order with constant coefficients. Method of separation of variable application to transmission line.

UNIT IV : MATRICES: (7 Hrs)
Invers of matrix by adjoint method and it used in solving simultaneous equation, rank of matrix, consistency of system of equation, inverse of matrix by portioning method, linear dipendace, liner and Orthogonal Transformation. Characteristic equation Eigen values and Eigen vectors, Reduction to diagonal form, cayley – Hamilton Theoram (Withought Proof) Statement and verification. Syylfets thermo, association of matrices with linear differential equation of second order with constant coefficient, determination of largest eigen value and Eigen vector by iteration method.

UNIT V: NUMERICAL METHODS: (7 Hrs)

UNIT VI: THE Z-TRANSFORM: (7 Hrs)
Z-Transform, invers Z-Transform Relationship of the Fourier transform to Z-Transform, properties of z-Transform convolution of two sequence, poles and zeros, the inverse from by partial fraction expansion, The inverse Z-Transform by partial properties, solution of difference equations. Advanced topic on the subject.

Text Books:

Reference Books:

List of Practical: (If any) -

BEEL 201: NETWORK THEORY [3-1-0-4]
Total Hrs: 45
Pre-requisite: - Basic Electrical (BEEL106)

Co-requisite: -

Course Objectives:
1. The subject aims at basic components
2. To study various sources and circuit analysis method used in electrical system and their behavior
3. To study various numerical methods

Course Outcome:
At the end of the course the student shall be able to:
1. CO1 Analyze circuits with ideal, independent, and controlled voltage and current sources. using Mesh & Nodal analysis.
2. CO2 Determine the equivalent circuits of a network that include passive devices, dependent sources, and independent sources in combination using network theorems.
3. CO3 Understand the analysis techniques of electrical networks and also waveform synthesis.
4. CO4 Understand and measure the transient and sinusoidal Steady-state Responses of simple RC and RLC circuits.
5. CO5 Simplify circuits using network reduction approach.
6. CO6 Determine two port network parameters and one parameter in terms of other parameters.

Unit I: Nodal and Mesh analysis (8 Hrs)
Nodal and Mesh analysis basic equilibrium equations, matrix approach for complicated network, containing voltage, current sources, Mutual Inductances, source transformations, Duality.

Unit II: Network Theorems: (7 Hrs)
Superposition, Reciprocity, Thevenin’s, Norton’s, maximum power transfer, compensation, Tellegen’s theorem as applied to A.C. circuits.

Unit III: (5 Hrs)
Trigonometric and exponential Fourier series. Discrete spectra and symmetry of waveforms, synthesis, steady state response of a network to non sinusoidal periodic inputs. Fourier transforms and continuous spectra.

Unit IV: (7 Hrs)
Laplace transformation and its properties, partial fractions, singularity functions, waveform synthesis. Analysis of RC & RL network with and without initial conditions with Laplace transformation, evaluation of initial& final conditions.

Unit V: (6 Hrs)
Transient behaviors, concept of complex frequency, Driving points and transfer functions, poles, zeros of admittance function, their properties, sinusoidal response from Pole-zero locations, convolution theorem and integral solution.

Unit VI: (7 Hrs)
Two port network parameters and interconnections Three Phase unbalanced circuits and power calculations. Introduction of Basic filters (RC, L-C). Advanced topic on the subject

Text Books:

Reference Books:

BECL 201: ELECTRONIC DEVICES & CIRCUITS
(3-1-0-4) (Total Hrs: 40)

Pre-requisite: -, Basic Electronics (BECL105)
Co-requisite: -

Course Objectives:
1. To gain knowledge of electronics devices and semiconductor physics.
2. To study need of electronics devices and its applications.
3. To familiarize the students with the analysis and design of analog circuits.
4. To use appropriate experimentation techniques to evaluate circuit performance.

Course Outcome:
1. CO1 Understand operation of diodes, types of diodes and their role in design of various electronic applications.
2. CO2 Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points for various biasing methods and perform small signal analysis.
3. CO3 Understand the concepts of feedback and apply the concepts for improvement of performance of amplifier and oscillator.
4. CO4 Understand, analyze and design different types of power amplifiers and use methods for reduction of distortions.
5. CO5 Understand the operation of the Field Effect Transistor (FET), Metal Oxide Semiconductor Field
Effect Transistor (MOSFET) and design FET circuits.
6. CO6 To understand the characteristics of CMOS circuit construction and and perform AC & DC Analysis.

Unit I: PN Junction Diode (8 Hrs)
PN junction, forward and reverse bias, VI characteristics, Dynamic Resistance, Temperature dependence, Avalanche and Zener Break Down, Photo Diode, LED’s, LCD’s, Varactor Diode, Tunnel Diodes, Half and full wave rectifiers with filters.

Unit II: Bi-Polar Junction Transistors (7 Hrs)

Unit III: Feedback Amplifier & Oscillators (6hrs)

Unit IV: POWER AMPLIFIER (8 Hrs)

Unit V: Unipolar Devices (6 Hrs)
Field Effect Transistor, MOSFET, NMOS, PMOS, Principles of operation and characteristics, Biasing arrangement, small signal analysis of CG, CB and CD.

Unit VI: CMOS Circuits (5 Hrs)
An introduction to CMOS, Diode and MOSFET, Transistors, MOSFET Switches, Transmission Gate, Inverter - DC, AC Analysis. Advanced topics on the subject.

Text Books:

Reference Books:
1. Kang : CMOS Integrated Circuits
2. R.J.Bekar : Fundamentals of CMOS Design
3. Theraja&Sedha : Electronics Devices And Ckts.

BECP 201: ELECTRONIC DEVICES & CIRCUITS LAB

1. To plot the V-I characteristics of PN junction diode & to perform simulation on Micro-cap.
2. To design zener Diode as a voltage Regulator & to perform simulation on Micro-cap.
3. To calculate the ripple factor and plot waveform with and without capacitive filter of half wave rectifier & to perform simulation on Micro-cap.
4. To plot I/P & O/P characteristics of common emitter transistor configuration in active region & find I/P & O/P resistance, current gain & to perform simulation on Micro-cap.
5. To design transistor shunt voltage regulator.
6. To design emitter follower type of voltage regulator using darlington pair and simulate it on Micro-cap.
7. To design class AB audio power amplifier and simulate it on Micro-cap.
8. To design a Wein Bridge Oscillator and simulate it on Micro-cap.
9. To design RC phase Shift Oscillator and simulate it on Micro-cap.
10. To plot the drain & transfer characteristics of FET in CS mode and to perform simulation on Micro-cap.
11. To verify frequency response of single stage RC coupled amplifier & to perform simulation on Micro-cap.
12. To design CMOS inverter using micro wind.

BEEL202 ELECTRICAL MEASUREMENTS & INSTRUMENTATION (3-1-0-4) Total Hrs: 40

Pre-requisite: -

Co-requisite: -

Course Objectives:
2. To study performance of various Analog and digital instruments for measurement and Instrumentation purpose.
3. To study Analogue to digital conversion & ICs in Instrumentation.

Course Outcomes
Upon successful completion of the course, students shall be able to-
1. CO1 Describe the operating principle of analog, digital, indicating and recording type of instrument
2. CO2 Use basic methods for measurement of resistance inductance and capacitance.
3. CO3 Illustrate the principle, construction and working of moving coil, moving iron & Dynamometer type instruments and digital Voltmeters
4. CO4 Model and analyze generalized Instrumentation Systems like Active and passive transducers, Relative and absolute motion measurement, LVDT, piezoelectric transducers and variable inductance transducer

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5. CO5 Identify and specify sensors for measurement of temperature, pressure and flow
6. CO6 Design component and instrumentation systems using integrated circuits

Unit I: Measuring Instruments (6 Hrs)
Classification, Analog & Digital instruments, comparison of Analog & Digital instruments, advantages of digital instruments, classification of analog instruments. Indicating type instruments, recording type instruments.

Unit II: Measurement of inductance and capacitance (6 Hrs)

Unit III: Measuring Instruments (8 Hrs)
Ammeters, Voltmeters, principle of moving coil, moving iron & Dynamometer type instruments, extension of range using series and shunts, errors due to extension of range. Digital Voltmeters:- Types of DVM, Ramp type DVM, integrating type DVM. Measurement of active and reactive power in polyphase circuits using dynamometer type instruments. General theory, extension of range using C.T. & P.T. Errors in instrument transformers, applications of instrument transformers for metering & protection. TOD Meters.

Unit IV: Generalized Instrumentation Systems: (8 Hrs)
Active and passive transducers, Digital and analog mode of operation. Motion Measurement: - Relative and absolute motion measurement, measurement of velocity and acceleration. Electrical transducer for motion measurement, LVDT, piezoelectric transducers variable inductance transducer, measurement of shaft torque and power.

Unit V: Temperature Measurement & Miscellaneous Measurements: (6 Hrs)

Unit VI: Methods Of Analogue To Digital Conversion & Integrated Circuits In instrumentation: (6 Hrs)
Error in A to D conversion, application in digital voltmeter electronic frequency time period measurement.: Operational amplifiers (741) comparators (339) Timers (555), Function generators (2206) : constant current source using ICD. Advanced topic on the subject

Text Books:

Reference Books:

BEEP202: ELECTRICAL MEASUREMENTS & INSTRUMENTATION LAB.

List of Practicals:
- Measurement of medium resistance by using Voltmeter- Ammeter method.
- Measurement of medium resistance by using Wheatstone's bridge.
- Measurement of high resistance by using loss of charge method.
- Measurement of low resistance by using Kelvin's double bridge.
- Measurement of unknown inductance by using Hay's bridge.
- Measurement of unknown inductance by using Owen's bridge.
- Measurement of unknown capacitance by using Maxwell bridge.
- Measurement of unknown capacitance by using Desauty bridge.
- Measurement of unknown capacitance by using Schering bridge.
- Measurement of 3-phase power by one- watt meter method.
- Measurement of 3-phase power by the two- watt meter method.
- Measurement of Reactive power in 3- phase circuit by one Wattmeter method.
- Measurement of displacement using linear variable differential transducer.
- Measurement of pressure using piezo electric transducer.
- Measurement of different quantities of three phase circuit using three phase power analyzer.
- PSIM based experiment
- MATLAB based experiment
- Lab view based experiment
- Open ended experiment

BEEL203: ELEMENTS OF ELECTROMAGNETICS (3-1-0-4)  Total Hrs: 40

Pre-requisite: -

Co-requisite: -

Course Objective:-

55
1. To introduce the electric & magnetic fields in detail.
2. To study the laws related to electric and magnetic fields.
3. To know applications of Electromagnetic in electrical engineering applications.

Course Outcomes:
Upon successful completion of the course, students shall be able to -
1. CO1 Represent the electromagnetic phenomena & fields mathematically in different coordinate systems and to predict their output.
2. CO2 Apply Knowledge of mathematics to the analysis of electrical systems involving electric fields.
3. CO3 Apply Knowledge of science to design of electrical systems involving electric fields.
4. CO4 Apply Knowledge of engineering to design of electrical systems involving electric fields.
5. CO5 Understand the design of electrical systems involving magnetic fields.
6. CO6 Understand the elementary ideas of Electromagnetic waves & uniform plane waves.

Unit I: Vector Analysis (07 Hrs)
Idea of Vector & Scalars, Vector Algebra, Vector addition, vector subtraction, Dot product, Scalar product in Cartesian co-ordinates system, conversion of variables from Cartesian to cylindrical and vice-versa, Spherical co-ordinates system, Transformation of Cartesian to spherical and vice versa. Introduction to finite element analysis.

Unit II Coulomb’s law, Electrical field intensity and electric flux Density (07 Hrs):
Coulomb’s law, electric field intensity, field often, point charges, field due to continuous volume charge distribution, field of line charge, field of sheet charges, concept of flux density.

Unit III Gauss’s law, Energy and Potential of charge system (06 Hrs):
Gauss’s law, Application of Gauss’s law, divergence theorem, definition of potential difference and potential, potential of a point charge, potential field of system of charge, potential gradient, Energy density in Electrostatic field.

Unit IV Conductors, Dielectric and Capacitance and Poisson’s and Laplace’s Equations (06 Hrs):
Current and current density, continuity of current, metallic conductors, conductor properties and Boundary conditions, Nature of Dielectric materials capacitance and capacitances, Capacitance of parallel plate capacitor, Capacitance of two wire line, Poisson and Laplace equations.

Unit V The Steady Magnetic Field and Magnetic Forces (08 Hrs):
Biot Savarts law, Ampere’s Circuital Law, Stokes theorem, Magnetic flux density, Scalar and Vector Magnetic potentials, force on moving charge, force between differential current elements, nature of Magnetic material, Magnetization and permeability, Magnetic circuits, potential energy, and forces on magnetic materials, Inductance and mutual inductances.

Unit VI Maxwell’s equations and boundary conditions, Elementary idea of Electromagnetic waves, uniform plane wave.

Advanced topic on the subject

Text Books:

Reference Books:

MBL 102 : GENERAL PROFICIENCY-II : GERMAN / FRENCH / SPANISH LANGUAGE

Pre-requisite: -
Co-requisite: -

Course Objectives:
1. To help students in improving their interpersonal skills with global standards.
2. The students will have easier access to valuable literature, so that language will not be a barrier for them.
3. To develop liking for foreign languages, which will be also helpful for them in shaping their carrier at international level.

Course Outcomes
Upon successful completion of the course, students shall be able to-
1. Read, write and understand the literature in the foreign language studied by them.
2. Interact with foreigner in his language.
3. Shaping students carrier at international level.
FOURTH SEMESTER

BEEL204 ELECTRICAL MACHINES –I (3-1-04)
Total Hrs: 40

Pre-requisite: - Basic Electrical (BEEL106)

Co-requisite: -

Course Objectives:
1. To develop familiarity with 1 ph. & 3 ph. Transformers, DC Machines, 1 ph. & 3 ph. Induction machines.
2. To study starting, breaking & reversal of AC & DC Machines.
3. To study various characteristics and Speed control for AC & DC motors.

Course Outcomes
Upon successful completion of the course, students shall be able to:
1. CO1 Understand the construction, principle, performance of 3-phase transformers, autotransformer
2. CO2 Understand the parallel operation of three phase transformer, conversion of three phase to two phase
3. CO3 Understand the construction, principle, performance, control and applications of DC Motors
4. CO4 Understand the construction, principle, performance, control and applications of three phase induction motor
5. CO5 To connect, run, control and test 3 ph Induction motor
6. CO6 Understand special machine and their characteristics

UNIT I
3-Phase Transformer : Transformer operation and principle, o.c. & s.c. test on three phase transformer, determination of equivalent circuit. Parameters, Regulation, Efficiency, Magnetizing current and harmonics, polarity test, various connections with vector groups. All day efficiency, Autotransformers.

UNIT II
Three phase to two phase conversion, parallel operation of three phase transformer, methods of cooling, temperature rise test, maintenance of transformer, and insulation of transformer.

UNIT III: D.C. Machines:
Basis principle & operation, Armature reaction & commutation, Compensating winding, interpoles. Type of excitation. Characteristics of shunt, series & compound motor and generator speed control of d.c. shunt & series motor, constant horse power & constant torque drive of d.c. motor

UNIT IV : Three Phase Induction Motor

UNIT V
Starting of 3 phase I.M., speed control of I.M. by pole changing, frequency control, rotor resistance by varying supply voltage, braking, regenerative braking, plugging, dynamic braking Crawling & cogging.

UNIT VI: Single Phase I.M:
Double field revolving and cross field theory split phase motor, shaded pole motor, equivalent circuit, Torque-slip characteristics.

Advanced topic on the subject

Text Books:

Reference Books:

BEEL204: ELECTRICAL MACHINES-I LAB
List of Practicals:
1. Verification of additive and subtractive polarity on two winding transformer.
2. Conversion of two-winding transformer into auto transformer.
3. Determination of efficiency and voltage regulation of a three-phase transformer by direct loading.
4. Connection of transformer for the conversion of three phases to two phases.
5. Load test on 3 phase squirrel cage induction motor.
7. No load and blocked rotor test on 3-phase induction motor.
8. To perform load test on DC shunt generator
10. Load test on DC series motor with mechanical loading.
11. Load test on DC Shunt motor.
12. To perform the sumners test on single phase transformers.
13. Speed control of DC shunt motor by field current and armature voltage control methods.
BECL 302 : ANALOG SYSTEM DESIGN (3-1-0-4) Total
Hrs: 40
Pre-requisite: - Electronic Devices & their Circuits (BECL201)
Co-requisite:

Course Objectives:

To understand analog circuits and systems.
To know linear and nonlinear applications of operational amplifier ICs.
To study frequency response of different circuits based on operational amplifier applications.
To study and use different ICs such as timers for applications.

Course Outcomes

Upon successful completion of the course, students shall be able to-

CO1 Understand the terminal characteristics and configuration of opamps

CO2 Design /analyze fundamental circuits based on op-amps.

CO3 Acquired knowledge of multistage amplifiers, analysis of multistage amplifier and its frequency response

CO4 Ability to interpret the characteristics of Filters and design of a filter

CO5 To study and analyze the waveshaping circuits and creates circuit based on the operational amplifier.

CO6 Design and analysis of various applications using op-amps and IC 555. Choose various IC for electronics application.

Unit I: Operational Amplifier Fundamentals (7Hrs)

Unit II: General Linear Applications (7Hrs)
Constant Current Source and Voltage Source, Summing, Scaling and Averaging Amplifiers, Voltage To Current Converter with Floating And Grounded Load, Current To Voltage Converter, Integrator and Differentiator.

Unit III: Structure Of Op-Amp (7Hrs)
Differential Amplifier, Cascaded Differential Amplifier Stages and Level Translator, AC and DC Analysis of Cascade Amplifier, Design of two stage direct-coupled amplifier.

Unit IV: Active Filters And Oscillators (8 Hrs)
Classification of Filters, Active Filters, First to Sixth-Order Butterworth filter, Multiple-Feedback Filters (Band Pass And Band Reject Filters) IGMF configuration, All Pass Filter, Cascade Design of Filters, Classification of Oscillators, Design of Opamp-based Phase Shift And Wein Bridge Oscillators, Square, Triangular And Saw Tooth Wave Generators.

Unit V: Non-Linear Circuits And Converters (5 Hrs)
Schmitt Trigger, Voltage Comparator, Voltage Limiters And Window Detector, Clippers And Clamplers, Peak Detector, Precision Rectifiers, Analog Switches.

Unit VI: Special Ics Applications (6 Hrs)
The 555 Timer, Phase Locked Loops IC565, ICL8038 & XR2206 Function Generator, Voltage Controlled Oscillator Basic Operation, IC based Voltage Regulator Circuits, Dual Track Voltage Regulator, Three - Terminal Regulator (Fixed Regulator) Voltage Adjustment And Current Boosting Of Fixed Regulator, Merits And Drawbacks Of Linear Regulators.

Advanced topics on the subject.

Text Books:

Reference Books:

BECP302: ANALOG SYSTEM DESIGN LAB
List of Practicals:
1. To design and verify gain and frequency response of Inverting and Non-inverting amplifier using IC 741.
2. To design and verify gain and frequency response of Integrator and Differentiator using IC 741.
3. To design adder and subtractor using IC 741.
4. To perform and simulate Clipper circuit using IC 741.
5. To design RC-Phase shift oscillator using IC 741.
6. To design and verify Astable Multivibrator circuit using IC 555.
7. To design 2nd order High Pass Filter using IC 741 and to study the frequency vs gain characteristics.
8. To design Wein Bridge oscillator using IC 741.
10. To design Low Voltage Regulator circuit using IC 723.
11. To design 2nd order Low Pass Filter using IC 741 and to study the frequency vs gain characteristics.
12. To design Schmitt Trigger circuit using op amp.
13. To design square wave generator using op amp.

Open Ended Experiments
14. To design Hartley Oscillator using op amp IC.
15. To design Colpitts Oscillator using op amp IC.

BEEL205 COMPUTER PROGRAMMING (3-1-0-4) Total Hrs: 40

Pre-requisite: -

-requisite: -

Course Objectives:
To make the students familiar with software programming.
To develop program logic.
To familiar with MATLAB environment.

Course Outcome:
At the end of the course the student shall be able to:
CO1 Develop computer programs and execute successfully to find solution for given engineering applications.
CO2 Develop skills to use system design notations and apply system design engineering process in order to design, plan and implement software systems.
CO3 Ability to understand file handling and analyze the methods for searching and sorting.
CO4 Understand and develop programs for linked list in real world.
CO5 Develop skills in Matlab to code real world artefacts.
CO6 Ability to develop various applications with advanced programming Tools.

unit I : (8 Hrs)
Structure of 'C' program, Data types, Storage class, variables, expressions and operators.

Unit II: (6 Hrs)
Program control statements, Concept of function and Recursion, I/O through Print, scanf, File I/O Open, Close, Read and Write.

Unit III: (6 Hrs)
Arrays, Searching (Linear & Binary). Sorting (Bubble, Selection Sort) File Handling.

Unit IV : (6 Hrs)
Pointers and structures, single linked list in sorting, deletion, and updation.

Unit V: (8 Hrs)
Introduction to MATLAB programming language. MATLAB environment, Operations with variables, Arrays, Columns and rows: creation and indexing. Writing script files: Logical variables and operators , Flow control , Loop operators.

Unit VI (6 hrs)
Writing functions in MATLAB : Input/output arguments, Function visibility, path.Simple graphics : 2D plots, Figures and subplots. Basics of data types & file I/O.

Advanced topic on the subject

Text Books:

Reference Books:

BEEP-205: COMPUTER PROGRAMMING LAB.

List of Practicals:
1. Program to find A^ and A for a given system.
2. Program to plot swing curve of a given system by step by step method.
3. Program for transient stability by m Euler's method.
4. Program to obtained load flow analysis ETAP software.
5. Study of simple transmission system PSCAD software.
6. To perform Load flow analysis of IEEE 3 system by using Gauss side method.
7. To perform Load flow analysis of IEEE 3 system by using Newton Raphson method.
8. To perform load flow analysis by decoupled method.
9. Program to find Z bus of a power s network.
10. Program to find Y bus of a power s network.
11. Program to find Symmetrical fault thro fault impedance Zf=j0.1 per unit.
12. Program to find unsymmetrical fault through a fault impedance \( Z_f = 0.1 \) per unit.
13. To do the load flow analysis using Power World Simulator software.
14. To write the program to calculate the network matrices in MATLAB by using singular transformation.
15. Program to find contingency analysis of given power system.

BECL309: MICROPROCESSOR APPLICATIONS (3-1-0-4) Total Hrs: 40

Pre-requisite: -

Pre-requisite: -

Course Objectives:
1) To introduce architecture, interfacing and programming of 8085 and different peripheral IC's
2) To study Various Interrupts for 8085
3) To study Architecture and interface of 8255 & 8253.

Course Outcomes:
Upon successful completion of the course, students shall be able to-
CO1 Identify the basic elements and functions of microprocessors related component
CO2 Analyze the architecture and use of addressing modes in programs
CO3 Develop simple programs using stack related instructions
CO4 Identify the need of interrupts in programs
CO5 Understand the various data transfer schemes and its relevance to hardware interfacing
CO6 Apply the knowledge of programming and hardware concept to interface the other peripherals to microprocessor

Unit-I: (7 Hrs)
VLSI circuit concept. Approach to integrated system design using Microprocessors. Bus concepts. Address, Data and control. Organization of computer with MPU, Bits/Bytes/Words/Long words - their ranges accuracy and precision. Memory organization. Linear/Absolute decoding.

Unit II: (6 Hrs)

Unit III: (7 Hrs)
Flag structure concept of PSW stacks and subroutines simple and Nested PUSH POP instruction and CALL/RETURN instruction.

Stack manipulations, simple programs.

Unit-IV: (6 Hrs)
Interrupts - Concept and structure in 8085. Interrupt services routines. Advanced instructions and programming of 8085A. Basic concept of Micro controller & application

Unit V: (6 Hrs)
Method of Data Transfer - Serial, parallel, synchronous asynchronous, IN/OUT instructions. Timing diagrams simple hardware interface to 8085 of standard Latches/Buffers/Keys/display devices as I/O ports. Handshaking concept. Architecture and interface of 8255 and 8253 to 8085.

Unit VI: (8 Hrs)

Text Books:

Reference Books:

BECP309: MICROPROCESSOR APPLICATIONS LAB (0-0-2-1)
1. Study of \( \mu \)P 8085 and perform arithmetic operations of two 8 bit numbers.
2. Study of \( \mu \)P 8085 and perform arithmetic operations of two 16 bit numbers.
3. To generate 10 no . Fibonacci series and store in memory location
4. Convert HEX number to decimal numbers.
5. Convert given HEX number into Gray code.
6. Transfer the data block from one memory location to other.
7. Find the greatest/smallest number.
8. Find the even, odd and zero numbers.
9. Arrange the data block in the ascending/descending order.
10. Arrange of 10 BCD numbers.
11. Write a program to generate the Fibonacci series.
12. Write a program to interface
13. To study the 8 bit Multiplications.
14. To study the 8255 and transfer the Data block on the I/O ports.
15. To generate the square wave of period 1 sec on sod pin.
16. To convert Hexadecimal number into its ASCII equivalent.
17. To interface DAC with µp 8085.
18. To interface ADC with µp 8085.
19. Write a program to display WELCOME’ on 7-segment display.
20. Write a program to display rolling massage on display.
21. Experiment related to Microcontroller Application to power systems.
22. Open-ended experiment.

**MBAL100**  
**ENGINEERING & INDUSTRIAL MANAGEMENT (3-1-0-4)**

**Total**  
Hrs: 40

Pre-requisite: -

Co-requisite: -

**Course Objectives:**

1. To make students familiar with Demand & supply,
2. To aware about Costing, Banking, Managerial aspects related to production, marketing and finance.
3. To analyze scope of financial management

**Course Outcomes:**

Upon successful completion of the course, students shall be able to-

CO1: Understand general problem solving process
CO2: Understand the basic cost concepts used in economic analysis
CO3: Understand the concept of time value of money & economic equivalence
CO4: Analyze the commonly used methods for comparing investment alternatives
CO5: Apply the techniques for incorporating depreciation and income tax calculations into economic analyses
CO6: Identify the procedures for performing benefit cost analysis of projects in the public sector.

**Unit I:**  
(6 Hrs)
Demand Utility and indifference curves, Approach to Analysis of demand, elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity, Marginalize.

**Unit II:**  
(6 Hrs)
Laws of Return and costs, price and output determination under perfect competition, monopoly, monopolistic, competition, oligopoly, Depreciation and methods for its determination.

**Unit III:**  
(8 Hrs)
Functions of central and commercial banks
Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Monetary and cycles, New economic policy, Liberalization, Globalization, Privatization, Market friendly state. Fiscal policy of the government, Meaning and phases of business.

**Unit IV:**  
(8 Hrs)
Definition, Nature and scope of management, Functions of management- Planning, organizing, Directing, Controlling, Communicating

**Unit V:**  
(6 Hrs)
Meaning of marketing management, Concept of marketing, Marketing Mix, Administrative and cost plus pricing, Channel of distribution, Advertising and sales promotion.

**Unit VI:**  
(6 Hrs)

Advanced topic on the subject

**Text Books:**

**Reference Books:**

**MBL103:**  
GENERAL PROFICIENCY-III  
: HOBBY CLASSES

Pre-requisite: -

Co-requisite: -

**Course Objectives:**

To identify one’s special capabilities in activities like sports, drama, singing etc.
To study like Pranayam, Trekking, Guitar, synthesizer dancing, English drama, sketching, kathak.
To learn more about photography, professional ethics, horse riding, volleyball, etc are offered

**Course Outcomes:**

Upon successful completion of the course, students shall be able to-

Sharpen their extracurricular skills for overall development.
Through this activities the students will grow in a broader sense
More idea about professional ethics and various games.
FIFTH SEMESTER

BEEL301 ELECTRICAL MACHINES –II
(3-1-0-4)  Total Hrs: 40
Pre-requisite: - Electrical Machines-I (BEEL204)
Co-requisite: -

Course Objectives:
To introduce synchronous machines to students.
To lay firm foundation of electrical machines for understanding its behavior in power system.
To study special motors for industrial applications.

Course Outcomes:
Upon successful completion of the course, students shall be able to:

CO1Understand the construction, principle of 3-phase synchronous machines, able to identify different types of synchronous machine.
CO2Understand details of Synchronous generator their load characteristics, able to solve the problems on regulation and performance.
CO3Understand the parallel operation of synchronous generator and able to find various performance parameters of synchronous generator
CO4Understand the SMIB system also understand the working principle, methods of starting and application of Synchronous motor.
CO5Understand the behavior and performance of synchronous machine in power system.
CO6“Understand the principle operation of Repulsion motors, AC series motors, universal motors, reluctance motor, hysteresis motor, power selsyns, position selsyns (only elementary aspects of the above types are expected). Introduction regarding application of finite element method to electrical machines analysis.

Advanced topic on the subject

Text Books:

Reference Books:

List of Practicals:
1. Effect of field excitation on the generation of voltage of an alternator.
2. Determination of voltage regulation of alternator by direct loading.
3. To draw open circuit characteristics of an alternator.
4. To draw short circuit characteristics of an alternator.
5. Determination of voltage regulation of alternator by EMF method.
8. Determination of negative sequence reactance of a synchronous generator.
10. Determination of potier reactance and voltage regulation of alternator by zero power method.

Unit I : (08 Hrs)
Three Phase Synchronous Generators: Introductions, constructional features of cylindrical and Salient pole rotor machines, introduction to armature winding and field windings, MMF of armature and field windings, induced EMF.

Unit - II (06Hrs)
Steady State Operation of Three Phase Synchronous Generators: Phasor diagram, regulation, steady state performance of three phase synchronous generator.

Unit III (06Hrs)
Synchronizing of Generator with Another Generator: Parallel operation, experimental determination of parameters, short ckt ratio, losses and efficiency.

Unit- IV (08Hrs)
Synchronizing Machines On Infinite Bus: Phasor diagram, expression for torque, load / torque angle, synchronous motor operation, effects of variable excitation and power input on generator operation and effect of variable excitation and load on motor operation.

Unit V (06 Hrs)
Transient Behavior: Sudden 3 - Phase short circuit. Transient and sub- transient reactance’s and their measurements. Time constant and equivalent circuit diagram, damper windings.

Unit VI (06Hrs)
Introduction To Introduction to Special Machines: Repulsion motors, AC series motors, universal motors, reluctance motor, hysteresis motor, power selsyns, position selsyns (only elementary aspects of the above types are expected). Introduction regarding application of finite element method to electrical machines analysis.
12. To plot V and Inverted V curve of a synchronous motor.
13. Synchronization of alternator with infinite bus by Dark lamp method
14. Synchronization of alternator with infinite bus by Bright lamp method.
15. Open ended Experiment

BEEL302 ELECTRICAL DRIVES AND THEIR CONTROL (3-1-0-4) Total Hrs: 40

Pre-requisite: - Electrical Machines-I (BEEL 204)
Co-requisite: -

Course Objectives:
1. To introduce the fundamentals, classification, selection, control of Modern Drives.
2. To introduce concept of industry automation using PLCs & AC DC Contactors.
3. To study electric traction system & recent drives used in industries.

Course Outcomes:
Upon successful completion of the course, students shall be able to:

CO1 Understand the fundamentals of different types of electric drives used in industries along with their starting, speed control and braking.

CO2 Understand the mechanical characteristics of electric drives.

CO3 Understand the automation in electric drive using PLC.

CO4 Understand the need of AC DC Contactors in the field of electric drives.

CO5 Understand the controlling methods, performance parameters and types of electric drives used in traction system.

CO6 Understand modern drives used in industries.

Unit I: (6 Hrs) Definition classification and speed torque characteristics of common drive motors and then characteristics under running braking and speed control.

Unit II: (8 Hrs) Selection Of Motor: Power capacity for continuous and intermittent periodic duties flywheel effect.

Unit III: (6 Hrs) PLC, its Programming and its application in electrical drives.

Unit IV: (8 Hrs) AC and DC Contactors and Relays: Lock out contactors, magnetic structure, operation arc Interruption contactor rating, H.V. contactors, control circuits for automatic starting and braking of DC motor. Series parallel control with numerical. Starting and braking of traction motor.

Unit V: (6 Hrs) Traction Motors: Motor Used In AC/DC Traction:- Then performance and desirable characteristics requirements and suitability of motor for traction duty. Traction motor control – control of DC traction motor. Series parallel control with numerical starting and braking of traction motor.

Unit VI: (6 Hrs) Brief idea about recent drives commonly used in industries. Digital control of electrical motors, Block diagram arrangement, comparison with other methods of control. Advanced topic on the subject

Text Books:

Reference Books:

BEEL303 CONTROL SYSTEMS – I (3-1-0-4) Total Hrs: 40

Pre-requisite: -Network Theory(BEEL201)

Course Objectives:
To introduce control system components.
To study control system modeling & time response analysis.
To study Stability aspects, Frequency response analysis and State variable techniques.

Course Outcomes:
Upon successful completion of the course, students shall be able to:

CO1 Develop the mathematical models and transfer functions from a given physical system

CO2 Analyze Transient and Steady State behavior of systems using standard test signals.

CO3 Judge the stability and relative stability of a control system.

CO4 Draw the root locus for the system &
judge the performance of control system
CO5Analyze performance of a control system using the graphical tools such as Bode plots, & Nyquist plots.
CO6Apply state space techniques to model dynamic systems.

Unit I  (08 Hrs)
Introduction to need for automation and automatic control, use of feedback, broad spectrum of system application, Mathematical modeling, (Electrical & Electromechanical) diff. Equations, transfer functions, block diagram, signal flow graphs, application to elementary systems, simplifications, effect of feedback on parameter variations, disturbance signal servomechanism and regulators, Control system components, electrical electromechanical, their functional analysis and input output representation.

Unit II  (06 Hrs)
Time response of system, first order and second order system, standard inputs, concept of gain and time constants, Steady state error, type of control system, approximate methods for higher order system.

Unit III  (06 Hrs)
Stability of control systems, conditions of stability, characteristics equations, Routh-Hurwitz criterion, special cases for determining relative stability.

Unit IV  (08 Hrs)
Root location and its effect on time response, elementary idea of root locus, effect of addition of pole and zero on proximity of imaginary axis.

Unit V  (06 Hrs)
Frequency response method of analyzing linear system, Nyquist and Bode Plots, Stability and accuracy analysis from frequency response, open loop and close loop frequency response, Nyquist Criterion, Effect of variation of gain and addition of pole and zero on response plot, stability margin in frequency response.

Unit VI  (06 Hrs)
State variable method of analysis, characteristics of system state, choice of state variables, representation of vector matrix differential equation, standard form, relation between transfer function and state variables. Recent trends in control systems. Advanced topic on the subject

Text Books:

Reference Books:

BEEP303: CONTROL SYSTEM-I LAB.
List of Practicals:
1. To plot the characteristics between $\phi$ and phase of synchro transmitter
2. To measure basic step angle of step motor speed control system
3. To plot speed-torque characteristics and Vs back emf characteristics of A.C servomotor
4. To determine transient response of a system simulator kit
5. To find the characteristics between $\phi$ and voltage of potentiometer
6. To plot the graph between angular position of transmitter and receiver by using synchro transmitter receiver pair
7. To determine transient response mechanical system by MATLAB/SIMULINK
8. Write a program to plot root locus of system by using MATLAB software
9. To find the transient response of second RLC series circuit by MATLAB/SIMULINK
10. Write a program to plot bode plot of system by using MATLAB software
11. To implement P, PI and PID controller system in MATLAB/SIMULINK
12. To determine the characteristics of position error detector by using potentiometer
13. To obtain performance characteristics of motor speed control system
14. To rotate the stepper motor by microprocessor kit
15. Open ended experiments

BEEL304 ELECTRICAL MACHINE DESIGN
(3-1-0-4)  Total Hrs: 40

Pre-requisite: - Electrical Machines-I (BEEL 204)

Co-requisite: -

Course Objectives:
To introduce the design aspects and methodologies for Transformers.
To introduce the design aspects and methodologies for Induction Machines.
To introduce the design aspects and methodologies for Synchronous Machines.

Course Outcomes:
Upon successful completion of the course, students shall be able to:

CO1 Understand the construction, principle of Alternators, able to identify different types of synchronous machine.

CO2 Understand details of Synchronous machine their load characteristics, able to solve the problems on regulation and performance.
CO3 Understand the parallel operation of synchronous machine and able to find various performance parameters of synchronous machine.

CO4 Understand the SMIB system also understand the working principle, methods of starting and application of Synchronous motor.

CO5 Understand the behavior and performance of synchronous machine in power system.

CO6 Understand the principle operation of Repulsion motors, AC series motors, universal motors, reluctance motor, hysteresis motor, power seasons, position seasons.

Unit I (6 Hrs)

Unit II: (8 Hrs)
Transformer Design: - Specific loading, equation for voltage per turn for power and distribution transformer output equation.

Unit III (6 Hrs)
Principle of electric and magnetic circuit design method of cooling and cooling circuit design. Estimation of performance characteristics from the design data.

Unit IV (6 Hrs)
Induction Motor: - Main dimensions, output equation, loading constant estimation of axial lengths, air gap diameter, winding design.

Unit V (6 Hrs)
Induction motor: Air gap length, slot combination for stator and rotor of I.M. cage rotor and would rotor design. Calculation of ON load current and other performance characteristics for designing.

Unit VI: (8 Hrs)
Synchronous Machine: Air gap length, methods of obtaining sinusoidal O/P voltage, field coil design for salient pole machine and for turbo generator rotor, ventilation of synchronous generator, cooling air circuits, closed ventilation / quantity of cooling medium hydrogen and water as an cooling media. Design of Electrical Machines using Motor Pro Software.

Advanced topic on the subject

Text Books:

Reference Books:
1 Sawney , Chakraborty, A course in electrical machine design, 2nd Edition, Dhanpatrai & sons, 2002

BEEL305 POWER STATION PRACTICE (3-1-0-4) Total Hrs: 40

Pre-requisite: - Network theory (BEEL 201)
Co-requisite: -

Course Objectives:
To introduce conventional as well as non-conventional methods of generation of electricity.
To study parameters related to site selection, awareness about important components of the systems.
To study the procedure to calculate the cost of generation.

Course Outcomes

Upon successful completion of the course, students shall be able to-

CO1 Understand various sources of energy that can be converted into electrical energy
CO2 Design & Operate thermal power station
CO3 Develop & analyse the performance of hydro power station
CO4 Identify elements and their functions for nuclear power plants
CO5 Analyze the performance of excitation system
CO6 To investigate & Compare the role of various non-conventional sources of energy

Unit-1: (08 Hrs)
Sources Of Electrical Energy: - Coal oil and natural gas water power, nuclear fission and fusion. Their scope and potentialities for energy conversion. Generation different factors connected with a generating station, connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity and utilization factor, load curve, load duration curve, load survey base load and peak load station, advantages of interconnection.

Unit-II: (06 Hrs)
Thermal Stations: - Choice of site, location, size and number of units, general layout, major equipment, essential and non-essential auxiliaries, electric supply to auxiliaries, cost of generation, effect of different factors costs.

Voltage Control Of A.C. Generator: - Exciter instability, methods of stabilizing exciter voltage, Automatic voltage regulator action.
Unit- III: (06 Hrs)
Hydro Station: - Hydrology, stream flow, flow duration curve, mass curve reservoir capacity, type of hydroplants and their field of use, pumped storages plants and their utility, surge tanks, governing characteristics of turbine and hydro generators.

Unit IV : (06 Hrs)
Nuclear Station: - Principle of Nuclear energy, materials, types of nuclear reactors, breeder reactors, location, material for moderator and control rods, cost economics.

Unit V : i) Solar Energy: - Introduction, Physical principles of conversion of solar radiation into heat, Solar energy collectors, solar energy storage, electrical power generation and other Miscellaneous applications of solar energy.
ii) Wind Energy: - Introduction, Basic principles of wind energy conversion, wind Delta, energy estimation, site selection. Basic component of wind energy conversion system, wind turbines and their analysis, wind Electrical generation, stand-alone and grid connected wind electrical power systems, various application of wind energy. (06 Hrs)

Unit VI: (08 Hrs)

Text Books:
M.V. Deshpande, Elements of electrical power station design, 3rd Edition, A.H.Wheelar, 1986

Reference Books:

BEEP306: ELECTRICAL WORKSHOP & DRAWING (P) (0-0-2-1)

Pre-requisite: - Electrical Machines-I (BEEL204), Basic Electrical Engg, Analog system Design.
Co-requisite: - Electrical Machines-II (BEEL 301)

Course Objective:
To introduce basic knowledge of design of transformer.
To study basics of circuit designs.

Course Outcome:
At the end of the course the student shall be able to:

CO1 Understand the design of transformer
CO2 To design various electronics circuits and component testing.
CO3 To operate and troubleshoot various household equipment
CO4 To understand earth resistance
CO5 To understand transformer oil testing
CO6 To understand various types of earthing

List of Practicals:
1. Application of VISIO software to draw Single line diagram of 33 kV / 11 kV substation
2. Connection diagram of 11 kV substation
3. Thermal power plant layout using VISIO software
4. To find the balanced & unbalanced current in 3-phase system, using PSIM Software.
5. To design the integrator & differentiator operational amplifier in PSIM software.
6. To find the speed of DC motor using software.
7. To find the capacitor value required in particular load for power factor correct MATLAB.
8. Design of 66 KV double circuit transmission tower in AUTOCAD.
9. To find the ripple factor of full wave rectifier with and without capacitor using PSIM software.
10. To draw ladder diagram to generate an alternate pattern in PLC.
11. To find the ripple factor of half wave rectifier with and without capacitor using CAD software.
12. To find the active & reactive flow in system using POWER WORLD SIMULATION software.
13. To find the value of frequency in resonance circuit using MATLAB.
14. Open ended experiments
BEEP416 SELF STUDY SYLLABUS (0-0-2)

Pre-requisite: - Electrical Power System-II
Co-requisite: -

Course Objectives
1. To provide an opportunity for learning modern electrical engineering systems/equipments without being coached by the teacher so that the ability of lifelong learning is cultivated.
2. To study and design of Electrical systems components.
3. To study and design the sub systems for efficient operation.

Course Outcome
CO1To understand basics Power systems
CO2To study construction of special machines
CO3To know about theory of position control motors
CO4To know about basics of electric transmission system
CO5To design various machine parameters
CO6 To study of different machine analysis.

TOPIC covered : ( Topics will be referred from NPTL Lectures/ PPT available in website etc.)

Draw the oriented network graph for the given power system
Draw the basic cutset Incidence Matrix of the given power system
Draw the basic loop incidence matrix of the given power system
Explain the Tree and Co-tree of the given oriented graph
Prove that \( C_0 = -B_0^1 \) of the given power system network graph
Prove that \( B_i = A_c^{-1}A_l \) of the given power system
Derive the BUS impedance matrix by step by step method
Write the algorithm for addition of link in the given power system
Write the algorithm for addition of branches in the given power system
Write the algorithm for removal of link.

- Develop the sequence impedance/admittance for L-G fault
- Develop the sequence impedance/admittance for L-L fault
- Develop the sequence impedance/admittance for L-L-L fault
- Develop the sequence impedance/admittance for L-L-G fault
- Develop the sequence impedance/admittance for 3-phase to ground fault conditions
- Develop the analytical expression for currents and voltages during L-L fault conditions
- Develop the analytical expression for currents and voltages during L-G fault conditions
- Develop the analytical expression for currents and voltages during L-L-L fault conditions
- Develop the analytical expression for currents and voltages during L-L-L-L fault conditions
- Explain the types of buses for Load flow studies
- Explain the Convergence Criteria
- Write the algorithm for Gauss-seidel method for load flow analysis
- Write the algorithm for Newton-Raphson method for load flow analysis
- Write the algorithm for Fast De-coupled method for load flow analysis
- Explain the comparison of Load flow methods
- Explain the types of stability
- Write the mathematical Model for transient stability simulation
- Write the transient stability solution by using Runga-Kutta method
- Write the transient stability solution by using Eulers method
- Write the transient stability solution by using Eulers modified method
- Explain the comparison of methods
- Explain the flow chart for Runga –kutta method
- Explain the flow chart for Eulers method
- Explain the flow chart for Eulers Modified method
- Explain comparison of methods
- Construction & Principle of Operation of a synchronous Inductor type Stepping motor
- Methods of Switching the windings & basic operation of the step motor
- Logic Circuit for open –loop control of a 2-phase stem motor
- Variable Reluctance (VR) stepping motor and its open-loop control
- Closed-loop operation of step motor
- Switched reluctance motor
- Constructional details of SR motor & Importance of Stator and rotor pole-arc angles.
- Design of stator and rotor pole arcs and determination of L(q)-q profile.
- Power converter & approximate prediction of current wave form and torque
- Prediction of supply current waveform & logic controller for forward and reverse motion
- Position sensing of rotor with hall-probes.
- Permanent magnet motors (conventional DC and brushless DC motor )
- Ferromagnetic domain theory and characteristic properties of different P.M. materials
- Construction details of pole and yoke parts of conventional PM DC motors
- Theory of BLDM as variable speeds synchronous motor
- Methods of reducing torque pulsation &
approximate torque speed characteristics & BLDM
. Double feed induction generator (DFIG)
. Construction & principal of operations of a induction generators.(IG)
. Switch Reluctance motor & SR Motor.
. Theory & BLDM as variable speed sync. Motor.
. Variable reluctance (VR) stepping motor and its open loop control.
. Close loop operation of steeper motor...
. Design of electrical machines using motor pro-software.
. Ventilation of synchronous generator & cooling arrangements.
. Explain the Design aspects of CT.
. Explain the Design aspects of PT.
. Automatic Generation Control.
. Excitation system AC type.
. Excitation system DC type.
. Excitation system Brushless type.
. Modeling of Turbine governor system.

Books:
Deshpande M.V., Electric Motors: Applications & control, PHI Publications, 2013
Rhengenmann, Handbook of Electric Motors, Macmillan Pub., 1995

Suggested Readings / Video Lectures:
IIT Kharagpur : A.K. Sinha , Prof. Sabyasachi sengupta, Prof. P.Sasidhara Rao , DDr.Krishna Vasudevan
NPTEL Video Courses : Prof. M.Gopal , Prof. T.K. Basu , Prof. L. Umanand
Kunal IT learning resources : Total 07 Learning resources are available

MBL104: GENERAL PROFICIENCY-IV (ADVANCED COMMUNICATION SKILL)
Pre-requisite: -
Co-requisite: -

Course Objectives:
To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking, one to one interaction and social ethics.

Course Outcomes
Upon successful completion of the course, students shall be able to-
1. Deliver the thoughts in an effective way
2. Understand the social ethics.
3. Implementation of social ethics.

SIXTH SEMESTER
BEEL308 HIGH VOLTAGE ENGG. (3-1-0-4)
Total
Hrs: 40

Pre-requisite: -
Co-requisite:-Electrical Power System-I (BEEL309)

Course Objectives:
To introduce the conduction and electrical breakdown phenomena in liquids, solids, gases or vacuum.
To introduce Generation of high voltage, high current and their measurement.
To introduce testing units required for the installation of electrical equipments

Course Outcomes
Upon successful completion of the course, students shall be able to-
CO1 Understand the breakdown mechanism in dielectric
CO2 Analyze the lightning and switching over
voltages along with protection
CO3 Analyze the traveling waves & should able to select proper insulation coordination
CO4 Develop & Design the systems for generation of high voltage and current
CO5 Apply the knowledge of high voltage engineering for measurement of high voltage and current
CO6 Perform the non destructive and high voltage test of electrical apparatus by experimentation.

Unit I (07 Hrs)

Unit II (07 Hrs)
Lightning and switching over voltages: Mechanism of lightning, types of strokes, parameter and characteristics of lightning strokes, characteristics of switching surges, power frequency over voltages. Control of overvoltage due to switching. Protection of lines by ground wires, protection by lightning Arrester, gap type and gapless L.A., selection of L.A. ratings, surge-absorbers.

Unit III (06 Hrs)
Traveling waves and Insulation coordination: Traveling waves on transmission lines, Classification of lines attenuation and distortion of traveling waves, reflection and transmission of waves, behavior of rectangular waves at transition points. Introduction to insulation coordination, associated terms, impulse waveform. Introduction to BIL, Reduced BIL and SIL.

Unit IV (7 Hrs)
Generation of high voltage and currents: Generation of High D.C voltages by rectifiers, voltage doubler and multiplier, circuits (Derivations of expression not required), electrostatic machines, Generation of high AC voltages by Cascaded transformers, Resonant transformers, generation high frequency AC high voltage. Generation of impulse voltages: Standard impulse wave shapes, analyses of model and commercial impulse generation circuits, wave shape control, Marx circuit, tripping and control of impulse generation, generation of switching surges, generation of impulse current.

Unit V (07 Hrs)
Measurement of high voltage and current: Measurement of high AC and DC voltage by micro ammeter, generating voltmeter, resistance and capacitance potential divider, series impedance voltmeter, CVT, Magnetic type potential transformers, electrostatic voltmeter. Peak reading AC voltmeter, Sphere gap arrangement. Measurement of impulse voltage by potential dividers and peak reading voltmeters. Measurement of High AC/DC current, measurement of high frequency and impulse current by resistive shunt (Bifilar strip shunt only)

Unit VI (06 Hrs)
Non destructive and high voltage testing of electrical apparatus: Non destructive testing, Measurement of DC Resistivity, measurement of Dielectric constant and loop-factor (low and power frequency only), Schering bridge for high charging circuits, high dissipation factor, three terminal measurement, transformer ratio arm bridges, partial discharge measurements by straight detectors & by balance detectors, calibration of detectors, discharge detection in power cables. High voltage testing. Testing of insulators, bushings, Isolators, circuit breakers, cables, transformer, lightning arresters and power capacitors. Recent trends in industrial testing & introduction to partial discharge. Advanced topic on the subject

Text Books:
Begamudre, Extra high voltage Ac transmission Engineering, 3rd Edition, New age, 2002

Reference Books:
D.Ruber, High voltage circuits breakers design and application, 2nd Edition, Dakker, 1997

BEEP308: HIGH VOLTAGE ENGG LAB.

List of Practicals:
1. Calibration of Voltmeter by Sphere method using
   1) 10 c.m. diameter sphere
   2) 5 c.m. diameter sphere
2. Measurement of breakdown voltage of type insulator
   1) Under dry condition
   2) Under wet condition
3. Calibration of Voltmeter by Point Gap method
4. Calibration of Voltmeter by Rod Gap method
5. Determination of breakdown voltage of Horn Gap apparatus
6. Determination of String efficiency of Suspension type insulator
7. Calibration of voltmmeter for different combination of electrodes
   1) sphere 10 cm diameter and sphere 5 cm diameter
   2) sphere 10 cm diameter and point gap
8. Determination of fault location in cable by Digital cable fault locator model- 2000A
9. Measurement of Capacitance of Insulating material by Eltel CTS-500 kit
10. Measurement of oil loss angle by Loss angle meter
11. Measurement of breakdown voltage of paper insulation
12. Determination of breakdown strength of transformer oil
13. Calibration of voltmeter by Sphere gap method using impulse generator
14. Measurement of Dissipation factor(Tan-Delta) of Insulating material by Eltel CTS-500 kit
15. Open ended experiment

BEEL309 ELECTRICAL POWER SYSTEM-I
(3-1-0-4) Total Hrs: 40

Pre-requisite: -
Co-requisite: -

Course Objectives:
1. To introduce Per unit system, cables, distribution system, transmission systems and different models that represent them Load flow studies.
2. To introduce elementary distribution schemes.
3. To study concepts of real and reactive power control

Course Outcomes:
Upon successful completion of the course, students shall be able to:
CO1 Understand the structure of electrical power systems
CO2 Understand the representation of power systems elements
CO3 Apply knowledge to the elementary distribution schemes
CO4 Understand the voltage regulation and efficiency of power transmission lines
CO5 Analyses the load Flow Studies
CO6 Understand power flow in multibus systems

Unit I (7 Hrs)
Structure of electrical power system, brief exposure of generation, transmission and distribution aspects, elementary consideration of economic bulk power supply system, use of high voltage, general system consideration, idea about substation, concept of real, reactive and complex power, Load and their characteristics, voltage and frequency dependence of loads.

Unit II (7 Hrs)
Representation of power system elements, models and parameters of generator, transformer and transmission lines, per unit system representation.

Unit III (6 Hrs)
Elementary distribution schemes: Feeders and distributors, LT and HT cables.

Unit IV (7 Hrs)
Voltage regulation and efficiency of power transmission lines using simple series equivalent representation, T-representation and by circle diagram using generalized constants.

Unit V (7 Hrs)
Interconnection of system elements to form two bus system, Illustration of active and reactive power transmission. Introduction to load flow studies in multi bus system (Methods of solution not expected). Introduction of frequency and voltage as system state indicators.

Unit VI (6 Hrs)
Elementary concepts of real and reactive power control, Steady state performance of turbine governors, load sharing between generators, preliminary concepts of automatic string efficiency, types of insulators. Introduction to advanced schemes like concept of single phasing.

Advanced topic on the subject

Text Books:

Reference Books:

BEEL310 POWER ELECTRONICS (3-1-0-4)
Total Hrs: 40

Pre-requisite: - Network Theory(BEEL 201)
Co-requisite: -

Course Objectives:
To introduce SCR, MOSFET, TRIAC, IGBT and other devices etc along with their performance characteristics and applications. To introduce different types of power electronic converters, their control and performance aspects for various applications.

To study single phase and three phase bridge inverters.

Course Outcomes:
Upon successful completion of the course, students shall be able to-
CO1 Analyze the Characteristics and working principle of SCR, UJT, TRIACS circuits
CO2 Design Single phase and Three phase AC-DC converters.
CO3 Select components for designing the circuitry for power converters
CO4 Use Solid state Power electronics devices for control, conversion and protection of SCR
CO5 Study Close loop control of DC-DC converter.
CO6 Analyze the Role of FACTS devices in Power electronics along with designing of UPS and intelligent controllers

Unit I: (08 Hrs)
SCR and Its characteristics: Gate characteristics, SCR turn off, ratings, series and parallel connections of SCRs. Triac and its applications, Unijunction transistors, Triggering circuits and opto couplers.

Unit II (06 Hrs)
Line commutated converters: Working of single pulse converter, two pulse mid point converter. three pulse midpoint converter and 3 phase six pulse bridge converter, effect of source inductance in converters, effect of free wheeling diode.

Unit III (06 Hrs)
Single phase and three phase half controlled converters: Speed control of d.c. motors using line commutated converters. Cycloconverters (single phase).

Unit IV (08 Hrs)
Static controllable switches: Characteristic and working of MOSFET Gate turn off Thyristers and insulated gate bipolar transistor, protection of SCR gate circuit protection, over voltage and over current protection, snubber circuit design, converter circuit faults and their protection. Advanced power electronics devices.

Unit V (06 Hrs)

Unit VI (6 Hrs)
Single phase and three phase bridge invertors, commutation and trigger-circuits for forced commutated thyristor inverters. Output voltage control, Harmonics in output voltage waveform, Harmonic attenuation by filters. Harmonic reduction by pulse width modulation techniques, Analysis for single pulse width modulation. Working of current source inverters few applications of inverters. Advanced topic on the subject

Text Books:

Reference Books:
M.S. Ashgar, Power Electronics, 2nd Edition, PHI, 2004

BEEP310: POWER ELECTRONICS LAB.

List of Practicals:
1. To determine latching and holding current of SCR by using V-I characteristics
2. To plot the V-I characteristics of TRIAC, forward direction and backward direction.
3. To determine intrinsic standoff ratio by using I-V characteristics of UJT
4. To perform UJT as a relaxation oscillator
5. To draw the collector and transconductance characteristics of IGBT
6. To convert DC to AC by using Series Inverter
7. To obtain variable AC from DC by Parallel Inverter
8. To perform class A commutation of a thyristor
9. To plot the characteristics of DC chopper
10. To convert AC to DC by using single phase diode bridge converter
11. To plot drain and transconductance characteristics of MOSFET
12. To find break over voltage through the I-V characteristics of DIAC
13. To perform the Ac voltage control by TRIAC
14. To simulate the three phase inverter by PSIM software
15. Simulink implementation of a 3-phase, 6 pulse source inverter supplying resistive load.
BEEL403 CONTROL SYSTEM –II (3-1-0-4)  
Total Hrs: 40

Pre-requisite: - Control System-I (BEEL303)  
Co-requisite: -

Course Objectives:  
1) To introduce the elementary design aspects of control systems.  
2) To study nonlinear systems, digital system.  
3) To study optimal operation of control systems.  

Course Outcomes:  
Upon successful completion of the course, students shall be able to-  
1. CO1Point out the need for compensation and suggest compensators for specific application.  
2. CO2Design a Control system using state variable technique  
3. CO3Formulate optimal control problem and obtain solutions using Parseval's Theorem  
4. CO4Analyze Non Linear systems using Describing Function techniques  
5. CO5Analyze Non Linear systems using Isocline and Delta methods  
6. CO6Analyze the effects of data sampling on the performance of a control system  

Unit – I  

Unit-II  

Unit-III  

Unit – IV  

Unit-V  

Unit VI  

Text Books:  

Reference Books:  

BEEP311 Minor project (0-0-4-2)

Course Objectives:  
1) To provide opportunity for selection of a project ,search related literature.  
2) To identify appropriate components with rating.  
3) To design, fabricate and test a real time system by working in a group.  

Course Outcomes:  
Upon successful completion of the course, students shall be able to-  
1. CO1Understand the literature survey,  
2. CO2Ability to work in a group of students of socially different backgrounds  
3. CO3Propose a system, design, fabricate and test to develop conclusions  
4. CO4Deliver power point presentation before teachers and colleagues.  
5. CO5Analyse results, make conclusions.  
6. CO6 Exhibit the project

ELECTIVE-1

BEEL401 : INDUSTRIAL INSTRUMENTATION AND AUTOMATION (3-0-0-3)  
Total Hrs: 30

Pre-requisite: - Electrical Measurements & Instrumentation (BEEL202)  
Co-requisite: - Control Systems-I (BEEL303), Electrical Drives & their control(BEEL302)

Course Objectives:  
1) To introduce the popular processes in industries and the methods to make the production processes more efficient & economical by automation.  
2) To introduce SCADA system components.  
3) To introduce transmission and distribution sector operations  

Course Outcomes:
Upon successful completion of the course, students shall be able to:

1. **CO1** To understand industrial variables and measurements
2. **CO2** Develop skills to learn various sensors, transducers, amplifiers, filters
3. **CO3** Introduction of SCADA and data acquisition system
4. **CO4** Understand programmable logic controllers.
5. **CO5** Understand SCADA system architecture,
6. **CO6** Understand industrial applications of PLC & SCADA system

**Unit I**

(05 Hrs)
Industrial measurement systems – different types of industrial variables and measurement systems elements – sensors and transducers for different industrial variables like pressure, torque, speed, temperature etc.

**Unit II**

(05 Hrs)

**Unit III**

(05 Hrs)
Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies, Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries

**Unit IV**

(05 Hrs)
SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

**Unit V**

(05 Hrs)
SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture - IEC 61850, SCADA Communication various industrial communication technologies - wired and wireless methods and fiber optics. open standard communication protocols

**Unit VI**

(05 Hrs)
SCADA Applications: Utility applications - Transmission and Distribution sector operations, monitoring, analysis and improvement. Industries - oil, gas and water. Case studies, Recent Case studies, Implementation, Simulation Exercises. Advanced topic on the subject

**Text Books:**


**Reference Books:**


**BECL 303 : MICROPROCESSOR BASED SYSTEMS [3-0-0-3] Total Hrs: 30**

**Pre-requisite:** - Basic Electronics (BECL105), Microprocessor Application(BECL 309)

**Course Objectives:**

1. To introduce the architecture, interfacing and programming of 8086 and 8088 microprocessor and peripherals for common applications.
2. To introduce 8051 architecture.
3. To introduce organization operation & interfacing of 8259.

**Course Outcomes:**

Upon successful completion of the course, students shall be able to:

1. Acquire extensive knowledge of microprocessor based architecture and its interfacing with peripheral devices.
3. Understand Serial Communication Standards RS 232, RS 485, i2C bus, SPI.

**Unit-I**

(5 Hrs)
VLSI circuit concept. Approach to integrated system design using Microprocessors. Bus concepts. Address, Data and control. Organization of computer with MPU, Bits/ Bytes / Words/ Long wards - their ranges accuracy and precision. Memory organization. Linear / Absolute decoding.

**Unit-II**

(5 Hrs)

**UnitIII**

(5 Hrs)
Flag structure concept of PSW stacks and subroutines simple and Nested PUSH POP instruction and CALL/RETURN instruction. Stack manipulations, simple programs.

**Unit-IV**

(5 Hrs)
Interrupts - Concept and structure in 8085. Interrupt services routines, Advanced instructions and programming of 8085A. Basic concept of Micro controller & application.

**Unit-V**

(5 Hrs)
Method of Data Transfer - Serial, parallel, synchronous asynchronous, IN/OUT instructions. Timing diagrams simple hardware interface to 8085 of standard Latches/Buffers/Keys/display devices as I/O ports. Handshaking concept. Architecture and interface of 8255 and 8253 to 8085.

**Unit- VI**

(5 Hrs)

Hardware Considerations - Bus contention. Slow memory interfacing complete signal description of 8085. Multiplexed Key board/Display interface and assembler directives. General awareness about microcomputer system related products. Introduction to microcontrollers. Advanced topic on the subject

Text Books:

Reference Books:

BECL 405: DIGITAL SIGNAL PROCESSING [3-0-0-3] Total Hrs: 30
Pre-requisite: Applied Mathematics-III(BAML202), Control System-I (BEEL303)
Co-requisite: -
Course Objectives:
1. To introduce the mathematical analysis of DSP.
2. To introduce filter design techniques.
3. To study various DSP applications.

Course Outcomes:
Upon successful completion of the course, students shall be able to -
1. Understand the architecture and applications of popular DSPs
2. Develop skills to analyze and process discrete time signals for different kinds of applications
3. Retrieve and interface the information from deterministic and random signals.
4. Design filter using different methods

Unit I (5Hrs)
Discrete time signals and systems, classification of discrete time systems and its properties, Linear convolution, Cross Correlation, Autocorrelation of discrete signals, sampling theorem & sampling process.

Unit II (5Hrs)

Unit III (5Hrs)
Transform analysis of LTI system & structure for discrete – time system. Frequency response of LTI system, Relationship between magnitude & phase response, Block diagram representation & signal flow graph representation of IIR and FIR systems. Linear constant coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures.

Unit IV (5Hrs)
Filter design Techniques: Design of discrete time IIR filters from continuous time filters, Frequency transformation of low pass IIR filters, Design of FIR filters by windowing, FIR filter design by Kaiser and Hamming window method.

Unit V (5Hrs)

Unit VI (5Hrs)
Advanced topic on the subject

Text Books:

Reference Books:

BEEL402: ELECTRICAL ENERGY MANAGEMENT [3-0-0-3] Total Hrs: 30
Pre-requisite: - Electrical Machines-I(BEEL204), Electrical Machines-II(BEEL301)
Co-requisite: - Electrical Power System-I(BEEL309)

Course Objectives:
1. To introduce the energy efficiency aspects in various electrical appliances and equipments.
2. To introduce types of compressors.
3. To introduce energy efficiency in environmental aspects of energy and pollution control.

**Course Outcomes:**
Upon successful completion of the course, students shall be able to:
1. CO1 To understand energy management and audit
2. CO2 To understand energy monitoring and targeting
3. CO3 To understand energy efficient technologies in electrical system
4. CO4 To understand the energy efficiency techniques in different applications like compressors,
5. CO5 To understand the energy efficiency techniques in lighting, fans, blowers and pumps.
6. CO6 To have knowledge about statutory aspects and legal provisions.

**Unit I** (05 Hrs)
Energy Scenario, basics of energy and its various forms, electricity basics, energy management and audit.

**Unit II** (05 Hrs)
Energy monitoring and targeting, energy efficiency in thermal utilities,

**Unit III** (05 Hrs)

**UNIT IV** (05 Hrs)
Types of compressors, Energy efficiency in compressed air system, fans and blowers, pumps and pumping system.

**Unit V** (05 Hrs)
Types of lighting systems, Energy efficiency in lighting system, energy efficient technologies in electrical system, electronic ballast, automatic power factor controllers,

**Unit VI** (05 Hrs)
Energy efficiency in environmental Aspects of Energy and pollution Control, energy performance assessment for equipment and utility systems. Statutory aspects and legal provisions, Statutory aspects and legal provisions. Recent software used for energy audit.

Advanced topic on the subject

**Text Books:**

**Reference Books:**

**MBL105- GENERAL PROFICIENCY –V**

**Course Objectives**
1. To develop the technical presentation.
SEVENTH SEMESTER

BEEP 412: INDUSTRIAL PROJECT PHASE–I

Pre-requisite: - Minor project (BEEP 411)

Co-requisite: -

Course Objectives:
1. To expose students to industry environment
2. To get practical orientation relevant to subjects
3. To provide solutions to industrial and social need

Course Outcome:
At the end of the course the student shall be able to:
1. CO1Understand the working culture of industry
2. CO2Identify and solve industrial problem with analytical approach
3. CO3Provide solution in specific domain
4. CO4Work in a multidisciplinary group
5. CO5Provide hands on experience on real time systems
6. CO6Boost technical confidence

- A group of 04 student (Maximum) should identify an industry of good standing on their own in consultation with guide.
- Students are expected to complete topic identification and synopsis during this project seminar.
- All formalities related to industry Identification, topic identification and synopsis must be completed during 1st month of phase1.
- Period of industrial project will be of 24 week starting from last date of even semester exam every year.
- Student must report to his project guide every month.
- Student will be required to present from time to time (minimum.4 times during project); their progress report for project evaluation in person. Under exceptional circumstances: the student may be allowed to present through video-conferencing. However this is not applicable to final Seminar
- Evaluation of the project will be according to the sheet attached.

BEEP 415: COMPUTER APPLICATION TO ELECTRICAL ENGINEERING

Pre-requisite: - EPS-I (BEEL309)

Co-requisite: -

Course Objectives:
1. To design the system with the help of software
2. To apply different analytical tools for solution of short circuit and load flow studies related problems.
3. To solve complex engineering problems using computers

Course Outcome:
At the end of the course the student shall be able to:

1. Have knowledge of numerical methods for power system studies.
2. Prepare transmission line information in bus admittance or bus impedance form that can be further used for load flow analysis, short circuit studies and transient stability studies.
3. Develop and test computer program for transient stability & load flow analysis using different iterative methods

List of Practicals:
1. Program to find A^ and A for a given system.
2. Program to plot swing curve of a given system by step by step method.
3. Program for transient stability by modified Euler’s method.
4. Program to obtained load flow analysis using ETAP software.
5. Study of simple transmission system using PSCAD software.
6. To perform Load flow analysis of IEEE 30 bus system by using Gauss sidle method.
7. To perform Load flow analysis of IEEE 30 bus system by using Newton Raphson method.
8. To perform load flow analysis by fast decoupled method.
9. Program to find Z bus of a power system network.
10. Program to find Y bus of a power system network.
11. Program to find Symmetrical fault through a fault impedance Zf=0.1 per unit.
12. Program to find unsymmetrical fault through a fault impedance Zf=0.1 per unit.
13. To do the load flow analysis using Power World Simulator software
14. To write the program to calculate the network matrices in MATLAB by using singular transformation.
15. Program to find contingency analysis of given power system.
EIGHT SEMESTER

BEEL404 ELECTRICAL POWER SYSTEM- II
(3-1-0-4) Total Hrs: 40
Pre-requisite: - EPS-I (BEEL309)
Co-requisite: -

OBJECTIVES:
1. To introduce the techniques to control the system voltage, voltage regulation, real and reactive power, power quality, efficiency, practical stability limits during healthy and faulty conditions.
2. To make students familiar with energy management.
3. To study environmental issues associated with transmission grids/power system.

Course Outcomes
Upon successful completion of the course, students shall be able to:
1. CO1 Analyze the formation of symmetrical components
2. CO2 Locate the symmetrical faults in power system
3. CO3 Locate the unsymmetrical faults in power system
4. CO4 Understand the concept of stability in terms of power system
5. CO5 Identify the solutions for economic operation of power system
6. CO6 Understand the need of grounding system

Unit I (06 Hrs)
Symmetrical fault analysis: Without & with pre-fault load current. Selection of Circuit Breakers ratings, current limiting reactors

Unit II (8 Hrs)
Symmetrical Component transformation: Three phase power in unbalanced circuit in terms of symmetrical component. Sequence impedances of Generator, Transformer, Transmission line & Passive loads. Phase shift in Star / delta three phase transformer (Yd I, Yd II connection.).

UNIT III (06 Hrs)

Unit IV (08 Hrs)


Unit V (06 Hrs)

Unit VI (06 Hrs)
I) Grounding of Neutral in power system.
II) Shunt & series compensation- Generalized equation, shunt reactor compensation of very long line with intermediate switching station, series capacitor compensation at line centre, shunt reactors at both ends and series capacitor in middle of line.

Advanced topic on the subject

Text Books:

Reference Books:
2. R D. Begamudre, Extra High Voltage AC. - Transmission Engineering, Note: - Unit 6 (ii) - Scope will be limited to the treatment given in recommended, 2nd Edition, New Age Publications, 1990

BEEP404: ELECTRICAL POWER SYSTEM-II LAB.

List of Practical:
1. Overview of lab equipment and safety precautions
2. Ferranti effect on transmission line panel
3. The effect of shunt compensation on transmission line performance using transmission line simulator
4. Simulation of power system for transient stability analysis by MATLAB
5. ABCD parameters of the transmission line
6. The Symmetrical and Unsymmetrical fault analysis using PSCAD Software
7. Load Flow Analysis of Balanced and Unbalanced 3-phase power System using ETAP.
8. The performance of transmission line using PLC.
9. The PLC operation for voltage regulation of long transmission line
10. To Plot Characteristics of UPFC
11. The various types of SVC using single phase power line analyzer
12. To plot the characteristics of TSSC
13. Open Ended Experiment

ELECTIVE –II

BEEL 409 OPTIMIZATION TECHNIQUES(3-0-03)
Total Hrs: 30
Pre-requisite: -
Co-requisite: -

Course Objectives
1. This course aims at introducing the optimization techniques and their applications required to monitor complex engineering systems with the help of fast computing tools.
2. To introduce Non-linear programming.
3. To introduce Dynamic programming.

Course Outcomes
Upon successful completion of the course, students shall be able to:
1. CO1: use the concept of mathematical modeling and apply various optimization techniques to real life problems.
2. CO2: apply the various techniques to transportation problems.
3. CO3: apply concepts of assignment problem in job scheduling or route selection.
4. CO4: use concept of Dynamic Programming in Multistage decision process.
5. CO5: use application of dynamic programming in various engineering problems.
6. CO6: use concept of nonlinear programming for optimization of various engineering problems.

Unit I (05 Hrs)

Unit II (05 Hrs)
Multi-variable optimization with equality constraints. Lagrange multiplier method, Multi-Variable optimization with inequality constraints, Kuhn-Tucker conditions.

Unit III (05 Hrs)
Linear Programming: Standard form, formulation of the LPP, Solution of simultaneous equations by pivotal condensation, Graphical methods, Simplex algorithm, Big M Method, Two phase Simplex method, Duality principle, Dual Simplex method.

Unit IV (05 Hrs)

Unit V (05 Hrs)

Advanced topic on the subject
Unit VI (05 Hrs)
Introduction to evolutionary computer techniques: Genetic algorithm, crossover mutation, sorting.

Text Books:

Reference Books:

BEEL410 ELECTRICAL INSTALLATION & DESIGN (3-0-0-3) (E-II) Total Hrs: 30

Pre-requisite: -

Co-requisite: -

Course Objectives
1. The course deals with planning, estimation & installation of electrical systems for large residential, commercial buildings & for large factories.
2. To introduce load forecasting.
3. To introduce determination of fault level of various locations in substations.

Course Outcome:
At the end of the course the student shall be able to:
1. Perform complete electrical installations, including; residential, commercial, and large industrial installations.
2. Learn about the design & Construction of underground Cables.
3. Learn about the design and installation of illumination systems.
4. Explain the configuration and function of common equipment found in a substation.
5. Understand the fundamental principles for the design and installation of associated protective systems relating to electrical installations.
6. Understand the fundamental transformer testing and recognizes the limits of acceptance of each test.

Unit I (05 Hrs)
Load forecasting, regression analysis numerical based on linear and exponential trends. Electrical installation for domestic commercial and industrial consumers, calculation of connected load, selection of transformers, switchgear cables and wires, single line diagram, special provision for high rise buildings (IER-50-A), earthing requirement, mudder and earth tests use of earth leakage circuit breakers (special reference to be given to IER 2).

Unit II (05 Hrs)
Cables –PVC and XLPE cables their construction in brief, current ratings, specification. Dreading factors mudder and continuity test. Over head distribution lines up to 33KV, line apparatus and basic construction in brief clearance selection of AAC and ACSR conductors, voltage drop calculation. Selection of Insulators, earthing...
requirement (special reference to be given to IER 77.79.80.81.87.89.90.91.92)

Unit III (05Hrs)
Illumination design definitions, polar curves, simple calculations, working principles of fluorescent, sodium vapor and mercury vapor lamps. Capacitors and P.F. improvement – determination of rating and location of capacitors, calculation of payback period for additional capacitors.

Unit IV (05Hrs)
Substation Single line diagram plan, 1 elevation, and clearances for 11 KV pole mounted, 11 KV plinth mounted (upto 1000 KVA and above 1000 KVA), 33 KV (upto 2500 KV A & above 2500 KV A) Substations. Single line diagram for substation with two transformer in parallel, Specifications of isolators, lightening arrestors, horn gap fuses, D.O. fuses, circuit breakers instrument transformers power transformer various bus bar systems, load transfer. (Special reference to be given IER).

Unit V (05 Hrs)

Unit VI (05 Hrs)
Sire resting of transformer (Visual, precommissioning rests like mugger magnetic balance term ratio) testing of oil, operational test for Buchholz OTI, WTI, alarm and trip functions, Recent software for electrical installation & design. Advanced topic on the subject

Text Books:

Reference Books:

BEEL411 EHV-AC& HVDC TRANSMISSION
(3-0-0-3) (E-II) Total Hrs: 30
Pre-requisite: -
Co-requisite: -
Course Objectives
1. CO1Understand the power handling capabilities of EHVAC lines
2. CO2Understand the effect of electrostatic and electromagnetic field on EHVAC lines
3. CO3Understand Comparison between AC and DC Transmission
4. CO4Understand Control of power in HVDC lines
5. CO5Understand the operation of filters:- AC & DC.
6. CO6Understand operation of circuit breakers and HVDC substations

Course Outcome:
At the end of the course the student shall be able to:
1. Understand the effect of electrostatic and electromagnetic field on EHVAC lines,
2. Understand Comparison between AC and DC Transmission.
3. Understand Control of power in HVDC lines, filters, circuit breakers and HVDC substations

Unit I
Power handling capacities of EHV AC Transmission lines. Voltage gradients : Electric field of point charge , sphere gap- line charge, single and three phase lines and bounded conductors- Maxwell's potential co-efficients, Mangofoil Formula

Unit II
Electrostatic and electromagnetic fields of EHV Lines, Electric shock and threshold current : Capacitance of long object , calculation of electromagnetic field of A.C. Lines (3-ph Single and double circuit line only) Effect of high electrostatics field , measurement of electrostatic ground wires, electrostatic interference Corona : Types critical disruptive voltages : Factor affecting corona , Methods for reducing corona power loss, corona current wave form charge voltage diagram audible noise and ratio interference

Unit III
Comparison of EHV AC and HVDC Systems Conversion from AC to DC Rectifiers, converters conversion from AC to DC. InvertorsKinds of DC Link.Earth electrode and earth returns : Introduction OBJECTIVE, location and configuration, resistance of electrodes means of reducing earth electrode resistance troubles caused by earth electrode resistance trouble caused by earth current and remedies.Multiterminal HVDC System : Introduction 2 pole transmission. MTDC System with series and parallel connected convertors advantages and parallel connected converters, advantages and applications configurations and types

Unit IV
Power flow control in HVDC System : constant current constant voltage, constant ignition and extinction angle control, control characteristics. Parallel operation of AC and DC links (Synchronous and Asynchronous links)

Unit V
Harmonic Filters: Introduction Filters, Surge capacitors and Damping circuits shunt filters series
Filters. AC filters, design of A. C. filters and tuned filters, double frequency and damped filters, cost considerations, Rating harmonics on D.C side of converters. D. C. Harmonic filters. (ii) Reactive power compensation : Reactive power requirements of HVDC converters, substations, effect of delay angle and extinction angle on reactive power.

Unit VI (05 Hrs)
(ii) HVDC substation protection against short-circuits: Introduction, fault, clearing, protective, zones, protection, symbols, HVDC line pole protections (fault clearing and re-energizing. (iii) HVDC sub-station Protection against over-voltages Difference between insulation coordination of AC and DC systems. Fundamentals of switching over-voltages, D. V. on A. C. sides and on D.C. side, surge-arresters protection scheme, insulation coordination and protection margin, Advances in HVDC transmission.

Advanced topic on the subject

Text Books:

Reference Books:

BEEL501 ADVANCED POWER SYSTEM STABILITY (3-0-0-3) (E-II)

Total Hrs: 30
Pre-requisite: -
Co-requisite: -

Course Objectives
1. To introduce fault analysis of large power system
2. To study methods of symmetrical components.
3. To study effects of grounding on stability.

Course Outcomes
Upon successful completion of the course, students shall be able to-
1. Understand the advanced methods of ensuring power system stability during fault conditions and major disturbances.
2. Understand the behavior of rotor in synchronous generators, the effect of change in load on rotor angular velocity and acceleration.

Unit I (05 Hrs)

Fault analysis of large power system, Calculation of three phase balanced and unbalanced faults.

Unit II (05 Hrs)
Methods of Symmetrical components. Fault levels in a typical system. Power in symmetrical components.

Unit III (05 Hrs)

Unit IV (05 Hrs)
Effects of grounding on stability, effects of various disturbance, parameters and controls on stability, prevention of stability pull out.

Unit V (05 Hrs)
Role of automatic voltage regulator (AVR) on improving stability.

Unit VI (05 Hrs)

Advanced topic on the subject

Text Books:

Reference Books:

MBAL101 ENTREPRENEURSHIP DEVELOPMENT (3-0-0-3) (E-II)
Total Hrs: 30
Pre-requisite: -
Co-requisite: -

Course Objectives
1. All round development has opened large number of avenues for ambitious young people to prosper on their own. Entrepreneurship needs a happy blend of technical abilities & managerial skills.
2. To introduce International Entrepreneurship Opportunities.

Course Outcomes
Upon successful completion of the course, students shall be able to:
1. CO1 Identify the skills and knowledge to become prospective entrepreneurs
2. CO2 Identify the problems and to think new idea
3. CO3 Prepare business plans and its feasibility report
4. CO4 Understand various institutions for financial assistance.
5. CO5 To improve the capabilities of family business
6. CO6 Knowing International Entrepreneurship Opportunities
Comparison of static and electro mechanical relays, two input amplitude and phase comparator. Generation of various distance relays, two input amplitude and phase comparator.

Introduction to static and numerical relays:

Course Objectives
1. To introduce the construction, working and practical application of different relays & protective schemes like distance protection, differential, over current & overvoltage protection.
2. To study different types of circuit breaker used and practical application
3. Introduction to static and numerical relays.

Course Outcomes
Upon successful completion of the course, students shall be able to:

1. Identify different types of protective relays for protecting power system equipments.
2. Understand Concept and working of different types of over current relays
3. Understand Concept and working of different types of distance protection.
4. Apply different Protection schemes for generator transformer and busbar.
5. Understand different types of Amplitude & Phase comparator
6. Identify different types of circuit breakers for protecting power system equipments.

Unit I
Entrepreneur: Meaning of Entrepreneur; Evolution of the Concept; Functions of an Entrepreneur, Types of entrepreneur, Intrapreneur – an emerging class, Concept of Entrepreneurship-Evolution of Entrepreneurship; Development of Entrepreneurship; The entrepreneurial Culture; Stages in entrepreneurial process.

Unit II

Unit III
Business Planning Process Meaning of business plan, Business plan process, Advantages of business planning, Marketing plan, Production/operations plan, Organizational plan, financial plan, Final project report with feasibility study, preparing a model project report for starting a new venture.

Unit IV
Institutions supporting entrepreneurs Small industry financing developing countries, A brief overview of financial institutions in India, Central level and state level institutions, SIDBI, NABARD, IDBI, SIDO, Indian Institute of Entrepreneurship, DIC, Single window, Latest Industrial policy of Government of India

Unit V
Family Business Importance of family business, Types, History, Responsibilities and rights of shareholders of a family business, Succession in family business, Pitfalls of the family business, strategies for improving the capability of family business, Improving family business performance

Unit VI
International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestic entrepreneurship, Stages of economic development, Entrepreneurship entry into international business, exporting, Direct foreign investment, barriers to international trade. Advanced topic on the subject

Text Books:

Reference Books:

BEEL406 SWITCH GEAR & PROTECTION
(3-1-0-4) Total Hrs: 40
Pre-requisite: - EPS-I (BEEL309)
Co-requisite: -

Course Objectives
1. To introduce the construction, working and applications of different relays & protective schemes like distance protection, differential, over current & overvoltage protection.
2. To study different types of circuit breaker used and practical application
3. Introduction to static and numerical relays.

Course Outcomes
Upon successful completion of the course, students shall be able to:

1. Identify different types of protective relays for protecting power system equipments.
2. Understand Concept and working of different types of over current relays
3. Understand Concept and working of different types of distance protection.
4. Apply different Protection schemes for generator transformer and busbar.
5. Understand different types of Amplitude & Phase comparator
6. Identify different types of circuit breakers for protecting power system equipments.
Unit VI
(6 Hrs)
Switchgear: Circuit breakers. Arc interruption theory, recovery and restricting voltages, RRRV, breaking of inductive and capacitive currents, C.B ratings, different media of arc interruption, overview of oil circuit breakers, construction and operation of Air blast, SF6 and vacuum breakers, Advances in industrial power system protection. Advanced topic on the subject
Text Books:
Reference Books:
BEEP406 : SWITCH GEAR & PROTECTION LAB
List of Practical:
1. To determine PSM and plot the characteristic of Definite Time over current Relay.
2. To analyze and plot the characteristic of Single Pole Static I.D.M.T. Over Current relay during earth fault.
3. To determine the pickup value and plot the characteristic of Electromagnetic IDMT Relay
4. To plot the characteristic of Static Definite Time Reverse Power Relay
5. To plot the Magnetization Characteristics of C.T and analyze the the significance of knee and ankle point.
6. To Plot The Characteristics of Fuse Wire
7. To plot the characteristics of Directional over Current Relay
8. To analyze the Operation of Impedance Relay (Model-ABB-RAKZB)
9. To analyze and plot Percentage Differential Protection Scheme
10. To plot the characteristic of Static over voltage Relay(Model-ASOV)
11. To analyze the effect of Reverse Restricting Recovery Voltage using MATLAB Software
12. To analyze and plot the Operation of Unrestricted Earth Fault Relays
13. To plot the Characteristic of Microprocessor Based Relay.
14. To simulate Surge Arresters in Transmission System using MATLAB Software
15. To simulate Fault in electrical power system using MATLAB Software
16. Open Ended Experiments
BEEP407 INDUSTRIAL TRAINING (AUDIT)
Pre-requisite: -
Co-requisite: -
Course Objectives
1. Exposure of Industry structure working, functioning of different sections and management.
2. More familiarity with industry practices leading to better employability aspects.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. Awareness about the design, manufacturing processes and testing of products in industry
2. Interaction with industry experts to find solution for own doubts.
3. Understand the structure of industry working schedule and function of different sections
BEEP408 PROJECT SEMINAR (SPE)(0-0-2-2)
Course Objective:
1. To Provide opportunity for working on a real time project, prepare a prototype and present conclusions in the form of reports.
2. To Provide opportunity for selection of Projects considering their usability to the industry and society without endangering the environmental aspects.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. Hands-on experience on real time systems
2. Boost of confidence
3. Ability to work in a multidisciplinary group.
4. Ability to consider the industry, social and environmental requirement
5. Present conclusions effectively before the audience
BEEEL414: POWER SEMICONDUCTOR BASED DRIVES
Course Objectives:
1. To introduce traction drives.
2. To study conventional and advanced control methodologies and performance parameters.
3. To introduce traction drives.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. CO1 Understand Dynamics of Electric Drives
2. CO2 Develop a comprehensive knowledge of converters and choppers used for DC motor Drives
3. CO3 Understand various Control Methods for Induction Motor Using inverters and Cycloconverter
4. CO4 Understand the use of Synchronous motor Drive in Process Industry
5. CO5 Understand importance of Special Motors / Drives in industrial Applications

BEEP406 : SWITCH GEAR & PROTECTION LAB
List of Practical:
1. To determine PSM and plot the characteristic of Definite Time over current Relay.
2. To analyze and plot the characteristic of Single Pole Static I.D.M.T. Over Current relay during earth fault.
3. To determine the pickup value and plot the characteristic of Electromagnetic IDMT Relay
4. To plot the characteristic of Static Definite Time Reverse Power Relay
5. To plot the Magnetization Characteristics of C.T and analyze the the significance of knee and ankle point.
6. To Plot The Characteristics of Fuse Wire
7. To plot the characteristics of Directional over Current Relay
8. To analyze the Operation of Impedance Relay (Model-ABB-RAKZB)
9. To analyze and plot Percentage Differential Protection Scheme
10. To plot the characteristic of Static over voltage Relay(Model-ASOV)
11. To analyze the effect of Reverse Restricting Recovery Voltage using MATLAB Software
12. To analyze and plot the Operation of Unrestricted Earth Fault Relays
13. To plot the Characteristic of Microprocessor Based Relay.
14. To simulate Surge Arresters in Transmission System using MATLAB Software
15. To simulate Fault in electrical power system using MATLAB Software
16. Open Ended Experiments

BEEP407 INDUSTRIAL TRAINING (AUDIT)
Pre-requisite: -
Co-requisite: -
Course Objectives
1. Exposure of Industry structure working, functioning of different sections and management.
2. More familiarity with industry practices leading to better employability aspects.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. Awareness about the design, manufacturing processes and testing of products in industry
2. Interaction with industry experts to find solution for own doubts.
3. Understand the structure of industry working schedule and function of different sections

BEEP408 PROJECT SEMINAR (SPE)(0-0-2-2)
Course Objective:
1. To Provide opportunity for working on a real time project, prepare a prototype and present conclusions in the form of reports.
2. To Provide opportunity for selection of Projects considering their usability to the industry and society without endangering the environmental aspects.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. Hands-on experience on real time systems
2. Boost of confidence
3. Ability to work in a multidisciplinary group.
4. Ability to consider the industry, social and environmental requirement
5. Present conclusions effectively before the audience

BEEEL414: POWER SEMICONDUCTOR BASED DRIVES
Course Objectives:
1. To introduce traction drives.
2. To study conventional and advanced control methodologies and performance parameters.
3. To introduce traction drives.
Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. CO1 Understand Dynamics of Electric Drives
2. CO2 Develop a comprehensive knowledge of converters and choppers used for DC motor Drives
3. CO3 Understand various Control Methods for Induction Motor Using inverters and Cycloconverter
4. CO4 Understand the use of Synchronous motor Drive in Process Industry
5. CO5 Understand importance of Special Motors / Drives in industrial Applications
6. CO6 Develop a comprehensive knowledge of converters and choppers used for traction system

Upon successful completion of the course, students shall be able to:

1. CO1 understand dynamics of drives
2. CO2 Learn the mathematical representation of various drives and the use of microprocessor, computers and digital controls
3. CO3 Understand variable frequency control of drives
4. CO4 understand synchronous servomotor drive in industries
5. CO5 understand modern control techniques for ac drives
6. CO6 understand digital control of AC/DC drives and special motors used in industries

Unit I Dynamics of Electric drives and control of electric drives, energy conservations in electric drives. (08 Hrs)

Unit II D.C. motor drives: Controlled rectifier fed d.c. drives, single phase and three phase rectifier control of d.c. separately excited motor. Dual converter control of D.C separately excited motor. Power factor, supply harmonics and ripple in motor current. Chopper controlled dc drives of separately excited dc motor, chopper control of series motor, source current harmonics. (09 Hrs)

Unit III Induction motor drives: Stator voltage control, variable frequency control using voltage source inverters, current sources inverters and cycloconverter. (08 Hrs)

Unit IV Synchronous Motor Drive: Starting Braking of synchronous motor, variable frequency control self controlled synchronous motor drive employing load commutated thyristor inverter of cycle converter, starting of large synchronous motors. (09 Hrs)

Unit V Brushless dc motor, stepper motor, switched reluctance motor drives and eddy current drives, Introduction to solar and battery powered drives. (08 Hrs)

Unit VI Traction drives: Conventional dc and ac traction drives, semiconductors converter controlled Drives, 25KV AC traction using semiconductor converter controlled dc motor. DC traction using semiconductor, chopper controlled dc motors, poly phase AC motors for traction drives, Recent industrial controllers. Advanced topic on the subject. (08 Hrs)

Text Books:

Reference Books:

ELECTIVE - III

BEEL502 ADVANCED ELECTRICAL DRIVES (3-0-0-3) Total Hrs: 30

Course Objectives
1. This Subject deals with modern drives controls techniques such as vector & scalar.
2. To study VVVF control.
3. To study DTC control for industrial application

Course Outcomes

Text Books:

Reference Books:

BEEL503 ELECTRIC VEHICLES (3-0-0-3)
Total Hrs: 30

Course Objectives
1. Electrical Vehicles need strong sources, efficient power-drives & excellent co-ordination within the vehicle.
2. This course introduces modern subsystems for efficient operation of vehicles.

Course Outcome
Upon successful completion of the course, students shall be able to-
1. CO1 Define and analyze fundamental electrochemistry of battery operation and performance requirements for HEV, and full electric vehicle applications
2. CO2 Understand, ultra-capacitors and hybrid system for electric vehicles in cost effective way.
3. CO3 Apply the operation of brushless dc and induction motors to HEV and EV vehicles
4. CO4 Describe the main hybrid and electric vehicle development considerations and performance requirements for various vehicle systems
5. CO5 Identify how to define key vehicle system requirements and select and size system components that best meet those requirements
6. CO6 Understand fuel cell and HEV vehicle.

Unit I (05 Hrs)
Electric vehicles (EV) development, past, present and future, comparison with IC engine driven vehicles.

Unit II (05 Hrs)
Batteries, fuel cells, ultracapacitors. Power converters in EV. Different types of motors used in EV and their torque-speed characteristics, motor control techniques,

Unit III (05 Hrs)
High performance and efficiency-optimized control, sensorless control. EV modeling, Their Characteristics,

Unit IV (05 Hrs)
Slip phenomena. Road condition estimation, driving force observer.

Unit V (05 Hrs)
EV motion control, optimum slip ratio control, movement control, lateral motion stabilization.

Unit VI (05 Hrs)
Fuel cell Vehicles, Hybrid Electric Vehicles (HEV), series, parallel and series-parallel (split) systems, Recent industrial power electronic applications. Advanced topic on the subject

Text Books:

Reference Books:
2. Springer Books, Electrical Vehicle Integration into Modern Power Networks

BEEL504: ADVANCED POWER ELECTRONICS (3-0-0-3)
Total Hrs: 30

Course Objectives
1. This subject deals with the modern power semiconductor switches, converters, their control and application in residential, commercial & industrial etc
2. To study DC to DC switch mode converter.
3. To introduce resonant converter

Course Outcomes
Upon successful completion of the course, students shall be able to-
1. CO1 Study overview and Protection of semiconductor devices
2. CO2 Study Single phase and Three phase line commutated converters.
3. CO3 Design three phase Inverter and also study harmonic analysis
4. CO4 Study Close loop control of DC-DC converter
5. CO5 Study comparison between PWM and resonant converter
6. CO6 Study Role of FACTS devices in Power electronics along with designing UPS and intelligent Controllers

Unit I (5 Hrs)
Overview of power semiconductor device structure, characteristics, rating and protection (Thyristor, BJT, MOSFET, IGBT, MOS controlled Thyristor etc.) comparison of controlled switches

Unit II (5 Hrs)

Unit III (5 Hrs)
Inverters, type (Hard/soft switch inverter, Voltage source inverter current source inverter). Operation with different types of loads. Performance parameters Harmonic elimination, control of
output, voltage using different switching techniques.

Unit IV (5 Hrs)
DC to DC switch mode converters, Basic concepts, analysis of switch on and off transients types, DC to DC converters comparison, soft switching, close loop control.

Unit V (5 Hrs)
Resonant converters, comparison of PWM and resonant converters, classification, Basic resonant circuit concepts, Analysis and design of SRC (series), PRC (parallel), SPRC (series-parallel) resonant converters, DC-DC as well as AC-DC resonant converter, application for induction heating and reduction in THD and P.F. improvement.

Unit VI (5 Hrs)
Different methods to control the output voltage. Electric utility application, various types of SVCs (static var compensator), Power conditioners and uninterruptible power supplies, protection of supply, introduction to recent intelligent controllers. Advanced topic on the subject

Text Books:

Reference Books:

BEEL505 MODERN CONTROL SYSTEMS (3-0-0-3) Total Hrs: 30
Course Objectives
1. Recent analytical tools enable us to monitor an engineering system in a fast manner ensuring system stability. The same aspects are highlighted in this course.
2. To introduce optimal control.
3. To introduce state variable analysis.

Course Outcomes:
Upon successful completion of the course, students shall be able to:
1. Understand and apply advanced optimal techniques to given system
2. Develop close-loop observer
3. Understand the concept of pole-placement

Unit I (05 Hrs)

Unit II (05 Hrs)

Unit III (05 Hrs)
Stability improvement by state feedback pole placement design and observers. Phase plane analysis isoclines method, delta method.

Unit IV (05 Hrs)

Unit V (05 Hrs)
Optimal Control, parameters optimization techniques, Lagrange parameter techniques, Calculus of variation, unconstrained and constrained minimization of functional.

Unit VI (05 Hrs)
Two point boundary value problems. Optimal Digital Control Systems. Advanced topic on the subject

Text Books:

Reference Books:

BEELS06 FUZZY AND NEURAL APPLICATIONS (3-0-0-3) Total Hrs: 30
Course Objectives
1. To introduce fast computing method to enable us to design economical & reliable control systems based on fuzzy logic & ANN. The same are introduced in this course.
2. To introduce neural applications to electrical systems

Course Outcomes
Upon successful completion of the course, students shall be able to:
1. Develop in students the skills to gain a basic understanding of neural network theory.
2. Develop in students the skills to gain a basic understanding of fuzzy logic theory
3. Explore the functional components of neural network classifiers or controllers
4. Explore the functional components of fuzzy logic classifiers or controllers
5. Develop and implement a basic trainable neural network or a fuzzy logic system for a typical control
6. Develop and implement a basic trainable neural network or a fuzzy logic system for computing application.
Unit I  (5 Hrs)
Neural Networks Different Architectures, Backpropagation Algorithm, Hybrid Learning Rule, Supervised Learning- Perceptrons, Adaline, Backpropagation Multilayer Perceptrons, Radial Basis function Networks.

Unit II  (5 Hrs)

Unit III  (5 Hrs)
Neural network applications to electrical systems.

Unit IV  (5 Hrs)

Unit V  (5 Hrs)

Unit VI  (5 Hrs)
Fuzzy Logic in Control Engineering- Mamdani and Sugeno Architecture for Fuzzy Control, Analytical Issues in Fuzzy Logic Control, Applications of Fuzzy Logic to electrical systems. Advanced topic on the subject

Text Books:

Reference Books:

ELECTIVE –III (Eight sem)
BEEL405 : FLEXIBLE AC TRANSMISSION SYSTEMS
(3-1-0-4)
Total Hrs: 40
Pre-requisite: -
Co-requisite: -
Course Objectives:-

1. To introduce different methods for enhancing the flexibility, loading capability.
2. To introduce reliability of power system and its stability margin by using power electronics devices.
3. To study various FACTS devices like TCR, TCS, SSSC, TCSC, STATCOM, UPFC and IPFC

Course Outcome:
At the end of the course the student shall be able to:
1. CO1To understand the basic concepts of FACTS
2. CO2To understand voltage source and current source converter operation
3. CO3To understand the operation of SVC and STATCOM
4. CO4To understand the operation of static series compensator
5. CO5To understand the operation of static voltage and phase angle regulator
6. CO6To understand the UPFC and IPFC operation

Unit I  (07 Hrs)

Unit II  (07 Hrs)

Unit III  (06 Hrs)
Static Shunt Compensators: SVC and STATCOM: OBJECTIVEs of shunt Compensation, Methods of Controllable Var Generation, Static Var Compensators SVC and STATCOM, Comparison Between STATCOM and SVC, Static Var System.

Unit IV  (07 Hrs)
Static Series Compensators: GCSC, TSSC, TCSC and SSSC: OBJECTIVEs of series Compensation, Variable Impedance Type Series Compensators, Switching Converter Type Series Compensators, External (System) Control for Series Reactive Compensators.

Unit V  (07 Hrs)
Static Voltage and Phase Angle Regulators; TCVR and TCPAR: OBJECTIVEs of Voltage and Phase Angle regulators, Approaches to Thyristor -
Controlled Voltage and Phase Angle Regulators (TCVR and TCP ARS), Switching Converter-Based Voltage and Phase Angle regulator, Hybrid Phase Angle Regulators.

Unit VI (06 Hrs)

Combine Compensators (UPFC, IPFC) and Special Purpose FACTS Controllers:
The Unified Power Flow Controller (UPFC), Interline Power Flow Controllers Generalized and Multifunctional FACTS Controllers, Sub synchronous Resonance, NGH-SSR Damping Scheme, Thyristor-Controlled Braking Resistor (TCBR), Recent trends in low rating & distributed FACTS devices.

Advanced topic on the subject

Text Books:

Reference Books:

BEEL507 SMART GRID TECHNOLOGIES AND APPLICATIONS (3-1-0-4)
Total Hrs: 40
Pre-requisite: -
Co-requisite: -
Course Objectives:
The students will be able to:
1. Understand concept of smart grid and its advantages over conventional grid
2. Know smart metering techniques
3. Learn wide area measurement techniques

Course Outcome:
Upon successful completion of the course, students shall be able to:
1. Understand the concept of smart grid, their comparison over conventional grid & international policies
2. To implement smart metering & vehicle to grid applications.
3. Analyse Smart Substation & PMU’s (Phasor Measurement Unit)
4. To practice power quality issues & audit.
5. To integrate grid with ICT (Information & Communication Technologies)

Unit I (08 Hrs)
Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid

Unit II (08 Hrs)
Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

Unit III (08 Hrs)
Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

Unit IV (08 Hrs)

Unit V (08 Hrs)
Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN).

Advanced topic on the subject

Text Books:
1. Design of smart power grid renewable energy systems by Ali Keyhani, Wiley IEEE.
### DEPARTMENT OF MECHANICAL ENGINEERING

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### SEM-IV

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**ELECTIVE –I**
- BMEL307 - Power Plant Engineering
- BMEL308 - Design of Mechanical Drives
- BMEL309 - Artificial Intelligence
- BMEL310 - Quality & Reliability Engineering
- BMEL311 - Mechanical Vibration
- BMEL312 - Advanced IC Engines
- BMEL318 - Renewable Energy Sources

*OPEN ELECTIVES*
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*Compulsory Industry Internship for full semester commencing from immediately after the VI semester ESE.
**At the place of Industry Internship
***Presentation of progress of Major project phase I in the college

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*In the college

**ELECTIVE –II**
- BMEL501- Computer Aided Design
- BMEL502- Refrigeration and Air Conditioning
- BMEL503- Finite Element Method
- BMEP503- Finite Element Method

**ELECTIVE –III**
- BMEL504- Material Handling Systems
- BMEL505- Advance Manufacturing Techniques
- BMEL506- Stress Analysis
- BMEL507- Automobile Engineering
- BMEL508- Modeling and Simulation
- BMEL509- Industrial Robotics
- BMEL510- Metrology & Quality Control
- BMEL511- Computational Fluid Dynamics
THIRD SEMESTER

BAML203 Mathematical application in Mechanical Engineering
(3-1-0-4) Total Hrs: 42
Pee-requisite:
1. BAML 101 Applied Mathematics-I
2. BAML110 Applied Mathematics-II

Course Objectives:
1. To learn important mathematical models used in mechanical engineering area.
2. Learn to manipulate the relevant mathematical objects with paper and pencil with mathematical software.
3. Teaching of basic numeracy skills to all pupils
4. The teaching of selected areas of mathematics such as calculus as an example of intellectual achievements of modern world
5. The ability to conceptualize, inquire, reason and communicate mathematically and to use mathematics to formulate and solve the problems in daily life.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Apply the concept of Laplace Transform in Mechanical System
2. Use Z-transform to solve applications in Mechanical Engineering.
3. Apply the concept of Fourier Transform in field of Mechanical Engineering.
4. Apply the concept of Complex Variables in Mechanical Engineering.
5. Use series solution to solve engineering applications.
6. Use Fourier series and Partial differential equation in solving engineering problems

Unit I [7 Hrs]
Laplace Transforms,(CO1 )

Unit II: [6 Hrs]
Z- Transform(CO2 )
Definition and properties, inversion z-transform, z-transforms pairs, relation with Laplace transform, Application of Z-transform to solve differential equation with constant coefficients.

Unit III: [6 Hrs]
Fourier Transform(CO3 )
Definition, Fourier integral theorem, Fourier sine & cosine integrals, finite Fourier sine & cosine transforms, Parseval's identity, convolution theorem,

Unit IV:[9 Hrs]
Complex Variables(CO4 )
Analytic function, Cauchy-Riemann conditions, conjugate functions, singularities, Cauchy's integral theorem and integral formula (statement only), Taylor's and Lautent's theorem (Statement only), Residue theorem, contour integration, evaluation of real & complex integral by residue theorem. Conformal mapping, mapping by linear & inverse transformation.

Unit V: [6 Hrs]
Special function & series solution(CO5 )
Series solution of differential equation by frobanious method, Bessel's function Legendres polynomials, Recurrence relations, Rodrigue formula, generating function, orthogonal properties of Jn(x) & Pn (x).

Unit VI: [8 Hrs]
Fourier series & Partial differential equations(CO6)
Periodic function & their Fourier series expansion, Fourier series for even & function, change of interval, half range expansion.

Partial differential equation: Partial differential equation of first order first degree i.e. Langrage's form, Linear homogeneous partial differential equation of higher order with constant coefficient, method of separation of variables, Application to one dimensional heat &diffusion equation, two dimensional Heat equations. (Only steady state).

Text Books:

Reference Books:

BMEL201 MACHINE DRAWING(3-0-2-4)
Total Hrs:28
Pee-requisite: BMEL108 Engineering Graphics
**Course Objectives:**

1. To get awareness and importance of machine drawing
2. To familiarize with the latest developments in mechanical engineering drawing
3. To study both conventional and systems for generation of drawing
4. To know recent train in solid modeling by CAD software
5. To know ecofriendly refrigerants in refrigeration and air conditioning applications.
6. To study preparation of drawing by using CAD tool
7. To study preparation of Production drawing by CAD software

**Course Outcomes:**

Upon successful completion of the course, students will be able to
1. Understanding basics of engineering drawing in mechanical engineering and applications
2. Get the exposure to the orthographic and sectional views with dimensions
3. Search out design data from hand books and select standard components
4. Understand the allocation of fits and Tolerances to production drawing.
5. Understand the principles, techniques and able to interpret of assembly drawing.
6. Understand the principles, techniques of production drawing by using CAD software and preparation of process planning sheet.

**Unit I**

**Drawing Standards (CO1)**

BIS Specification - Welding symbols, Machining Symbols, Surface Finish Symbols, Heat Treatment, Manufacturing Instructions

**Unit II**

**Interpretation of Orthographic Projection (CO 2)**

Orthographic Projections of elements, Sectional-Multiple-Missing views, Profiles, Cross Sections, References, Alignment & Dimensioning.

**Unit III**

**Standard Practices and Study for following elements (Excluding design calculations) (CO3)**


**Unit IV**

** Fits and Tolerance (CO 4)**

Fits and Tolerance allocation for mating parts-tolerance data sheet - tolerance table preparation - Geometric Tolerance and Allowance. Indicating on the drawing of position, as per standard and as per prevalent in industry.

**Unit V**

**Assembly Drawing (CO5)**

(8 Hrs)

Principles, Techniques, Types and Standards for Preparation of assembled views given parts details - couplings: flange, universal - Bearing: footstep, Plummer block - Lathe tailstock - Stop valves, Screw Jack – etc

**Unit VI:**

**Production Drawing (CO6)**

(5 Hrs)

Elements of production drawing Information (Plates, Part list, Formats) on: tolerances, manufacturing methods, Production planning Sheet, Process planning Sheet.

**Advanced Topic**

Production drawing sheet on CAD Software

1. Modeling and Production drawing by using CAD software

**Practical:**

Sheet 1: Dimensioning, Symbols (Welding, Machining & Surface Finish)
Sheet 2: Orthographic Projections & Missing Views
Sheet 3: Sectional Views
Sheet 4: Sketching Of Machine Components
Sheet 5: Keys, Cotters & Coupling Joint
Sheet 6: Assembly & Disassembly
Sheet 7: Solid Modeling of Mechanical component (on CAD software)
Sheet 8: Production Drawing sheet (On CAD software)

Note: The examination must include:

1. Total Assembly Test
2. Identifying The Missing Element Of The Assembly

**Text Book:**


**Reference Books:**


UNIT-IV

Flow through Pipes:(CO 4)

Laws of fluid friction (Laminar and turbulent), Darcy's equation and Chezy's equation for frictional losses.Minor losses in pipes Hydraulic gradient and total gradient line. Hydraulic power transmission through pipe, Energy Gradient; Pipe in series and parallel ; Branched pipes; three reservoir system; Siphons; Transmission of power through pipes; Water Hammer pressure due to sudden closure of valve.

UNIT-V

Boundary Layer Concepts: (CO 5)

Nominal thickness, Displacement thickness and Momentum thickness energy of the boundary layer; Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; Turbulent boundary layer; Separation of boundary layer on plane and curved surfaces. Drag & Lift: Definition of drag and lift; Flow past plates, Cylinders and sphere; Drag on sphere, cylinder and flat plate.

UNIT-VI

Dimensional Analysis: (CO 6)

Fundamental dimensions, dimensional Homogeneity, Rayleigh's method and Buckingham's method,dimensional less numbers and their significance. Hydraulic similitude , Type of models, Problems related to Reynolds number & Froude number.

Advance topic on the subject

Text Books


Reference Books

BMEL203 MATERIALS ENGINEERING (3-0-2-4)  
Total Hrs: 42

Pee-requisite: Nil

Course Objectives:
1. To introduce various materials used in manufacturing metallic components
2. To introduce & correlate between science and Engineering of metallic materials
3. To introduce various techniques for enhancing the inherent characteristics of materials
4. To introduce the quantitative measurement of material properties.

Course Out Comes:
Upon the successful completion of the course students will be able to
1. CO1. Apply basic basic knowledge related to Alloys & phase diagram
3. CO3. Students will get sufficient theoretical knowledge about various types of Cast Iron
4. CO4. To observed various heat treatment processes.
5. CO5. To differentiate and apply Ferrous & Non-ferrous material.

Unit I  [8Hrs]
Constitution of alloys and Phase Diagrams (CO1)
Introduction to Basic Terms (System, Phase, Variables, Components Etc.) related to equilibrium diagram. Alloys and solid solutions, compounds. Polymorphism, Hume Rothery rulesTime Temperature cooling curves, Construction of equilibrium diagrams using cooling curves, Binary phase diagrams Isomorphous systems, Partial miscibility, Metallic systems completely miscible in liquid state and completely immiscible in solid state. Lever rule, equilibrium cooling, Microstructures under equilibrium cooling conditions, Eutectic, Hyper and hypo eutectic alloys.

Unit II (CO2)  [10 Hrs]
Ferrous materials -Plain Carbon Steel and Alloy Steels
b) Purpose of alloying, Different alloying elements and their effect on enhancing the different characteristics, Tool steels, Stainless steels, spring steels etc Designation of steels. AISI, ASTM, EN etc.

Unit III(CO3)  [5 Hrs]
Cast Irons
Cast iron, White cast iron, Maurer Diagram, malleable cast iron, malleableizing cycle, Grey cast iron, Types of grey cast iron, Nodular cast iron., Alloy cast iron. Microstructure, Properties and Application of each type of cast iron.

Unit IV (CO4)  [10 Hrs]
Heat Treatment
a) Introduction, importance of heat treatment, Basic heat treatments such as annealing, normalizing, hardening and tempering, procedure, allied phases - martensite, retained austenite etc related properties, and microstructure and their correlation.
TTT diagram, construction, heat treatment based on it .Industrial applications of different heat treatment processes Hardenability, Jominy end quench Test.
b) Surface Treatments based on above such as Induction Hardening

Unit V (CO5)  [5 Hrs]
Non-Ferrous materials and new generation materials
Brief introduction to different nonferrous materials and study of the Aluminium and its alloy, eg.Aluminium Silicon, related phase diagram, Na modification Copper and its alloys, eg. Copper-zinc, Copper –tin, Dezincification, Seasons cracking. Introduction to nano materials, high temperature smart materials, properties and relevant applications,

Unit VI (CO6)  [4 Hrs]
Testing of materials
Need of testing .Destructive and non destructive testing Mechanical testing, Tensile test, Impact test Izod and Charpy test Hardness measurement, Rockwell , Brinell hardness, micro hardness. Magnetic particle inspection. .

Text Books:

Reference Books:

BMEP203 MATERIALS ENGINEERING Evaluation Scheme: Practical [2P]
Total Hrs:
list of Practical:
(Any 10 experiments from the following list)
1. Preparation of the specimen for metallographic examination
2. Detailed study of the optical microscope for metallographic examination.
3. Phase identification of equilibrium cooled plain carbon steels
4. Hypo eutectoid
5. Eutectoid
6. Hyper eutectoid
7. Micro structural examination of cast iron
8. Grey
9. Malleable
10. Nodular
11. Property Structural co-relation for basic heat treatment processes for plain carbon steels
12. Annealing
13. Normalizing
14. Hardening
15. Hardenability measurement using Jominy End Quench set up.
16. Hardness measurement and detailed study of Rockwell hardness testing machine.
17. Tensile Testing of Mild Steel using universal Testing machine
18. Impact testing of metallic material using charpy/izod test procedure
19. Phase identification nonferrous materials (Al-si, brass, Bronzes)
20. Study of the SEM used for advanced material characterization.
21. Study of the TEM used for nano material characterization.
22. Study of Non destructive methods for testing of materials.
23. Open ended experiments.

**BMEL204 KINEMATICS OF MACHINES (3-1-0-4)**

**Total Hrs: 42**

**Pee-requisite: Nil**

**Course Objectives:**
1. To understand basic concepts of different mechanisms and its applications to various fields.
2. To develop competency in graphical and analytical methods in solving problems of quantitative kinematic analysis of mechanism.
3. To make students conversant with Concepts of cam mechanism.
4. To make the students conversant with basic concepts of gears, its applications and torque analysis.
5. To develop analytical competency in designing efficiency of various gears.
6. To make the students conversant with static force analysis and synthesis of mechanism.
7. To give exposure to students the advances in synthesis of mechanism

**Course Out Comes:** Upon successful completion of the course, students will be able to:
1. To apply the basics concepts of different mechanisms.
2. To identify the exact solving problems of quantitative kinematic analysis of mechanism.
3. To develop an appropriate application of Cam and follower mechanism.
4. To calculate the velocity ratio and select the gears for real life application.
5. To find the gear trains for suitable application and condition.
6. To understand advanced computing techniques, tools and synthesis of mechanism in the area of kinematics of machines.

**Unit I (CO1) [6 Hrs.]**
Basic concept of mechanism, link, kinematic pairs, kinematic chain, mechanism, machine, simple and compound chain, Degree of freedom, estimation of degree of freedom of mechanism by Grubber’s criterion and other methods. Harding’s notations, classification of four bar chain [class – I & class – II], inversion of four–bar–chain, Kutchbach theory of multiple drives.

**Unit II [4Hrs.]**
Quantitative kinematic analysis of mechanism :- Displacement, Velocity and Acceleration analysis of planer mechanism by graphical method as well as analytical method [complex number method / matrix method], Coriolis component of acceleration, Instantaneous center method, Kennedy’s theorem.

**Unit III (CO2) [6Hrs.]**
Concepts of cam mechanism, comparison of cam mechanism with linkages. Types of cams and followers and applications. Synthesis of cam for different types of follower motion like constant velocity, parabolic, SHM, cycloidal etc. Pressure angle in cam, parameters affecting cam performance.

**Unit IV (CO3) [10Hrs.]**
Concept of motion transmission by toothed wheels, comparison with cams and linkages, various tooth profiles, their advantages and limitations, gear tooth terminologies, concept of conjugate action, law of conjugate action, kinematics of involutes gear tooth pairs during the contact duration, highlighting locus of the point of contact, arc of contact, numbers of pairs of teeth in contact, path of approach and path of recess, interference, undercutting for involutes profile teeth.

**Unit V (CO4) [10Hrs.]**
Kinematics of helical, bevel, spiral, worm gears, rack and pinion gears, kinematic analysis, and torque analysis of simple epicyclic and double epicyclic gear trains.

**Unit VI (CO5) [6Hrs.]**
List of Tutorials
1. Drawing sheets on Inversion of
2. Class I & Class II four bar cham
3. Single slider crank chain
4. Double slider crank chain
5. Problems on kinematic analysis
6. Graphical method
7. Analytical method
8. Cam constructions
9. Cams with specified contour
10. Analysis of epicyclic gear train with torque analysis
11. Problems on static force analysis
12. Linkages
13. Cam
14. Gear
15. Problems on synthesis
16. Graphical method
17. Analytical method

Recommended Books

Text Books
1. Theory of mechanisms and machines by Shigley J.E., Tata mc graw hill, Third edition, 2010

Reference Books
1. Theory of Machine by Thoman Bevan, Pearson Education India, CBS publication
3. Theory of Machines by V.P.Singh ,Danpat Rai publication Third edition, 2012

BMEL205 ENGINEERING THERMODYNAMICS
(3-1-0-4) Total Hrs: 42
Pee-requisite:Nil

Course Objectives:
1. Identify the unique vocabulary associated with thermodynamics through the precise definition of basic concepts.
2. To form a sound foundation for the development of the scientific principles.
3. Review the English and the metric SI Unit systems that will be used throughout the text.
4. Explain the basic concepts of thermodynamics such as system, state, state postulate, equilibrium, process, cycle, energy, and various forms of energy.
5. Review concepts of temperature, temperature scales, pressure, and absolute and gage pressure.
6. Introducing basics of ideal and real gases, steam formation, basic laws of thermodynamics, and their applications.
7. Introduce an intuitive systematic problem-solving technique that can be used as a model in solving engineering problems.

Course Outcomes:
At the end of this course, student shall be able to
1. Apply fundamental concepts of thermodynamics to thermodynamic systems.
2. Understand the process and the first law of thermodynamics and compute the work involved & heat transfer in the given system.
3. Understand the second laws of thermodynamics and their application to a wide range of systems with calculations of the efficiencies of heat engines and other engineering devices.
4. To analyze the work and heat interactions associated with a prescribed process path and determine the reversibility or irreversibility of a process from such calculations.
5. Identify and apply gas laws to various subsystems processes.
6. Effectively use Rankine cycle analysis and investigate ways to modify the basic Rankine vapor power cycle to increase the cycle thermal efficiency.

Unit I (CO 1) Basic concepts and properties
[6 Hrs]
Introduction, thermodynamic system, control volume, macroscopic and microscopic approaches, properties and state of a system, point and path functions, thermodynamic equilibrium, processes and cycles, quasi-static process, properties such as specific volume, pressure, temperature, zeroth law of thermodynamics, temperature scales, Ideal gas , Equation of state, universal gas constant, thermodynamic heat and work.

Unit II (CO 2) First law of thermodynamics
[8 Hrs]
Energy of systems, classification of energy, law of conservation of energy, first law applied to closed system undergoing a cycle, Joule experiment, energy-a property of system, internal energy: a function of temperature, enthalpy, specific heat at constant volume and constant pressure, change in internal energy and heat transfer during various non-flow processes. First law applied to flow processes: steady-state steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, throttling valve, turbines and compressors, pumps, heat exchangers etc. Work done and heat transfer during steady flow processes.

Unit III (CO 3) Second law of thermodynamics
[7 Hrs]
Second Law Of Thermodynamics: Second Law of Thermodynamics :- Introduction, Thermal energy reservoirs, Kelvin-Plank & Clausius statements,
Heat engines, Refrigerator & Heat pump, Perpetual motion machines, Reversible & Irreversible processes, Carnot cycle, Thermodynamic temperature scale.

**Unit IV: Entropy (CO 4)**

[6 Hrs]

Entropy: - The Clausius inequality, Entropy, Principle of increase of entropy, Change in entropy for Closed & Steady flow open systems. Second law analysis of engineering systems:- Availability, Reversible work & Irreversibility

**Unit V (CO 1, CO 2) Gas Power Cycle**

[7 Hrs]

Gas power cycles: Otto cycle, Diesel cycle, semi-Diesel, Sterling cycles, their efficiency and mean effective pressure calculations, Dual cycle, Ericsson cycle.

**Unit VI (CO 5, CO 6) Vapors power cycles**

[8 Hrs]

Properties of steam, Phase change process of pure substance, Sensible heat and latent heat, specific volume and entropy of steam, dryness fraction of steam, throttling of steam, determination of dryness fraction, steam tables and their use, T-s and H-s diagram, Rankine and modified Rankine cycle, work done and efficiency, specific steam consumption, comparison of Rankine and Carnot cycle, representation on P-v, T-s and h-s diagram.

**Advanced Topic**

**Text Books Recommended:**


**Reference Books:**


**BMEP206 COMPUTER AIDED COMPONENT DESIGN (0-0-2-Audit course)**

**Practical per Week :** 2 Hrs.  
**Credits: Audit Course**

**Course Objectives:**

1. To develop competency in computer software for design and drafting of mechanical component.  
2. To give hands on experience on CAD software.  
3. To develop basic knowledge and experience of engineering modeling concept.

**Course Outcomes:**

1. Able to use basic computer software related with drafting and design.  
2. Able to develop computer models of mechanical engineering components

**List of Practicals:**

A group of students (not more than 9 students in a group) should design mechanical components of some system or assembly, using any one of the design software. Students should submit brief report on the work.

1. Importance of Computer Aided Software.
2. Design any mechanical component by using available CAD software package.

**Delivery Methods:**

- Class room Teaching
- Power point Presentation
- Experimentation & Component Design

**MBL 102 : GENERAL PROFICIENCY II : German/ French/ Spanish Language**

**Course Objective:**

To help students in improving their interpersonal skills with global standards. The students will have easier access to valuable literature, so that language will not be a barrier for them. They will be in a position to interact at international Fora. They may develop liking for foreign languages, which will be also helpful for them in shaping their carrier at international level.

**Course Outcome:**

1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums

**MBL102 : GENERAL PROFICIENCY-II : GERMAN/ FRENCH / SPANISH LANGUAGES**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning Goals</th>
<th>Activities</th>
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<tr>
<th>The Alphabets and accents</th>
<th>Pronunciations techniques</th>
<th>Worksheet and charts</th>
<th>French / German / Spanish / German / Spanish文化 – Culture – Cuisine – Monument – Delicacies – Wine vis-à-vis Indian culture</th>
<th>Diwali Festival</th>
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<tbody>
<tr>
<td>Number 1 to 20</td>
<td>Greetings &amp; Salutations</td>
<td>Articles, Personal Pronoun, Day timing, Daily routines, forms of respects, Vocabular</td>
<td>Receiving Guests, Traditions, Activities, Role play, Entertainment, Manners, Greetings of people / welcome &amp; Good Bye's</td>
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<td>Family and relations</td>
<td>Shapes and colors, Possessive Pronouns, Gender, Negative sentence, Relations, Day of week, Forms of respect, Vocabulary</td>
<td>Group Activities, Paragraph writing, including, Names of months, Seasons, Sky, Stars</td>
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<tr>
<td>Weather and Seasons</td>
<td>Climate, Fabrics, Clothes, sizes, interrogatives, Basic verbs</td>
<td>Group Activities, Paragraph writing, including, Names of months, Seasons, Sky, Stars</td>
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<tr>
<td>House &amp; Household things</td>
<td>Describing neighborhood, Present Tense</td>
<td>Furniture, Household articles, Colors</td>
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<td>Visit to supermarket</td>
<td>Learning the shopping etiquettes, vocabulary of food items, conversing with shopkeepers etc., Plurals</td>
<td>Project on vocabulary of vegetables and fruits, Bakery products, Group Activity / Role play</td>
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<tr>
<td>Timing Telephonic Conversion</td>
<td>How to Ask time, converse on telephone</td>
<td>Timing and clock (Hours &amp; Minutes)</td>
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<tr>
<td>Visit to city</td>
<td>Nature, Directions, Means of transportation, Tenses, contd.</td>
<td>Self introductions, Role-play, preparing charts</td>
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<tr>
<td>In Restaurant / Hotel</td>
<td>Ordering eatables, Table manners, Verbs</td>
<td>Enhancing vocabulary of food Dishes, cutlery</td>
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<tr>
<td>Visit to Doctor</td>
<td>Health matters, illness, Commonly used verbs, contd.</td>
<td>Worksheets, projects</td>
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Delivery Methods:

- Class room Teaching
- Power point Presentatio
- Use of Audio visual.aid.
IV SEMESTER
BAML207 APPLIED MATHEMATICS-IV (3-1-0-4)
Total Hrs.42

Pee-requisite:
1. BAML 101 Applied Mathematics-I
2. BAML110 Applied Mathematics-II
3. BAML203 Applied Mathematics-III

Course Objectives:
1. To get familiar with mathematical object
2. To get familiar with important mathematical models used in own engineering branch
3. Learn to manipulate the relevant mathematical objects with paper and pencil with mathematical software
4. Teaching of basic numeracy skills to all pupils
5. The teaching of selected areas of mathematics such as calculus as an example of intellectual achievements of modern world

Advance topic on the subject

Course Outcome: Students shall be able to
1. Apply numerical methods to solve algebraic, simultaneous equations for approximating solutions in the field of mechanical engineering.
2. Use numerical methods to solve ordinary differential equations for approximating solutions in the field of engineering.
3. Use concept of calculus of variation to solve Mechanical engineering problems.
4. Apply the concept of random variables in engineering field.
5. Use spatial probability distribution in solving engineering problems.
6. To introduce the basic methods of optimization in engineering.

Unit I Numerical methods (CO1) [7Hrs]

Unit II Numerical method (CO2) [7Hrs]
Eigen values & eigen vector by iteration method, Jacobi method, Givens method & Householder’s method, solution of ordinary differential equations by Taylor’s series method, Runge-Kutta fourth order method, Modified Euler method, Milne’s predictor corrector method.

Unit III Calculus of Variation (CO3) [6Hrs]
Functional, extremals of functions, Variational principle, Euler’s equation, constrained extremals, Hamilton principle & Lagrange’s equation in solid mechanics.

Unit IV Random Variables (CO4) [7Hrs]
Random Variables, Distribution functions of continuous & discrete random variables, Joint distributions, mathematical expectations, moment, Moment generating function & characteristic function.

Unit V Special probability distribution (CO5) [7Hrs]
Geometric, Binomial, Poisson’s, normal, Exponential, Uniform, Weibul provability distribution. Random process, ensemble average & temporal anerage, Auto correlation & rosscorrelation, stationary random process, power spectrum stationary process & ergodic random process.

Unit VI Introduction to optimization techniques (CO6) [8Hrs]
Linear programming, mathematical model formulation, Solutions by Graphical & Simplex method.

Advance topic on the subject

Text Books:

Reference Books.
2. Chandrika Prasad, ‘Mathematics for engineers’
3. Chandrika Prasad, ‘Advanced mathematics for engineers’
5. Forrey, ‘Calculus of Variations’

BMEL 207 MECHANICS OF MATERIALS
(3-1-0-4) Total Hrs.42

Pee-requisite: Nil

Course Objectives
1. To teach the fundamentals of simple stresses and strains.
2. To enhance skills in Principal stresses and strains.
3. To imbibe concept of shear force and bending moment with practical exposure and applications.
4. To facilitate the concept of bending and its theoretical analysis.
5. To learn torsion of shaft
6. To study strain energy and impact loading conditions for various applications.
7. To learn and apply statistical methods in determining various factors.
Course Out Comes:
Upon successful completion of the course, the students will be able to:
1. CO1. Understand the concepts of various stresses and strains and their relative effects in context with engineering applications.
2. CO2. Effectively use the concepts of shear force and bending moment diagrams in various designs of machine elements.
3. CO3. Estimate the slope and deflection of beams.
4. CO4. Resolve the stresses induced in shafts and failure criteria of columns & struts.
5. CO5. Determine the strain energy in a body subjected to various types of loading.
6. CO6. Apply various theories of failure in designing a machine parts by considering factor of safety.

Unit I (CO1) [8 Hrs.]
Concept of simple stresses and strains: Introduction, stress, strain, types of stresses, stress – strain diagram for brittle and ductile material, elastic limit, Hooks law, modulus of elasticity. Modulus of rigidity, factor of safety, analysis of tapered rod, analysis of composite section, thermal stress and strain, thermal stresses with heat flow in cylinders and plates, Hertz’s contact stresses Longitudinal strain and stress, lateral stresses and strains, Poisson’s ration, volumetric stresses and strain with uni-axial, bi-axial and tri-axial loading, bulk modulus, relation between Young’s modulus and modulus or rigidity, Poisson’s ratio and bulk modulus.
Principal stresses and strains: Definition of principal planes and principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stresses in one plane in mutually perpendicular two planes, when member is subjected to shear stress and direct stresses in two mutually perpendicular planes, Mohr’s circle for representation of stresses. Derivation of maximum and minimum principal stresses and maximum shear stresses when the member is subjected to different types of stresses simultaneously (i.e. combined stress)

Unit II (CO2) [8 Hrs.]
Shear force and bending moment: Types of beam (cantilever beam, simply supported beam, overhung beam etc.). Types of loads (Concentrated and UDL), shear force and bending moment diagrams for different types of beams subjected to different types of loads, sign conventions for bending moment and shear force, shear force and bending moment diagrams for beams subjected to couple. Relation between load, shear force and bending moment. Stresses in beams: Pure bending, theory of simple bending with assumptions and expressions for bending stress, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections. Shear stresses in beams: Concept, derivation of share stress distribution formula, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress.

Unit III (CO3) [7 Hrs.]
Deflection of beams: Derivation of differential equation of elastic curve with the assumptions made in it. Deflection and slope of cantilever, simply supported, overhung beams subjected to concentrated load UDL, Relation between slope, deflection and radius curvature Macaulay’s method, area moment method to determine deflection of beam.

Unit IV (CO4) [8 Hrs.]
Torsion of circular shafts: Derivation of torsion equation with the assumptions made in it. Torsional shear stress induced in the shaft, when it is subjected to torque. Strength and rigidity criteria for design of shaft. Torque transmitted by solid and hollow circular shaft. Derivation of maximum, minimum principal stresses and maximum shear stress induced in shaft when it is subjected to bending moment, torque and axial load.
Columns and Struts: Failure of long and short column, slenderness ratio, assumptions made in Euler’s column theory, end conditions for column. Expression for crippling load for various end conditions of column. Effective length of column, limitations of Euler’s formula, Rankine formula, Johnson’s parabolic formula.

Unit V (CO5) [5 Hrs.]
Strain energy and impact loading: Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads and impact loads. Strain energy stored in bending and torsion, Castigliano’s theorem.

Unit VI (CO6) [6 Hrs.]

Advance topic on the subject

Tutorials
1. Two problems on principle stresses
2. Two problems on Mohr’s circle
3. Two problems on Thermal stresses with heat flow
4. Three problems on S.F. & B.M. diagrams
5. Two problems on Stresses in beam bending
6. Two problems on shear stresses
7. Two Problems on Macaulay’s methods
8. Two problems on area moment method
9. Two problems on shafts
10. Two problems on columns and struts
11. Two problems on compound loading
12. Two problems on fatigue and variable loads.

**Text Books:**

**Reference Books:**

**BMEL208 MANUFACTURING PROCESS I**

(3-0-2-4) Total Hrs. 42

**Pee-requisite:** Nil

**Course Objectives**
1. To develop an insight into metal cutting principles
2. To provide details of the construction of conventional metal cutting machine tools
3. To provide details of manufacturing operations for gears and super finishing processes
4. To enable drawing detail specifications of machine tool for drilling, grinding, milling etc.
5. To select machining parameters for optimum utilization of resources and time for high productivity and dimensional accuracy

**Course Out Comes:**

Upon successful completion of the course, students will be able to
1. CO1. Select tool based on the material and desirable properties
2. CO2. Operate and perform different operations on Lathe machine
3. CO3. Perform milling operations
4. CO4. Select grinding material and machine as regards to applications
5. CO5. Work with drilling, reaming and boring machine for different operations
6. CO6. Apply suitable super finishing process like lapping, honing, buffing, etc and exhibit the knowledge of advances in machining.

**Unit I (CO1)** [5Hrs.]
Introduction to Machining Parameters:
Introduction to machining, tool materials and their properties nomenclature and tools geometry of single point cutting tool, classification, HSS, carbide tool, coated tools, diamond coated tool, coolant materials.

**Unit II (CO2)** [8 Hrs.]
Lathe: Introduction, type, construction of simple lathe, mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed, feed and depth of cut, time estimation for turning operations such as facing, step turning, taper turning, threading, knurling.

**Unit III (CO3)** [8 Hrs.]
Milling: Introduction, specifications, types, column and knee type milling machine, fixed bed type milling machines, production milling machines, special purpose milling machines such as thread milling machines, profile milling machine, Gear Milling / Hobbing machines. Mechanisms and Attachments for Milling. Cutting parameters, Types of milling operations, Types of milling cutters, Tool geometry and their specifications.

**Unit IV (CO4)** [8 Hrs.]
Grinding operations, grinding wheel, specifications and selection, cylindrical and centreless grinding operation, surface grinding, tool and cutter grinding, time estimation for grinding operations.

**Unit V (CO5)** [7 Hrs.]
Reaming: Introduction, description of reamers, type of reaming operations.
Boring: Introduction, types of boring machine, horizontal boring machine, vertical boring machine, jigsaw boring machine, micro boring, boring operations.

**Unit VI (CO6)** [6Hrs.]
Broaching: Introduction, type of broaches, nomenclature of broaches and type of broaching machines. Introduction to advance machining processes.

**Advance topic**

**Text Book:**
Reference Books

1. Manufacturing Technology (Metal Cutting and Machine Tools) – P.N. Rao
2. Manufacturing science – Ghosh and Malik
3. Workshop Technology (Volume – II) – By Hajra Choudhary
5. Technology of machine Tools – Krar and Oswald
6. Manufacturing Processes – M Begman
7. Processes and Materials of Manufacture – R. Lindberg
8. Production Technology – HMT
9. Workshop Technology (Volume I & II) – By Bawa

BMEP208 MANUFACTURING PROCESS I
Evaluation scheme: Practical [2P]
Total Hours: Practical
1. Study of single point cutting tool
2. Tools for left hand and right hand turning
3. Tools for external and internal turning (Boring)
4. Study of cutting tool manual (any one)
5. Study of mechanisms in Lathe
6. Study of mechanism in drilling
7. Study of grinding operations
8. Study of mechanism in milling
9. Practical on turning involving facing, step turning, taper turning, boring, boring with internal steps and taper, drilling (on lathe), internal and external threading
10. Practical on grinding
11. Practical on Milling machine – Gear Milling
12. Practical on use of drilling machines.
13. Open ended Practicals.

BMEL 301 DYNAMICS OF MACHINES (3-0-2-4)
Total Hrs.42

Pee-requisite: 1. BMEL204 Kinematics of Machine

Course Objectives:
1. To make the students conversant with force analysis
2. To understand gyroscopic principle and its effects in various applications.
3. To develop competency in graphical and analytical methods in solving problems in rotating and reciprocating machineries.
4. To make the students conversant with basic concepts of vibrations, it's effects and measurement.

Course Out Comes:
Upon successful completion of the course, students will be able to:
1. To apply the requirement of static and dynamics force analysis.
2. To detect and solve the problems related to flywheel and energy storage
3. To identify and solve problems of rotating machinery and balancing of machinery.
4. To develop an appropriate knowledge of force analysis to handle various mechanical problems, found in reciprocating machinery.
5. To select advanced computing techniques and tools in the area of longitudinal and transverse vibrations.
6. To apply the knowledge of trosional vibration for industrial equipments and rotary machines in real situation.

Unit I:CO-1 [6 Hrs]
Static Force and Dynamic Force Analysis Static force Analysis in linkages, Superposition Method, FBD. Equilibrium of four force members, Principal of Virtual Work, D'Alembert's Principal, Dynamic Analysis of Four Link Mechanism, Engine Force Analysis, Dynamically Equivalent System. Computer aided mechanism design

Unit II:CO-2 [8 Hrs]

Unit III :CO-3 [8 Hrs]
Balancing of Rotary Masses and Governors Static and Dynamic balancing of Rotary masses, Balancing of several masses rotating in different planes. Centrifugal and Inertia Governors.

Unit IV:CO-4 [8 Hrs]
Balancing of Reciprocating masses Partial balancing of locomotive, balancing of primary and secondary forces of Multicylinder In-Line Engine.Crankshaft and associated components, gas forces and inertia forces on crankshaft.

Unit V:CO-5 [8 Hrs]
Longitudinal and Transverse Vibration
Free Vibration, Critical or whirling speed of shaft, free and forced damped vibration, vibration isolation and transmissibility, Vibrational Measurement techniques

Unit VI: CO-6
Torsional Vibration
Free Torsional Vibration, mode shape, Single, Two and Three rotor system, Torsionally equivalent shaft, geared system

Text Books

Reference Books
2. Theory of Machines by V.P. Singh ,Danpat Rai publication Third edition, 2012

List of Practical:
1. Determination of gyroscopic couple and sense of direction
2. Determination of jump of cam-follower
3. Dynamic balancing of rotating mass system
4. Dynamic balancing of reciprocating mechanism
5. To determine whirling speed of shaft
6. To determine the time period of a simple pendulum
7. To determine the radius of gyration “k” of a given pendulum
8. To determine the radius of gyration “k” of a given shaft using Bi-filler suspension
9. To determine the frequency of longitudinal vibration
10. To determine the time period and natural frequency of undamped free vibrations of equivalent mass system
11. To determine undamped frequency of forced vibration of equivalent mass system
12. To determine the natural frequency of vibration of single rotor system
13. To determine the natural frequency of vibration of two rotor system
14. To determine the damping coefficient of damped torsional vibration
15. To determine frequency of helical spring

BMEL302 Fluid Machinery(4-0-2-5)
Total Hrs.46

Course Objectives:
1. To learn and understand the momentum principle and its application to various fluid machineries.
2. To learn and understand the working principles of fluid machineries and to study their design aspects, performance characteristics.
3. To learn and understand the principles of model testing and its application to hydraulic pumps and turbines.

Course Outcomes

CO 1: Students shall be able to apply impulse-momentum principle, draw velocity polygon diagram for a particular case of jet impingement over vane.

CO 2: Students shall be able to explain basic concepts of hydraulic turbines and shall be able to apply relevant laws and principles for the design the hydraulic turbines.

CO 3: Students shall be able to apply the fundamentals of similarity laws, model testing to the hydraulic turbines and pumps.

CO 4: Students shall be able to explain mechanism of energy transfer in dynamic pumps and shall be able to apply relevant laws and principles for the design of dynamics pumps.

CO 5: Students shall be able to explain constructional details, mechanism of energy transfer in positive displacement pumps and shall be able to apply relevant laws and principles for the design of reciprocating pumps.

CO 6: Students shall be able to explain basic concepts, mechanism of operation of hydrostatic and hydrokinetic systems

Unit I (CO 1) [7Hrs.]
Momentum principle and its application
Impulse- momentum principle, Calculation of force exerted on fixed plate, moving flat plates & curved vanes, Calculation force exerted on series of moving vanes, velocity diagrams & their analysis.

Unit II (CO 2) [8Hrs.]
Impulse Turbines
Theory of impulse turbines, Principle, Constructional features, analysis and governing, Installation of Pelton turbine, design parameters, performance characteristics and their analysis, Specific speed, Cavitation in Pelton Turbine.
Unit III (CO 2, CO 3)  
**Reaction Turbines** [8 Hrs.]
Main components and constructional features of Kaplan and Francis turbines, Cavitation in water turbines, Governing mechanism, safety devices, Performance characteristics and their analysis, specific speed. Model Testing- application to hydraulic turbines.

Unit IV (CO3, CO 4)  
**Hydrodynamic Pumps** [8 Hrs.]
Centrifugal Pumps: Principles of operation, Classification, basic theory, types, construction, installation, characteristics and their analysis, Cavitations in pumps, Model Testing: application to hydrodynamic pumps Axial flow pump: - Basic theory, construction, operation, and characteristics

Unit V (CO 5)  
**Positive displacement pumps:** [8Hrs]
Reciprocating Pumps: Basic theory, types, construction, installation and characteristics. Classification, working principle, indicator diagram, Air vessels.
Rotary Positive Displacement Pumps: - Basic theory, types, and construction. Variable delivery pumps. Introduction to gear pumps, sliding vane pumps, Screw pumps.

Unit V I (CO 6)  
**Hydrostatic and Hydrokinetic systems** [8 hrs]
Hydrostatic systems, their function, components and application such as Hydraulic press, lift, crane and fluid drive for machine tools. Intensifier and accumulator.
Hydrokinetic systems: Fluid couplings and torque converter.
Water lifting devices.

**Advance Topic**

**Text Books :**
1. Daugherty and Fanzine, ‘Fluid Mechanics with Engineering Applications’
2. V.P. Vasandani, ‘Hydraulic Machines – Theory and Design’

**Reference Books:**

**BMEP302 Fluid Machinery**
**Evaluation scheme: Practical [2P]**
**Total Hours :**

**Practical**
(Minimum ten to be performed: six experiments and four study)

**List of Practicals:**
1. To verify Bernoulli’s theorem.
2. To determine the coefficient of discharge of Venturimeter.
3. To determine the coefficient of discharge of Orifice meter.
4. To verify the moment equation using the experiment set – up on Diffusion of submerged air jet.
5. To determine the type of flow by using Reynolds number.
7. Determination of performance characteristics of Pelton wheel.
10. Determination of performance characteristics of Reciprocating Pump.
11. Open ended practical.

**BMEP303 INDUSTRIAL SAFETY PRACTICES & WORK CULTURE (0-0-2-Audit course)**

**Course Objectives**
1. To enable understanding of the importance of industrial safety
2. To develop personal habits and work culture aimed at minimizing hazards, accidents and waste

**Course Outcome:**
At the end of the course the student shall be able to:
1. follow industrial safety practices and rules.
2. follow the work culture in industry

**Practical per Week:** 2 Hrs.

**Credits: Audit Course**
It is expected to visit the nearby industry and study the industrial safety practices and work culture.
Students are required to submit the brief report on the safety practices and work culture in the industry.

**MBL103: GENERAL PROFICIENCY-III**

**Hobby classes**

**Course Objective**: To identify one’s special capabilities in activities like sports, drama, singing etc. Through this activities the students will grow in a broader sense. Options like Pranayam, Trekking, Guitar, synthesizer dancing, English drama, sketching, kathak, photography, professional ethics, horse riding, volleyball etc are offered

**Course Outcome**: 1. Able to follow industrial safety practices and rules.
2. Able to follow the work culture in industry

**Details of Course**
V SEMESTER

BMEL 304 MACHINE DESIGN – I (3-1-0-4)

Total Hrs. 42

Pee-requisite:
1. BMEL207 Mechanics of Material

Course Objectives:
1. To make students conversant with fundamental aspect of design.
2. To develop competency in designing various components of various joints.
3. To develop competency in designing a system involving the various component, as a design project in practical.
4. To develop analytical skills in designing various drives.
5. To make students conversant with tools for designing pressure vessel.
6. To give exposure of designing of transmission shafts.

Course Out Comes: Upon successful completion of the course, students will be able to:
1. Apply basic concepts of design, selection of materials in the design of a project.
2. Design the joints for various components.
3. Apply the design principles of power screw, helical & leaf spring in the design of suspension system.
4. Apply the design principles of clutches and brakes for various applications.
5. Apply the design principles of pressure vessel in various industrial applications.
6. Design the shafts for various power transmission systems.

UNIT I (CO1) : (5 Hrs.)
Definition of design, types of design, design process, need, defining the problem, feasibility, preliminary, design alternatives, final design selection, preliminary and final plans & drawings.
Failure criterion and manufacturing considerations in design, basis of good design, failure of machine parts, deformations, wear, corrosion, manufacturing methods, machining, cost design consideration in casting and forging.
Mechanical Properties, applications and designations as per ISI and their equivalence with other standards of engineering materials, selection of materials, temperature effects on properties of materials such as cast iron, plane carbon steel, alloy steels, aluminum and copper alloys, cast steel, plastics, polymers and composites and their applications.

UNIT II (CO2) : (8Hrs.)
Design of Cotter and Knuckle Joint, shrink and press fit joints.

Riveted Joint: Riveted joint for boilers, structural works (Uniform Strength Joint), and eccentric loaded riveted Joint.
Welded Joint: Design of single transverse, double transverse, parallel fillet, combination fillet butt joint, eccentrically loaded welded joints.
Bolted Joint: Design of bolted fasteners, bolts of uniform strength, bolted joints under eccentric loading design of lever: hand lever, foot lever, and bell crank lever.

UNIT III (CO3) : (6Hrs.)
Design of Power Screw, Derivation of expression for deflection and shear stress in helical spring, Design of helical spring, Design of leaf spring.

UNIT IV (CO4): (8Hrs.)
Kinematics of Friction Drives such as brakes clutch. Design of friction clutch: single plate, multiple plate, cone, and centrifugal clutch. Design of brake: shoe brake, band brake, and internal expanding brake.

UNIT V (CO5): (7 Hrs.)
Classification of thin and thick cylindrical pressure vessel, stresses in thin and thick cylindrical pressure vessels. ASME code of pressure vessel and piping, When It Is subjected to internal pressure, Expression for circumferential and longitudinal stresses, design of pressure vessel, heads and cover Plate.

UNIT VI (CO6): (8Hrs.)
Design of transmission shafts on the basis of strength, rigidity and critical speed, ASME code for shaft design, design of stepped shaft, axle, splined shaft, keys.

Advanced topic in the subject

Text Books:

Reference Books:
BMEL 209 COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING (3-0-2-4)

Total Hrs. 45

Pree-requisite:
1. BITL104 Basic of computing

Course Objectives:
1. To teach the fundamentals of algorithms.
2. To develop theoretical foundations and appropriate use of data structures.
3. To enhance skills in statistical techniques in DBMS and to understand database management and their models.
4. To provide hands on experience on various models of data and their operators.
5. To inculcate knowledge of constraints and design.

Advanced topic in the subject

Course Outcomes:
Upon the successful completion of the course students will be able to
1. CO1. Prepare algorithms, C-program and their flowcharts.
2. CO2. Apply use vector sorting & searching techniques over linear data structure.
3. CO3. To apply The basics of trees, general trees and their searching techniques over non-linear data structures.
4. CO3. To apply Data base management system & their models in real time problems with help of SQL.
5. CO4. To handle various models of data and their operators along with integrity constraints.
6. CO5. To make use of object modeling – basics of oops, with relation to modeling of objects

Unit I (CO1) (8 Hrs)
Introduction to algorithm, expressing algorithm, narrative description, flowchart, an algorithm language, data, data types and primitive operations. variables and expressions from algorithm to program, decision structures, sub algorithms.

Unit II (CO2) (7 Hrs)
Composite data structures, arrays and vector sorting algorithms. 1-2 dimensions.

Unit III (CO3) (7 Hrs)
Linear data structures, linked list, stacks, queues, recursion non-linear data structures, trees, general trees and their searching techniques

UNIT IV (CO4) (8 Hrs)
An introduction to DBMS: data and database systems concepts and meaning. disadvantages of file systems advantages of database approach disadvantages of using DBMS, database languages, database administrator & user, system structure. computer network networking, topologies, protocols, network model, internet & E-commerce B – B.

UNIT V (CO5) (7 Hrs)
Entity relationship model entities and entity sets, relationship and relationship sets, mapping constraints, keys, entity relationship diagram, reducing E-R diagrams to table, generalization, aggregation, design of an E-R database scheme.

UNIT – VI (CO6) (8 Hrs)
relational database & SQL: structure of relational database, relational algebra, basic structure of SQL, set operations, aggregate, functions, nested sub queries, derives relations.

Text Books:

Reference Books:

8. R. L. Kruse, Bruce P. Leung and Clovis L. Tondo

Tutorials
Programming in C/C++/SQL or any other suitable package based on above syllabus.
BMEP 209 COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING

Evaluation Scheme: Practical [2P]
1. Algorithm and Program Development Programs are expected in any suitable language preferably C.
2. Programming using simple numerical computation, simple, compound & nested if-else statements
3. Programming using simple & nested looping (for, while loops)
4. Programming using Arrays
5. Programming using Sorting Techniques, Searching Techniques
6. Use of SQL for creation and modification of table.
7. Use of SQL for creation of table with constraints.
8. Use of SQL for insertion of data in the table.
9. Use of SQL single table retrieval.
10. Use of SQL having & group by clause.
11. Use of SQL joins and correlations.
12. Use of SQL set functions, concatenation.
13. Use of SQL nested queries.
14. Study of indexing and hashing.
15. Study of various network topologies.

BMEL 305 MECHANICAL MEASUREMENTS (4-0-2-5) Total Hrs. 48

Pee-requisite: Nil

Course Objectives:
1. To understand the basic concept of measurement system and functional elements of measurement system
2. To understand the performance characteristics of measuring instruments
3. To understand various measuring instruments for strain measurement, pressure measurements,
4. To understand the data acquisition system and its application

Course Outcomes:
Student should be able to

CO1 Students learn to understand the working of measuring instrument.
CO2 Develop skill to select proper measuring instruments.
CO3 Learn to use of measuring instruments.
CO4 Learn use measuring instruments for force, torque and shaft power measurement.
CO5 Learn to use measuring instruments for temperature measurement.
CO6 Learn to use measuring instruments for speed, vibration, liquid level and humidity measurement.

Unit I (CO 1) Generalized Measurement system: (9 Hrs)
1. Significance of measurement, generalized systems, application of measuring instruments, Types of measuring instruments.
2. General configuration and functional elements of measuring instruments, types of inputs, various methods of correction for interfering and modifying inputs

Unit II (CO 1, CO 2) General performance Characteristics: (8Hrs)
1. Static characteristics, different types of errors, combination of component errors in overall systems.
2. Dynamic characteristics: General mathematical model of zero order, first order and second order instruments, response of first and second order instruments to following inputs step, ramp, impulse and frequency.

Unit III (CO 1, CO 2,CO 3) Strain Measurement & Pressure Measurement: ( 8Hrs)

Strain Measurement :-
Types of strain gauges, strain gauge circuits, calibration, Temperature compensation, use of strain gauges on rotating shafts, selection and installation of strain gauges.

Pressure Measurements :-
Basic methods of pressure measurement, dead weight gauges and manometers, elastic transducers and force balance transducers, strain gauge pressure cell, High pressure measurement Bridgeman type, low pressure Measurement - Mcleod, Krudsen, ionization, Thermal conductivity gauges.

Force measurement :-
Force measurement using transducer (pneumatic and hydraulic load cells, strain gauge load cells, piezoelectric load cells), torque measurement on rotating shaft, electrical type dynamometer

Motion measurements – Measurements of displacement, velocity & accelerate strain gauges, LVDT, capacitive, photoelectric & Inductive transducers, encoder.

Flow Measurements: Construction- Venturi, orifice, Dall tube, rotameter, Pressure probes- Pitot static tube, yaw tube anemometer, positive displacement flow meters, turbine meter, electromagnetic flow meter.

Unit V (CO 5) Temperature measurement: (8 Hrs)
Measurement of temperature using Liquid in glass thermometer, pressure thermometers, thermocouples, resistance thermometers, bimetallic thermometers, thermistors, radiation and optical pyrometer

Unit VI: (CO 6) Speed Measurements: (7 Hrs)

108
Various mechanical type tachometers, electrical type tachometers, stroboscope etc.

Other Measurements:
- Vibration Measurements, Humidity measurement, liquid level Measurements. Advance topic on the subject

Advanced Topic

Text Books:

Reference Books:

BMEP 305 MECHANICAL MEASUREMENTS
Evaluation Scheme: Practical [2P]

LIST PRACTICALS: - At least of eight practical from the following list.
1. Measurement of strain using strain gauges.
2. Calibration of pressure gauge with pressure gauge tester.
4. Performance of capacitance transducer as an angular displacement measuring device.
5. Performance of inductive Transducers.
6. Speed measurement by magnetic pick up.
7. Pressure measurement by strain gauge type transducer.
8. Vacuum measurement using McLeod gauge.
9. Temperature measurement. Using RTD, Thermistors
10. Open ended practicals

BMEL 306 MANUFACTURING PROCESS II (3-0-2-4) Total Hrs.42
Pree-requisite: 1. BMEL208 MANUFACTURING PROCESS I

Course Objectives:
1. To understand basic material properties for bulk material shaping
2. To provide basic principles of metal flow and design considerations for manufacturing sand casting
3. To provide details of different joining processes for large scale manufacturing
4. To enable understanding basic concept and principles of rolling forging and sheet metal working
5. To use state of the art newer technologies including powder metallurgy as well as plastic as widely accepted new age material for mass production

Advanced topics on the subject.

Course Out Comes:
Upon successful completion of the course, students will be able to
1. CO1. Apply basic knowledge related to foundry and casting design.
2. CO2. Design gating system and select appropriate casting method depending on the product to be manufactured.
3. CO3. Understand the basics of manufacturing processes such as forging, rolling, extrusion, wire drawing techniques.
4. CO4. Apply knowledge of Powder metallurgy and suggest composites materials as per the requirements.
5. CO5. Select appropriate joining processes in industries for joining different materials, understand defects and select inspection techniques
6. CO6. Understand applications and processing of plastics for developing different components.

Unit I (CO1) (8 Hrs.)
Casting process: Introduction, pattern making: types, materials used, pattern making allowances, colour codes core making: - types, core material and its properties. recent development in pattern making
Molding: types of sand moulds, molding sand composition, molding sand properties, molding machines.

Unit II (CO2) (8 Hrs.)
Gating design – elements of gating systems, pouring time, riser design melting furnaces – types, electric furnace, induction furnace, Cupola – construction and operation, cleaning, inspection and casting defects. recent trends in melting.
Foundry mechanism: special casting processes such as investment casting, centrifugal casting, shell molding, co molding, slush casting, die casting, automation in foundry operations.

Unit III (CO3) (7 Hrs.)
Forming processes, advantages and drawbacks, rolling, forging, extrusion, wire drawing, embossing, etc.

Unit IV (CO4) (6 Hrs.)
Powder metallurgy: powder manufacture and conditioning, production of sintered structural
components, self-lubricating bearing, cemented carbides, ceramics, sintered carbide cutting tools.

Unit V (CO5) (7 Hrs.)
Joining processes: introduction to welding, soldering, brazing processes, types of welding, arc welding and gas welding processes, defects and inspection of welding joints, electrodes, weldability of metals, welding equipment’s of fixtures.

Unit VI (CO6) (6 Hrs.)
Processing of plastics, thermoplastic, thermosetting plastics, general properties and applications of thermosetting and thermo plastics. General plastic processes: extrusion, injection moulding, compression moulding, transfer moulding blow moulding, calendaring.

Text Books:

Reference Books
2. M Begman, ‘Manufacturing Processes’

BMEL 306 MANUFACTURING PROCESS II
Evaluation Scheme: Practical [2P]

List of Practicals
1. Practical on Molding
2. Simulation Practical on Casting – I
3. Simulation Practical on Casting – II
4. Study of Mechanization in Foundry
5. Study in Sintering operation
6. Practical on Welding, Soldering & Brazing
7. Practical on Arc Welding
8. Practical on Gas Welding
9. Open ended practicals

BMEL-210 ENERGY CONVERSION – I (3-1-0-4) Total Hrs. 42

Pee-requisite:
1. BMEL205 Engineering Thermodynamics
2. BMEL 202 Fluid Power I

3. BMEL 302 Fluid Power II

Course Objectives:
1. To get awareness and importance of steam generation.
2. To familiarize with the latest developments in chimney draught system.
3. To study fluidized bed boiler and gradation and analysis of coal.
4. To study types of steam nozzle and working principle of steam turbine
5. To know energy losses in steam turbine
6. To study steam condensers and cooling towers

Course Outcomes:
Student should be able to
CO1 Apply principle of steam generation for various types of steam generators
CO 2 Use of chimney draught for thermal power plant
CO 3 Design fluidized bed boiler for steam generation
CO 4 Apply knowledge and principle of steam nozzles and steam turbines
CO 5 Calculate various losses in steam turbines
CO 6 Design steam condensers and cooling towers

Unit I (CO 1) Steam Generators: (8 Hrs)
Principles of Steam Generation, Classification Of Steam Generators, Fire Tube And Water Tube Steam Generators, High Pressure Steam Generators. Boiler Mountings and Accessories.

Unit II (CO 2) Chimney Draught: (6 Hrs)
Draught And Its Classification, Chimney Height, Chimney Diameter, Efficiency, condition For Maximum Discharge, Performance Of Steam Generators. Evaporation Capacity, Equivalent Evaporation, Boiler Efficiency.

Unit III (CO 3) A. Fluidized Bed Boilers:(7Hrs)

B. Steam Fuel For Steam Generator

Unit IV (CO 4) A. Steam Nozzles: (8 Hrs)

B. Steam Turbines:
Steam Turbines: Principles Of Working Of Steam Turbines, Classification Of Steam Turbines, Comparison Of Impulse And Reaction Turbines, Compounding Of Steam Turbines.

Unit V (CO 5) Energy Losses in Steam Turbines: (7 Hrs)
Energy Losses In Steam Turbines, Flow Of Steam Through Turbine Blades, Ideal And Actual Reheat Factors, Velocity Diagrams, Graphical And
Analytical Methods, Work Done, Thrust And Power, Dimensions And Proportioning Of the Blades, Steam Turbine Efficiencies, Condition For Maximum Efficiencies, Reheat And Regenerative Cycles, Governing Of Steam Turbines

**Unit VI (CO 6) Steam Condensers and Cooling Towers: (6 Hrs)**


**Text Books:**
1) Thermal Engineering by P.L. Ballaney
2) "Thermal Engineering" Mathur & Mehta, Dhanpatrai & Publications

**Reference Books:**

**BMEP 307 INDUSTRIAL CASE STUDY (0-0-2-2)**

**Course Objectives:**
1. To enable developing abilities of team work to find solution to real life problems in industry
2. To develop ability of systematically collecting data and it's analysis through brain storming
3. To develop ability of decision making based on systematic qualitative and quantitative data analysis techniques
4. To provide exposure to real life engineering problems and solve them in holistic manner

**Practical per Week:** 2 Hrs.

A report should be submitted. The report should consist of the problem/issue identified methodology of data collection, data collected, and method of analysis, result and conclusion. Minimum two presentations should be made.

**MBL104: GENERAL PROFICIENCY-IV (Advanced Communication Skill)**

**Course Objective:** To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking, one to one interaction and social ethics.

**Course Outcomes:**
1. Able to apply mechanical engineering subject knowledge in live problems.
2. Able to use analytical tool for solving the problems.
VI SEMESTER

ELECTIVE – I

BMEL307 POWER PLANT ENGINEERING
(3-0-0-3) Total Hrs: 42

Pree-requisite:
BMEL210 Energy Conversion-I

Course Objectives
1. To study the economics of power generation
2. To study various methods of power generation
3. To study performance of various power plants

Advance topic on the subject

Course Outcomes:
Student should be able to
1. CO1. Identify and understand the types, working and components of nuclear power plant.
2. CO2. Design and selection of site and equipments for hydroelectric plant
3. CO3. Understand working and operating the boiler, steam turbine and other components of thermal power plant
4. CO4. Design and development of gas turbine power plant
5. CO5. Select components and site for diesel, solar, tidal, wind and MHD power plant
6. CO6. Measure and improve various energy storage equipment and determine cost of energy under various operating conditions

Unit I (CO 1) [7 hrs]
Nuclear Power Generation
Nuclear Reactors: Types of reactors, PWR, BWR, CANDU, Gas cooled liquid metal cooled, Breeder reactor problems of operation, location of nuclear station, present & proposed nuclear plant in India.
Nuclear Waste Disposal: Effects of nuclear waste on environment, its disposal to soil, water, air, etc. Comparison with other power plants.

Unit II (CO 2) [6 hrs]
Hydroelectric Power Plant
Hydrology: Rainfall, Runoff, Hydrograph, flow duration curve, mass curve.
Hydroelectric power plant: Site selection, classification of hydroelectric power plant, general arrangement, details of different components prime movers, governing, model & model testing advantages, comparison with other power plant, Micro hydral turbines.

Unit III (CO 3) [7 hrs]
Steam Power Plant
Introduction: Coal – its properties, handling & storage, fuel firing methods, ash & dust handling, boiler accessories, high pressure boiler, draught system, steam turbine, condenser, cooling towers.
Water treatment, steam pipes, power plant layouts, pollution from steam power plant.

Unit IV (CO 4,CO5) [8 hrs]
Gas Turbine Power Plant
Introduction, selection of various components, different arrangement, comparison with other power plant. Diesel Electric Power Plant: Introduction, Outline, type of engines, different components, performance, plant layout comparison with other power plant.
Introduction to unconventional power sources – Solar, wind, Tidal, geothermal, MHD, Trigeneration.

Unit V (CO 6) [7 hrs]
Peak load plants, waste heat recovery system, various energy storage – systems like pumped hydro, compressed air, Flywheel, battery storage, thermal sensible & latent heat storage, chemical energy storage.
Automation & Instrumentation: Measurement of water purity, O2, CO2 measurement, gas analysis, smoke & dust measurement, moisture measurement, nuclear measurement.

Unit VI: (CO6) [7 hrs]
Fluctuating Load: Load curves, various terms & definition, effect of fluctuating load.
Economic Analysis: Tariffs, load division, and cost of electric energy.
Combined Operation: Need, division, combination of different plant & their coordination, advantages.

Advance topic on the subject

Text Book
1. Domkundwar ‘Power Plant Engineering’ Dhanpat Rai Publication, New Delhi

Reference Books
1. Vopal & Slortzki, ‘Power Plant Engineering’
2. P.K. Nag, ‘Power Plant Engineering’

ELECTIVE – I

BMEL308: DESIGN OF MECHANICAL DRIVES
(3-0-0-3)

ELECTIVE-I

Course Objectives:
1. To understand selection & design of belts & pulleys
2. To understand the analysis of gear train.
3. To make the student conversant with design of gear box, clutches & brakes

Course Outcomes:
1. Shall be able to develop competency in understanding selection & design of belt & pulley
2. Shall be able to understand torque transmitting capacity in gear trains which will be the prerequisite for gear box design.
3. Student shall be able to design of gear and estimating power.
4. Student shall be able to select appropriate procedure for design of Gear box
5. Students shall be able to select appropriate procedure for designing of gear box, clutches & brakes

Unit-I(CO1) DESIGN OF MECHNAICAL DRIVES FOR FLEXIBLE ELEMENTS
Selection of V belts and pulleys – Selection of Flat belts and pulleys – Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

Unit II (CO2) SPUR GEARS AND PARALLEL AXIS HELICAL GEARS
Gear Terminology-Speed ratios and number of teeth-Force analysis - Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.

Unit III (CO3) BEVEL, WORM AND CROSS HELICAL GEARS

Unit IV (CO4) DESIGN OF GEAR BOXES
Geometric progression - Standard step ratio - Ray diagram, kinematics layout - Design of sliding mesh gear box - Constant mesh gear box. – Design of multi speed gear box.

Unit V (CO5) DESIGN OF CAM, CLUTCHES AND BRAKES
Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-internal and external shoe brakes. Advance topic.

Text Books:
2. Mehta, N. K., Machine Tool Design

Reference Books:

BEML309 ARTIFICIAL INTELLIGENCE (3-0-0-3)
Total Hrs.42

Pee-requisite:
1. BITL 104 Basic of computing
2. BECL105 Basic electronics

Course Objectives
1. To understand the artificial Intelligence in the environment of mechanical engineering
2. To understand the Artificial intelligence first order logic and concepts in knowledge engineering
3. To provide exposure to information extraction and machine translation

Advance topic on the subject

Course Outcomes:
1. Describe the key components in the artificial intelligence (AI) field
2. Use mini max search and alpha-beta pruning techniques
3. Apply probability theorem, Bayesian network and key aspects of intelligent agents

UNIT I INTRODUCTION (CO1) (8Hrs)

UNIT II SEARCHING TECHNIQUES (CO2) (9Hrs)
Informed search and exploration – informed search strategies – heuristic function – local

UNIT III KNOWLEDGE REPRESENTATION (CO3) (10Hrs)
First order logic – representation revisited – syntax and semantics for first order logic – using first order logic – knowledge engineering in first order logic - inference in first order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - resolution - knowledge representation - ontological engineering - categories and objects – actions - simulation and events - mental events and mental objects

UNIT IV LEARNING (CO4) (8Hrs)

UNIT V APPLICATIONS (CO5) (7Hrs)

Advance topic on the subject

TextBook

References

For more details, visit www.annauniv.edu/academics/index.html/

ELECTIVE - I
BMELE 310 QUALITY AND RELIABILITY ENGINEERING
(3-0-0-3) Total Hrs.43
Pree-requisite: Nil

Course Objectives
1. To study the significance and meaning of quality.
2. To study different quality control tools i.e various charts.
3. To study various sampling techniques used in industries.
4. To study product life cycle in industries.

Course Outcomes: Student should able to
1. CO1. Implement principles of SQC.
2. CO2. Find out various variable quality parameters through control charts.
3. CO3. Find out various attribute quality parameters through control charts.
4. CO4. Apply sampling techniques.
5. CO5. Apply reliability techniques.

UNIT Introduction to Quality (CO 1) [7 Hrs]
Quality - the changing business condition. significance and meaning of quality, quality function, definition of SQC, benefits and limitation of SQC, brief discussion on quality of design, quality of manufacturing and quality assurance, quality cost.

UNIT II Process Control for Variables (CO2) [8Hrs]
Variation in process- factors – process capability – process capability studies and simple problems – Normality and Histogram ,theory of control chart- uses of control chart – control chart for variables – X chart, R chart, design of experiments ,Taguchi method, orthogonal arrays.

UNIT III Process Control For Attributes (CO3)[7 Hrs]
Control chart for attributes –control chart for proportion or fraction defectives – P chart and NP chart – control chart for defects – C and U charts, state of control and process out of control identification in charts.

UNIT IV Acceptance Sampling (CO4) [8Hrs]
Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling techniques – O.C. curves – producer’s risk and consumer’s risk. AQL, LTPD, AOQL concepts- standard sampling plans for AQL and LTPD- uses
of standard sampling plans.

UNIT V Life Testing - Reliability(CO5) [7 Hrs]
Life testing – objective – failure data analysis, mean failure rate, mean time to failure, mean time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems, maintainability and availability – simple problems, acceptance sampling based on reliability test – O.C Curves.

UNIT VI Quality and Reliability(CO6) [6 Hrs]

Advance topic on the subject

Note : Use of approved statistical table permitted in the examination

Text Books:

References:

UNIT I (CO1) :Introduction
Need & scope, concepts & terms used, SHM, method of representing vibration,Fourier series & harmonic analysis.

UNIT II (CO2) : Single DOF system
(a) Damped free vibrations, types of damping, logarithmic decrement, coulomb damping, and damping materials.
(b) Forced Vibrations: types of excitation, forced excitation, support excitation, excitation due to unbalance in machines, response due to above types of excitations,transmissibility, force transmissibility & motion transmissibility, vibration isolators,commercial isolation materials & shock mounts.

UNIT III (CO3) :Two DOF system: -
(a) Free un-damped vibrations – principal modes and natural frequencies, coordinate coupling and principal co-ordinates.
(b) Forced Vibrations (undamped) – harmonic excitation, vibration, dampers & absorbers, dynamic vibration absorber – tuned & untuned type

UNIT IV (CO4): Multi DOF systems
Close couple systems, far coupled systems, orthogonality of mode shapes, modal analysis, forced vibration
UNIT V (CO5): Rotor Dynamics
Single mass system - torsional vibration in rotary machinery, two mass system, multimass system, balancing of rotor, dynamic behavior of rotor, gyroscopic effects.

UNIT VI (CO6): Conditioning Monitoring
Vibration instrumentation - displacement, velocity, acceleration, shock measurement, transducer, terminal devices spectrum analyzer, exciter, special mounting techniques signature analyzer, concept of signature and prediction of trouble by signature monitoring
Vibration Measurements - vibration pickups, accelerometers; inductance and capacitance type pickups, piezoelectric pickups; exciters, vibration meter, FFT analyzer, fault detection based on vibration.

Text Book:-

Reference Books’

ELECTIVE-I
BMEL 312 ADVANCE I. C. ENGINES (3-0-0-3)
Total Hrs. 42
Pree-requisite:
1. BMEL205 Engineering Thermodynamics
2. BMEL 210 Energy Conversion-I

Course Objectives
1. Identify the unique vocabulary associated with Engines through the precise definition of basic concepts to form a sound foundation for the development of the scientific principles to follow and to prevent possible misunderstandings.
2. To explain the principles of operation, the different classifications, and the measurements and performance standards of an internal combustion engine.
3. To introduce Combustion phenomenon in I.C Engines
4. Making awareness about exhaust emissions, their controlling methods and environmental hazards

Advance topic on the subject
Course Out Comes:
Upon the successful completion of the course, students will be able to
1. Select suitable operating cycle for I C Engine
2. Control combustion in I C Engines considering various parameter
3. Run engine in control laboratory environment for various operating characteristics of different engines
4. Design engine parameter like carburetor, air fuel ratio, fuel economy etc for better performance.
5. Adopt modern technologies to control various systems used in I C Engines.
6. Use alternate fuels to control pollution caused by conventional fuels.

UNIT-I (CO) [7 hrs]

UNIT-II (CO) [7 hrs]

UNIT-III (CO) [8 hrs]
Determination of IP, BP, FP, Mean effective pressure, Fuel consumption, Air Consumption, Engine efficiencies, Performance characteristics, Energy balance.

UNITIV (CO) [7 hrs]

UNITV (CO) [7 hrs]
Diesel Injection : Mechanical injection system, classification of injection system, fuel feed pump, injection pump, governors , Fuel nozzles, electronic injection system, electronic fuel injection system (EFI), multi point fuel injection, (MPFI), Electronic control system.

UNIT VI (CO) [6 hrs]
Air pollution due to I.C. Engines, Emissions, Euro norms, Emission control methods, Catalytic converters. EGR system, Diesel Particulate Filter,
effect of design and operating parameters on IC engine emission. Catalyst, Alternative fuels, Methanol, Ethanol, vegetable oils, biogas, comparison of their properties with diesel and petrol

Text Books:

Reference Books:
1. I.C Engine, V Ganesan , Tata McGraw publication

BMEL 318 Renewable Energy Sources (3-0-03)

Course Objectives:
1. To understand the importance of renewable energy in present energy crises.
2. To learn solar energy wind machine devices & their applications.
3. To understand biomass energy conversion techniques, fuel cell, MHD, geothermal, ocean wave energy & their applications.

Course Outcomes:
1. Shall be able to describe the challenges and problems of various conventional energy sources.
2. Shall be able to design and compare different solar collector systems and select most appropriate as per client objectives.
3. Shall be able to collect and organize wind data as a basis for further analysis and evaluation.
4. Shall be able to apply the concept and knowledge of how biomass, biogas, fuel cell and MHD power energy conversion takes place.
5. Shall be able to describe the concept of energy conversion system of ocean thermal and geothermal energy.
6. Shall be able to do economical analysis and calculate payback period of renewable energy system.

Unit I (CO 1) (8 Hrs)
Solar Energy: Energy Sources, conventional energy sources, prospects of Renewable & non-Renewable energy sources, Solar radiation & its measurement, calculation of incident angle, global radiations, solar day length and its prediction, flat plate collectors, focusing collectors.

Unit II (CO 2) (8 Hrs)

Unit III (CO 3) (8 Hrs)

Unit IV (CO 4) (7 Hrs)
Introduction, Biomass conversion Technology, biogas generation, biogas plant, materials used, site selection, fuel property of biogas, methods for obtaining biomass, gasification, Fuel Cell, design & principle of operation, classification, types, applications, MHD power generation, methods, MHD design problems, status, Thermo electrical power, Thermionic generation.

Unit V (CO 5) (7 Hrs)
Ocean Energy: Ocean currents and wave, ocean wave power, conversion of wave energy, pneumatic and oscillating wave converters. Tidal power: power developed, single basin and two basin power plants. Ocean thermal energy conversion systems: ocean temperature profile, OTE power plant development. Geothermal energy resources, power generation methods. Such as vapour dominated and water dominated systems.

Unit VI (CO 6) (5 Hrs)
Economical analysis of renewable energy system, problem on Economical analysis. Advance topic on the subject.

Text Book:
1. S.Rao and Dr. B.B.Parulekar ‘Energy Technology’
7. V.M.Domkundwar,’ Solar energy & Non-conventional Energy sources
MEP-313 ENERGY CONVERSION – II

Course Objectives:

1. To study various types of compressor.
2. To familiarize with the characteristics of rotary compressor.
3. To study internal combustion engines.
4. To know various testing methods of internal combustion engines.
5. To study applications of gas turbine and jet propulsions.
6. To study various refrigeration and air-conditioning methods.

Course Outcomes:

Student should be able to
1. Apply various concepts of reciprocation air compressor.
2. Use of Multistage compressor and rotary compressor.
3. Apply knowledge of internal combustion engines.
4. Know various testing methods of internal combustion engines.
5. Apply knowledge of gas turbine and jet propulsion for jet engines.
6. Use of various processes for refrigeration and air-conditioning.

Unit I (CO 1) Positive displacement Compressors: (7 Hrs)
Reciprocating compressors: Parts, Operations, Work done during isothermal, polytropic and adiabatic compression process, PV diagram, isothermal efficiency, Effect of clearance, volumetric efficiency, Mechanical efficiency, Multistage compressor, condition for minimum work input, capacity control, Actual indicator diagram.

Unit II (CO 2) Rotary Compressors: (7 Hrs)
Rotary and vanes blower and screw compressor: Principle, operation, parts, indicator diagram, work done, Rodts efficiency, vanes efficiency. (No analytical treatment expected)

Centrifugal Compressor:
Principle, operation, parts, velocity diagram, static & total head quantities, work done by impeller, isentropic efficiency of compressor, slip factor, pressure coefficient, power input factor.

Axial flow compressor:
Principle, operation, parts, velocity diagram, work done, Degree of reaction stage efficiency compressor characteristics, surgin& chocking. Poly tropic efficiency.

Unit III (CO 3) I.C. Engines: (7 Hrs)
Air standard & fuel air cycles, parts of I.C. Engines, working of I.C. Engines, Two stroke and four stroke I.C. Engines SI & CI Engines, Introduction to combustion in SI & CI Engine, carburetion and fuel injection. (Analytical treatment not expected)

Unit IV (CO 4) I.C. Engine Testing: (6 Hrs)
Measurement of power: Indicated, friction and brake power, measurement of speed, fuel land air consumption, calculation of indicated and brake thermal efficiency, volumetric efficiency, mechanical efficiency, percentage of excess air, Heat balance sheet, performance, characteristics and factors influencing the performance of I.C. Engines.

Unit V (CO 5) Gas Turbines and Jet propulsion: (6 Hrs)
Ideal cycles isentropic and small stage efficiency, application of gas turbine pressure losses, effect of inter-cooling, reheat and regeneration, fuel – air ratio, combustion efficiency performance calculation, open cycle and closed cycle gas turbine plants co-generations and combined power cycles. Principles and working of turbojet, turboprop, Ramjet and pulse jet simple turbojet cycle, Thrust power, propulsive power. Thermal efficiency propulsive efficiency, overall efficiency.

Unit VI (CO 6) Gas Turbines and Jet propulsion: (9 Hrs)
Refrigeration and Air-conditioning
Introduction, capacity of refrigerating unit, refrigeration methods, vapours refrigeration cycle, vapours compression refrigeration cycle, selection of refrigerant, vapour absorption cycle, Electrolux refrigerator, dry air, moist air and saturated air, specific humidity, reparative humidity

Reference Books:

Evaluation scheme: Practical [2P]
Total Hours:
Practicals:
1. Trial on reciprocating compressor
2. Trial on rotary compressor
3. Study of internal combustion engines
4. Performance testing of a single cylinder four stroke S.I. Engine
5. Study of Engine Cooling and lubrication systems
7. Study of Carburetors such as zenith, carter, soles, S.U. etc.
8. Study of Cogeneration GT Plant and Jet propulsion systems
10. Technical report on visit to thermal power plant
11. Trial on Vapour compression refrigeration cycle.
12. Trial on Air-Conditioning cycle
13. Trial on Desert cooler

BMEL314 MACHINE DESIGN – II (3-0-2-4)  
Total Hrs. 46

Pee-requisite:

1. BMEL304 Machine Design I

Course Objectives
1. To develop competency in designing couplings, flywheel.
2. To develop competency in designing bearings.
3. To develop statistical skills in designing various drives.
4. To make students conversant with tools for designing gear drive.
5. To give exposure to haulage system.

Advance topic on the subject

Course Out Comes:
Upon successful completion of the course, students will be able to:
1. Apply the basics of design of mechanical components like coupling and flywheel and their applications.
2. To select and design the appropriate bearing for real time application.
3. To select the different mechanical drives like, belt, rope, chain drive for the various uses.
4. To design the spur or helical gears in the manufacturing industries.
5. To design and select the worm and worm or bevel gear for various application.
6. To select the motors and haulage system for different applications.

UNIT I: CO-1  (7 Hrs.)
Coupling : types of shaft coupling, design of flange coupling, flexible bush coupling.
Flywheel : coefficient of fluctuation of energy and coefficient of fluctuation of speed, energy store in flywheel, stresses in flywheel, design of flywheel.

UNIT II: CO-2  (7 Hrs.)
Surface finish, friction wear, lubrication, oil seals, design of journal bearings for radial and thrust loads, selection of ball and roller bearing for radial and thrust loads, failures of antifriction bearing, design of hydrostatic pocket type thrust bearing such as circular step thrust bearing, bearing housing.

UNIT III: CO-3  (8Hrs.)
Flat belt drive : types of belts and belt material, analysis of belt tension, condition for transmitting maximum power, design of flat belt, flat belt pulley.
V belt drive : types of V-belt, analysis of V-belt tension, design of V belt pulley.
Roller change drive : velocity ratio and length of chain, design of chain, dimensions of tooth profile, sprocket.

UNIT IV: CO-4  (8Hrs.)
Review of kinematics of gears and terminology, interference, tooth profiles, formative number of teeth etc. Buckingham equation, design of spur gear drive, helical gear drive, hypoid gear, spiral gear

UNIT V: CO-5  (8Hrs.)
Worm gear drive : types and proportion of worm and worm gear, force analysis, beam strength of worm gear teeth, dynamic tooth load, wear load, thermal rating of worm gear, design of worm and worm gear.
Bevel gear drive ; types of bevel gear, proportions of bevel gear, force analysis of bevel gear drive design of bevel gear drive.

UNIT VI :CO-6  (8Hrs.)
Introduction to haulage system, design of wire rope, sheave and drums, electric motor rating, types of motor like AC, DC, their characteristics, controls, selection motors.

Text Books :

Reference Books :

**BMEP 314 MACHINE DESIGN – II**

**Evaluation scheme: Practical [2P]**
**Total Hours:**
**List of Practical:**
Numerical problem (at least 10 problems should be included in the journal)
1. Design of fly wheel
2. Design of coupling
3. Design of Journal Bearing
4. Design of Selection Antifriction bearing
5. Design of Belt drive
6. Design of chain drive
7. Design of wire rope
8. Design of Gear drive
10. Design of Camshaft.

Each student shall submit two assembly design report along with the drawing for assembly / sub assembly for any mechanical system consisting of not less than four members included in the syllabus.

**BMEL 315 HEAT TRANSFER (4-0-2-5)**
**Total Hrs.55**

**Pee-requisite:**
BMEL205 Engineering Thermodynamics

**Course Objectives**
1. To provide a general knowledge on the basic mechanisms of heat transfer
2. Make the right assumptions and approximations for tackling practical situations
3. To develop intellectual skills of providing analytical solutions to variety of real life situation involving heat transfer.
4. Exploring the advanced career opportunities in the area of heat transfer like design of heat exchangers, heat transfer augmentation methods, thermal analysis etc.

**Advance topic on the subject**

**Course Outcomes:**
At the end of this course, students shall be able to
1. Apply basic laws of heat transfer to solve steady state heat conduction problem.
2. Apply the steady state and transient conduction problems to real life problems.
3. Determine heat transfer coefficient of force convection and apply various empirical co-relation to solve a problem.
4. Evaluate heat transfer coefficient for natural coefficient.

5. Evaluate the performance of heat exchanger using LMTD and NTU method.
6. Ability to perform and analyse the system using laws of conduction, convection and radiation.

**UNIT I (CO 1, CO6)**
(10Hrs)

**UNIT II (CO 2, CO6)**
(9Hrs)

**UNIT III (CO 3, CO6)**
(9Hrs)

**UNIT IV (CO 4, CO6)**
(9Hrs)

**UNIT V (CO6)**
(9Hrs)

UNIT VI (CO5, CO6) (9Hrs)

Text Books:

Reference Books:

BMEP 315 HEAT TRANSFER
Evaluation scheme: Practical [2P]
Total Hours: Practical
1. Determination of thermal conductivity and total thermal resistance of composite wall.
2. Determination of thermal conductivity of metal rod.
3. Determination of emissivity of non – black surface.
4. Determination of thermal conductivity of an insulating material in powder form.
5. Determination of temperature distribution and heat transfer rate from a fin
   a. Under A) Free Convection B) Forced Convection Conditions
6. To determine heat transfer coefficient in agitated vessel & its comparison with Non agitated situation
7. To study temperature history of specimen with respect to time and its comparison with lumped capacitance theory.
8. To find out the heat flow rate & rate heat transfer coefficient of water for Shell & Tube Heat exchanger.
9. To find out temperature distribution heat transfer rate overall heat transfer coefficient effectiveness of parallel & counter flow heat exchanger.
10. To find out heat transfer rate overall heat transfer coefficient & effectiveness and cross flow heat exchanger.
11. To find out temperature distribution heat transfer coefficient & effectiveness of plate type heat exchanger.
12. To determine heat flow rate through lagged pipe & thermal conductivity of lagging material through lagged pipe.
13. Determine of forced convection heat transfer heat transfer coefficient for air over a surface.

BMEL316 INDUSTRIAL ENGINEERING (3-1-0-4) Total Hrs.42

Pee-requisite: Nil

Course Objectives
1. To understand various concepts in Industrial Engineering.
2. To understand basic concept of work study and method study.
3. To learn various work measurement techniques.
4. To study principles and characteristics of organisation.
5. To understand human factors consideration in system design.
6. To learn sales forecasting, production planning and control, inventory control.
7. To study the process of product design and development.

Advance topic on the subject

UNIT I: Introduction (CO 1) (7 Hrs)
Introduction to Industrial Engineering, concept of productivity, work study: Introduction & advantages of work study, work study procedure. Method Study: Introduction, objectives and scope of method study, method study procedure, various recording techniques: different types of charts & diagrams, fundamental hand motion, micro-motion study, cycle graph and crono cycle graph, principles of motion economy.

UNIT II: Work Measurement (CO2) (8 Hrs)
Work Measurement: work measurement techniques, time study equipment, number of
cycles to be timed, performance rating systems, allowances, computation of standard time, work sampling, synthetic data, pre-determined motion time analysis, Maynards operation sequence technique (MOST).

UNIT-III: Factory Organization: (CO 3) (6 Hrs) Principles of organization, importance and characteristics of organization, organization theories- classical organization theory, Neo-classical organization theory, Modern organization theory, types of organization - military or line organization, functional organization, line and staff organization.

UNIT: IV: Ergonomics: (CO4) (6 Hrs) Ergonomics: fundamentals applications of ergonomics in layout of equipment, design of seating display, design characteristics of control, fatigue, physiological and other causes of fatigue, environmental condition of fatigue. man-machine workplace system, human factors considerations in system design.

UNIT: V: Production Planning & Control (PPC) and Inventory Control: (CO5) (8 Hrs) PPC its objectives, functions, preplanning and planning, routing, estimating, scheduling-master schedule daily schedule, Gantt Chart, dispatching-centralized vs. decentralized, control, follow up and progress reporting. Functions, types of inventory, inventory control- importance & functions, inventory costs, factors affecting inventory control, various inventory control models, ABC analysis, lead time calculations. Sales forecasting: Introduction, objectives and importance of sales forecasting, methods of sales forecasting, collective opinion, method, Delphi technique, economic indicator method, regression analysis, moving average method, time series analysis.

UNIT VI: Various Concepts in Industrial Engineering: (CO6) (7 Hrs) - Wages and incentives: concept, types, plans, desirable characteristics; - Value Analysis: Definition, VA & VE, Job plan of VA, FAST diagram. - Supply chain Management: definition, concept objectives, applications, benefits some cases in Indian industries; - JIT: definition, concept, importance, misconception, relevance, applications, push-pull technique. - Introduction to TQM, ISO standard, environmental and TS business standards. - MRP: Introduction, objectives, factors, guidelines, techniques, elements of MRP system, mechanics of MRP-I & II Advance topic on the subject

Text Books:

Reference:

MBL 105- GENERAL PROFICIENCY- V: (2-0-0) Pee-requisite: Nil - GD (Group discussion) - PI (Personal Interview) - Technical report writing - CV (Curriculum Vitae)

Course Objectives: -To develop the technical presentation and report writing skills for better employability of students

Course Outcomes:
1. Write more accurate and effective technical reports.
2. Create favorable environment for better recruitment.
3. Perform better in group discussion and interview.

Syllabus to be approved by Board of Studies for Interdisciplinary Courses.

MBL 106- GENERAL PROFICIENCY- VI: (2-0-0) Pee-requisite: Nil - Research Methodology Workshop

Course Objectives: -
1. To orient the students for research in the area of their interest and introduce them the step wise procedure for carrying out the research.
2. To introduce various mathematical and simulation tools useful for research activity.
3. To introduce them the methods for safeguarding the intellectual property rights.

Course Outcomes:
Students shall be able to
1. Understand the need and importance of research.
2. Carry out research in a scientific manner.
3. Prepare research report and publish research findings on Research Methodology.

No Scheduled classes in time – table.

A 3 days workshop shall be conducted.
Syllabus to be approved by Board of Studies for Interdisciplinary Courses.

OPEN ELECTIVES
VII Semester
BMEL317 Self Study (2-0-0-2)
Pee-requisite: Nil

Course Objectives:
1. To learn latest topics related with mechanical engineering.
2. To develop written, oral communication

Student is required to study any one of the following, during industrial training:
1. National Programme on Technology Enhanced Learning (NPTEL), Video lecturers from IITs & IISc
2. Case study on the topic of interest related to mechanical engineering

The student shall prepare a report of the work. He / she is required to deliver the seminar after completion of training before the committee constituted for the purpose of evaluating the work, in the college.

Course Outcomes:
1. To develop ability to investigate a broadly defined problem, locate, search and select relevant data and the state of the art information concerning an emerging area of technological development in Mechanical Engineering.
2. To select and apply appropriate techniques, resources, and modern engineering and IT tools
3. To develop ability to communicate in written and oral forms by collating and presenting the topic using PPT and other aids.

BMEP405 Industry Internship
Pee-requisite: Nil

Course Objectives:
1. To familiarize students with the real life industry environment and practices.
2. To provide exposure on state of the art technologies.
3. To understand management principles and concepts of finance and project management

Course Outcome: -

4. Students will be able to learn various operational feasibility of small scale industries

Guidelines for the students:
- A group of students (maximum four) may identify an industry of good standing on their own, in consultation with the industry internship coordinator of department.
- Industry from Nagpur and around may be preferred as far as possible.
- The details of identified industry be intimated to industry internship coordinator in the enclosed format - I, well in advance as per the prescribed schedule.
- Every student or a group is required to take permission from the identified industry in the enclosed format II through department training coordinator, for forwarding to IIP cell.
- The industry internship schedule during suitable dates will be May to mid of Nov. (minimum of 6 months).
- Group is required to identify the person of the respective industry who will guide / monitor the industry internship; consent in this respect in writing is essential and is to be submitted to the coordinator in enclosed format II.
- All the formalities related to industry internship are to be completed before 1st May of every year.
- Exhaustive report of industry internship shall be prepared by the group of students and to be submitted after completion of training duly signed by industry guide/mentor. The industry mentor is to submit review of the student directly to Head of Mechanical Engineering department. The group shall present a seminar on the training using audio visual aids before the seminar committee constituted for the purpose of evaluating the seminar / quality of training. Seminar delivery will be followed by question answer.

Delivery Method
- Industrial Training

BMEP406 Major Project Phase I & Seminar
Pee-requisite: Nil

Guidelines for the students:
- A group of students (maximum four) shall select project topic as per the guidelines during industrial training.
- Project be identified, based on some products manufactured in the industry where they are undergoing industry internship or any other project. In both cases the guide must be consulted to finalize the major project phase I topic / area and title, and detailed synopsis shall be submitted to department project coordinator.
- The same group of students identified earlier for industry internship shall continue to work as a project group.
- Each student shall submit type written report of his work. Each project group has to give presentation, in the College immediately after completion of the training giving all the details of the respective project work completed during the training period.
- A committee shall evaluate the project work. External and internal evaluation will be of 75 marks each.
- After completion of project phase I, phase II shall be continued in VIII semester.

**Course Outcome:**

1. Learn how to do the literature survey on the normal topic along with the comparative study of various approaches studied under literature.
2. Study some products manufactured in the industry where the student is undergoing training and identifying of the problem project point of view.
3. Design of some mechanical system may also comprise of machines, thermal, hydraulic/pneumatic system.
4. Finalizing the project title, design, fabrication, experimental aspects.
VIII SEMESTER

BMEL 403 OPERATIONS RESEARCH & MANAGEMENT (3-1-0-4)  Total Hrs: 45
Pee-requisite:
1. BAML101 Applied Mathematics-I
2. BAML110 Applied Mathematics-II
3. BAML203 Applied Mathematics-III

Course Objectives:
1. To study importance of Operations Research.
2. To study how real life problems is represented and solved by mathematical model.
3. To study optimization techniques for Transportation & Assignment problems.
4. How to do project management.

Course Out Comes:
Upon successful completion of the course, students will be able to
1. CO1: Ability to apply Operation Research methodology to solve industrial problems.
2. CO2: Ability to convert the real world problem into a mathematical form and provide an optimum solution for implementation.
3. CO3: Ability to formulate the real world Assignment and Transportation Models and provide an optimum or feasible solution.
4. CO4: Able to apply the concept and knowledge of project management to achieve the project goals.
5. CO5: Able to build the network and analyze it for improvement in project or task.
6. CO6: Able to apply the inventory and simulation tools to investigate and control the uncertainty of resources.

UNIT I  (CO 1)  (7 Hrs)
Introduction
OR methodology, Definition of OR, Application of OR to engineering and Managerial problems, Features of OR models, Limitation of OR.

UNIT II  (CO 2)  (8 Hrs)
LINEAR Programming
Definition, mathematical formulation, standard form, solution space, solution – feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy. Graphical and simplex methods, Big M Method, formulation of Dual of LPP.

UNIT III  (CO3)  (7 Hrs)
Transportation & Assignment Problems

UNIT IV  (CO 4 (7 Hrs)
Project Management
Introduction Project Management, concept of Project Management & Its definition, classification of projects, project life cycle, project identification, project formulation, Project planning, Project organization, Project scheduling, tools & techniques of projects scheduling, project monitoring & control, project audit.

UNIT V  (CO 5)  (8 Hrs)
Project Planning
Project Management: Drawing of Network, CPM & PERT, Probability of completion of project, Cost analysis of project, Allocation & updating of Network.

UNIT IV  (CO 6)  (8 Hrs)
Inventory control & simulation

Text Books :

Reference Books :

BMEL 404 AUTOMATION IN PRODUCTION
(3-0-2-4)  Total Hrs: 46
Pee-requisite:
1. BMEL208 Manufacturing Process-I
2. BMEL306 Manufacturing Process-II

Course Objectives:
1. To introduce concept of fixed automation through design of transfer lines and automated handling systems
2. To introduce numerical control of machine tools, their construction as well as manual and automated part programming of components
3. To provide exposure to automated material handling and tool handling systems such as industrial robots, AGVs and AS/RS
4. To introduce FMS and group technology as modern systems of flexible manufacturing
5. To provide awareness of usage of computers in process planning and quality control

Advance topic on the subject

Course Out Comes:
Upon successful completion of the course, students will be able to
1. CO1. Understand the basics of industrial automation.
2. CO2. Work on part programming languages used in CNC.
3. CO3. Develop programs for simple robot applications.
4. CO4. Design automated storage and retrieval systems
5. CO5. Implement GT, CAPP and FMS concepts in manufacturing.
6. CO6. Use various quality inspection techniques including machine vision and CMM.

UNIT – I  (CO1)  (8Hrs)

UNIT – II  (CO2)  (8Hrs)
Numerical Control – Basic concepts, components of NC, types of NC Systems – point to point, straight cut and continuous path, applications and economics of NC CNC part programming: Manual part programming and APT programming Extensions of NC technology: Direct numerical control, Computer numerical control and Adaptive control.

UNIT – III  (CO3)  (8Hrs)

UNIT – IV  (CO4)  (7Hrs)

Carousel storage systems, quantitative analysis of AS/RS & Carousel.

UNIT – V  (CO5)  (8Hrs)
Flexible manufacturing system and Group technology
FMS – Components, Types of systems, FMS layout configuration computer functions, level of flexibility, data files system reports, FMS benefits GT - GT philosophy, part families, parts classification & coding, Optiz classification systems, production flow analysis, Machine cell design – composite part concept, types of cell design, best machine arrangement, benefits of GT

UNIT – VI  (CO6)  (7Hrs)
Computer Aided Process Planning and Computer Aided Quality Control
CAPP - Retrieval & generative CAPP systems, benefits of CAPP CAQC – Use of computers in QC, off line & online inspection, shop floor control, contact and non-contact inspection techniques, optical and non-optical inspection methods, prominently cover CMM, Machine vision.

Text Book :

Reference S Books:

BMEP 404 AUTOMATION IN PRODUCTION

Evaluation Scheme: Practical [2P]

PRACTICALS :
3. Practice Programming on APT
4. Performance, Simulation on CNC lathe (at least two Complex Geometric)
5. Performance, Simulation on CNC milling (at least two Complex Geometric)
7. A case example on Part Coding in Group Technology.
8. Study of CAQC in any organization.
10. Study of Flexible manufacturing system.

ELECTIVE-II

BMEL501 COMPUTER AIDED DESIGN (3-0-2-4)

Total Hrs: 46

Pee-requisite:

1. BITL104 Basic of computing

127
2. BMEL 201 Machine Design-I
3. BMEL304 Machine Design-II
4. BMEL314 Machine Design-III

Course Objectives:
1. To develop basic knowledge and experience of engineering modeling concepts.
2. To understand various transformations used in CAD.
3. To develop basic knowledge and experience of various curve representations and generations.
4. To teach the fundamentals of Finite element method.
5. To study and use various analysis techniques.
6. To develop competency in optimization techniques.

Course Out Comes:
Upon the successful completion of the course students will be able to

1. CO1. To identify, formulate the CAD principles in engineering problems.
2. CO2. To use Rasterization principles over Computer Graphics.
3. CO3. To generate geometric entities with help of DDA & Bresenham algorithms.
4. CO4. To solve numerical on transformation and modeling of curves.
5. CO5. To solve engineering problems using Finite element method & Finite element analysis.
6. CO6. To able use Optimization and algorithms to formulate and solve engineering problems.

UNIT I (CO1) (6 Hrs)
Introduction to CAD, application and advantages of CAD to Mechanical Engineering filed etc. CAD Softwares modules (Operating System, Graphics, Applications, Programming, Communication). Rasterization Principle, Rasterization of line, frame buffer, N-bit plane buffers, simple colour frame buffer.

UNIT II (CO2) (7 Hrs)

UNIT III (CO3) (9 Hrs)

UNIT IV (CO4) (8 Hrs)

UNIT V (CO5) (7 Hrs)
Truss: Finite Element analysis of 2-D problems- constant Stain Triangle, Mesh generation Techniques, Problems on Beams and Frames.

UNIT VI (CO6) (9 Hrs)

Text Books :

Reference Books :

BMEP501 COMPUTER AIDED DESIGN

Evaluation Scheme: Practical [2P]

PRACTICALS
1. Introduction to CAD softwares.
2. Program on Bresenham’s Line Algorithm.
3. Program on Bresenham’s Circle Algorithm
4. Program on Bresenham’s Ellipse Algorithm
5. Simple examples of two dimensional transformations.
6. Simple examples on three dimensional transformation
7. generation of sketches showing geometric properties using any CAD software.
8. Generation of solid models showing geometric properties using any CAD software.
9. Assembly generation using any CAD software. (At least two)
10. One dimensional problems of Finite Element Method.
11. Finite Element Method problems on truss.
13. open ended experiments

ELECTIVE-II
BMEL 502 REFRIGERATION & AIR CONDITIONING (3-0-2-4)
Total Hrs: 45
Pee-requisite:
1. BMEL205 Engineering Thermodynamics
2. BMEL315 Heat Transfer
3. BMEL210 Energy Conversion - I
4. BMEL313 Energy Conversion - II

Course Objectives:
1. To get awareness and importance of refrigeration and air conditioning
2. To familiarize with the latest developments in refrigeration and air-conditioning
3. To study both conventional and non conventional refrigeration systems
4. To know environment related issues with use of refrigerants
5. To know ecofriendly refrigerants in refrigeration and air conditioning applications.
6. To know air conditioning equipments
7. To study design of air conditioning systems ducts.

Course Outcomes:
Student should be able to
CO1 Apply various concepts of refrigeration systems and environment related issues with use of refrigerants related to engineering field in order to become professionally efficient.
CO2 Use of Multistage Refrigeration systems for various applications.
CO3 Apply knowledge of various non-conventional refrigeration systems to developed new efficient systems.
CO4 Know various psychrometric terminologies.
CO5 Apply knowledge for load calculation for designing of air conditioning systems.
CO6 Apply knowledge in designing of air transmission & distribution systems.

Unit I Refrigeration: (CO 1) (8 Hrs)
Introduction, Definition, Applications. Study of simple vapour compression refrigeration system: Analysis of simple vapour compression refrigeration system, effect of sub-cooling, superheating, polytropic compression & pressure drops on the performance of the system.


Refrigerants:
Nomenclature of refrigerants, refrigerant properties, mixture refrigerants, global warming potential & Ozone depletion potential Montreal & Kyoto protocol. Alternante réfrigérants.

Unit II Multi stage vapour compression
Refrigeration systems: (CO 1, CO 2) (8Hrs)
Multiple compressor & multiple evaporator systems, cascade refrigeration systems. Study of equipments such as compressors, evaporators, expansion devices & controls defrosting Methods (types & principle only). Testing & charging of refrigeration systems.

Unit III Other Refrigeration Techniques: (CO 1, CO 3)  (7Hrs)
Air cycle refrigeration, Applications in air refrigeration systems, Vortex tube, and thermoelectric refrigeration.


Unit IV Psychrometry (CO 4) (7 Hrs)
Introduction, Psychometric properties of air, psychometric chart psychometric processes by pass factor, apparatus dew point temperature.


Unit V Advanced Psychrometry: (CO 4, CO 5) (8 Hrs)
Application of psychometric to various air-conditioning systems RSHF, GSHF, ESHF, Air washers, air coolers. Heat Load Calculations: Data collection for load calculation, various components of heat load estimate, method of cooling load calculation.

Unit VI: Air Transmission & Distribution: (CO 4, CO 6) (7 Hrs)
Principle of air distribution, types of grills & diffusers & their selection criteria, air alteration, types of air filter, distribution of air through ducts, pressure losses in ducts, methods of duct design, duct friction chart, air conditioning controls.

Text books:

Reference Books:
BMEP 502 REFRIGERATION & AIR CONDITIONING Evaluation Scheme: Practical [2P]

Practical:
01. To perform experiments on Vapour Compression Test Rig to determine COP of the system.
02. To perform trial on Vapour Absorption Refrigeration system.
03. To Perform experiment on Desert cooler to evaluate its performance.
04. To perform trial on Vortex Tube Refrigeration System.
05. To perform trial on Thermoelectric Refrigeration System.
06. To perform trial on Adiabatic Demagnetization Refrigeration System.
07. To perform experiment on Air Conditioning Test Rig.
08. To perform experiment on Steam Jet Refrigeration System.
09. Study of Central air conditioning plant.
10. Trial and Demonstration on Mini Ice plant.

Open Ended Practical
11. Trial and Demonstration on Multiple Capillary tube in Refrigeration System.
12. Trial and Demonstration on Air Conditioning System with Additional Condenser.
13. Trial and Demonstration on Refrigeration System with Diffuser at Condenser inlet.
15. Trial and Demonstration on Multi-utility Refrigeration System.

Tutorials
1. Exercises on computer assisted cooling load calculation.
2. Exercises on computer assisted duct design.

Related Industrial Visit
1. Report on visit to air-conditioning or cold storage plant or ice plant.
2. Study of a central A/c plant

ELECTIVE-II
BMEL 503 FINITE ELEMENT METHOD (3-0-2-4)
Total Hrs: 44

Pree-requisite:
1. BMEL207 Mechanics of material
2. BMEL304 Machine design-I
3. BMEL314 Machine design-II

Course Objectives:
1. To teach the fundamentals of finite element method with emphasize on the underlying theory and assumption.
2. To develop theoretical foundations and appropriate use of finite element methods.
3. To enhance skills in numerical techniques and to understand and perform engineering analysis of machine members.
4. To provide hands on experience using finite element software to model, analyze and design systems.
5. To inculcate programming knowledge of generating algorithms.

Course Outcomes:
1. Shall be able to evaluate and compare FEM with other numerical methods
2. Students shall demonstrate an ability to derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts.
3. Shall be able to develop the skills of solving truss and beam problems for various loading conditions
4. Shall be able to develop an appropriate knowledge of analysis to handle for the mechanical problems, with proper selection of materials and elements
5. Shall be able to develop competence to design and analyze problems of engineering
6. particularly having relevance to vibration & dynamic analysis.
7. Shall be able to demonstrate ability to make use of commercial software to solve complex problems.

UNIT I (CO1) (7Hrs)

UNIT II : (CO2) (7Hrs)

UNIT III ; (CO3) (8Hrs)
Finite element modeling and analysis using Bar and Beam element – stiffness matrix assembly, boundary conditions, load vector, temperature effects.
Two dimensional plane - Local and Global coordinate system, element stiffness matrix, assembly, boundary conditions, load vector, force and stress calculations.

UNIT IV : (CO4) (8Hrs)

UNIT V: (CO5) (7Hrs)
Introduction to Isoperimetric and Higher order elements. Introduction to Numerical Integration. Introduction to dynamic analysis, formulation of mass matrix for one-dimensional bar element, free vibration analysis using one – dimensional bar element. Torsion of prismatic bars using triangular elements.

UNIT VI: (CO6) (7Hrs)
Steady state one dimensional and two dimensional heat conduction problems using I-D and triangular element respectively. Programming aspects of FEM – Algorithms for, reading Finite Element modeling data, formation of element stiffness matrix, formation of elemental load vector. Assembly of individual elemental stiffness matrix into global ‘ stiffness’ matrix, assembly of individual elemental load vector into global load vector, application of boundary conditions, solution of equations, determination of stresses and strains.

Pre – Post processing in FEA

Advanced Topic

Text Books:

References:

BMEL503 FINITE ELEMENT METHOD
Evaluation Scheme: Practical [2P]

PRACTICALS:
1. To study of FEM / FEA
2. To study Processor / Post-Processor
3. 2 Dimensional plane truss by finite element analysis.
4. Finite Element Analysis of Plane Stress Bracket
5. Find the effect of self weight by finite element analysis.
6. Problem of axisymmetry in which cylinder subjected to internal pressure
7. To study Steady State Heat Transfer Analysis Problem

ELECTIVE-III
BMEL504: MATERIAL HANDLING SYSTEM (3-0-0-3) Total Hrs: 50

Pee-requisite: Nil

Course Objectives:
1. To enable understanding of newer manufacturing technologies and developments in respect of non traditional welding and machining
2. To understand constructional details and operations of modern CNC manufacturing systems as well as part programming
3. To provide exposure to current manufacturing philosophies including FMS lean manufacturing and JIT as well as material and enterprise resource planning

Course Outcomes:
1. Shall be able to understand the importance of material handling in the context productivity improvement and maintenance management
2. Shall be able to design various overhead hoisting materials handling system for different applications.
3. Shall be able to design and select load handling attachment for lifting application
4. Shall be able to evaluate safety mechanism and select the right safety equipment based on situation.
5. Shall be able to select drives for various material handling applications.
6. Shall be able to undertake modifications in the basic equipment with a view to enhance their capabilities by integrating AGV & Robot.

UNIT – I (CO1) (8 Hrs)
Types of intraplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipments, general
characteristics of surface and overhead equipments and their applications. Introduction to control of hoisting equipments.

UNIT – II (CO2) (10 Hrs)
Flexible hoisting appliances like ropes and chains, welded load chains, roller chains, selection of chains hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems. Chain and rope sheaves and sprockets.

UNIT – III (CO3) (7 Hrs)
Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

UNIT – IV (CO4) (10 Hrs)
Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagentic, double shoe type, thruster operated, controller brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes general theory of band brakes, its types and construction.

UNIT – V (CO5) (8 Hrs)
Different drives of hosting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels, slewing, jib and luffing gears. Operation of hoisting gear during transient motion, selecting the motor rating and determining braking torque for hoisting mechanisms, drive efficiency calculations, selecting the motor rating and determining braking torque for traveling mechanisms, slewing mechanisms, jib and luffing mechanisms. (Elementary treatment is expected)

UNIT – VI (CO6) (7 Hrs)
Cranes with rotary pillar, cranes with a fixed post, jib cranes with trolley, cranes with luffing boom cantilever cranes, cage elevators safety devices of elevators belt and chain conveyors and their power calculations, vibrating and oscillating conveyors pneumatic and hydraulic conveyors, screw conveyors hoppers, gates and feeders. Introduction to AGV’s as new material handling device, use of robot for material handling.

Advanced Topic

Text Books:
1. Processes & Materials of Manufacture, by Roy A Lindberg, Prentice Hall of India

Reference Books:

ELECTIVE-III
BMEL 505 ADVANCED MANUFACTURING TECHNIQUES (3-0-0-3) Total Hrs: 44
Pree-requisite:
1. BMEL 208 Manufacturing Process-I
2. BMEL306 Manufacturing Process-II

Course Objectives:
1. To enable understanding of newer manufacturing technologies and developments in respect of non traditional welding and machining
2. To understand constructional details and operations of modern CNC manufacturing systems as well as part programming
3. To provide exposure to current manufacturing philosophies including FMS lean manufacturing and JIT as well as material and enterprise resource planning

Course Outcomes:
1. CO1: Able to apply various non – traditional Machining processes to the relevant industrial applications.
2. CO2: Able to apply advance nontraditional machining processes like EDM, LBM, PAM etc. for manufacturing by considering surface finishing criteria.
3. CO3: Able to apply the acquaintance of different nontraditional welding processes for precision welding.
4. CO4: Able to analyze different nontraditional welding processes and apply to the industrial application.
5. CO5: Able to apply the knowledge G-codes & M-codes for precision manufacturing.
6. CO6: Able to apply the acquaintance of manufacturing philosophies viz., JIT, ERP, MRP & FMS for optimum manufacturing.

UNIT I (CO1) (7 Hrs)
Non Traditional Machining Processes, its classification and historic development. Different non-traditional machining process viz. Abrasive Jet Machine (AJM), Ultrasonic Machining (USM), Electrochemical Machining (ECM)

UNIT II (CO2) (8 Hrs)
Electric Discharge Machining (EDM), Electron Beam Machining (EBM), Laser beam Machining (LBM), Plasma Arc Machining (PAM). Process Parameters and its application of different Non-Conventional Machining Process as above.

UNIT III (CO3) (6 Hrs)
Unconventional Welding techniques such as Inert Gas, Laser, Electron Beam, Plasma Arc, Atomic Hydrogen, Submerged Arc Welding,

UNIT IV (CO4) (6 Hrs)
Explosive Welding techniques, Electro Slag Welding. Recent development in welding, and comparative analysis.

UNIT V (CO5) (8 Hrs)
Introduction to CNC, DNC Systems, NC part programming. CNC Turning, Milling, Machining Center, its Classification, different parts and operations.

UNIT VI (CO6) (9 Hrs)

Advance Topics

Text Books:
1. Processes & Materials of Manufacture, by Roy A. Lindberg, Prentice Hall of India

Reference Books:
4. CNC Machines by Pabla and Adinathan, New Age Publishers

ELECTIVE – III

BMEL506 STRESS ANALYSIS (3-0-0-3)

Total Hrs: 45

Pee-requisite:
1. BCEL107 Engineering Mechanics

Course Objectives:
1. To understand basic concepts of stress analysis.
2. To develop competency in analytical methods in solving problems.
3. To make students conversant with concepts of stress distribution.
4. To make the students conversant with basics of optics related to photoelasticity.
5. To make the students conversant with 3-D photoelasticity and to give exposure on fringes.

6. To learn and apply various methods in stress and strain analysis and exposure to new advancements in stress analysis.

Course Outcomes:
1. Able to justify on the suitability of selected material it is capable to sustain load or pressure to given problem
2. Able to check elasticity of any material by the help of polar scope.
3. Able to check stress propagation of dynamic load problem, heat transfer problem and fluid related problem if it is isoclinic and is chromatic basic
4. Able to check some casting material in view of stress freezing phenomenon and fringe multiplication
5. Able to apply strain gauge technique for stress and strain analysis
6. Able to apply strain gauge technique for stress and strain analysis

UNIT I (CO1) (8 Hrs.)
Two Dimensional Problems in Cartesian coordinate system – Fundamentals of stress and strain, stress – strain relationship, Elastic constant, plane stress, plane strain, differential equation of equilibrium Boundary conditions, Saint Venant’s principle, compatibility equation, Airys stress function. Stress analysis of cantilever subjected to concentrated load at it’s end and simply supported beam subjected to uniformly distributed load.

UNIT II (CO2) (7 Hrs.)
Two dimensional problem in polar coordinate systems – General equations of equilibrium in polar coordinate compatibility equation, stress distribution about symmetric, axis, stress analysis of cylinder subjected to internal and external pressure, Pure bending of curved beams, effect of hole on the stress distribution in plates, Stress analysis of rotating circular disk.

UNIT III (CO3) (8 Hrs.)
Two Dimensional Photoelasticity – Introduction to basic optics related to photoelasticity, stress option law, plane and circular Polariscope arrangements, effect of stressed model in plane and circular polariscope, Isoclinic and Isochromatics, stress trajectories, calibration of photoelastic material (determination of fringe constant). Various photoelastic materials and their properties, Casting of photoelastic models, Tardy’s compensation technique, Separation techniques like, shear difference, oblique incidence and electrical analogy.

UNIT IV (CO4) (7 Hrs.)
Introduction to 3-D photoelasticity – Phenomenon of Stress freezing, Method of stress freezing, slicing techniques, determination of material fringe constant at critical temperature. Scaling Model – Prototype relations.
UNIT V (CO5) (8 Hrs.)
Strain gage technique for stress and strain analysis – Introduction to electrical resistance strain gages, gage, factor, bridge circuit, bridge balance, output voltage of Wheatstone bridge, balancing of bridge, temperature compensation, various bridge configurations, bonding of strain gages to the specimen, determination of principle strains and stresses using strain rosettes. Environmental effects on performance of strain gages, Strain gages response to dynamic strains, Effect of lead wires. Introduction to Strain measurement on rotating components, Static and Dynamic Strain Measurement introduction to semiconductor gages, high temperature strain gages and self – temperature compensated gages. Introduction to Commercial strain indicators.

UNIT VI : (CO6) (7 Hrs.)
Grid technique of strain analysis, Brittle coating method for stress and strain analysis, Morie fringe method for stress and strain analysis. Advanced Topic

Text Books :
1. Theory of Elasticity – S.P. Timoshenko
2. Experimental stress Analysis – Dally and Riley

Reference Books:
1. Experimental Stress Analysis – T.K Ray
2. Experimental Stress Analysis – L.S. Srinath

Elective – III

BMEL507 AUTOMOBILE ENGINEERING
(3-0-0-3) Total Hrs: 45

Pree-requisite: Nil

Course Objectives:
1. To study various components of automobiles
2. To understand various systems & mechanisms in automobiles
3. To study maintenance of automobiles
4. To learn the emerging Technology in the field of automobile Engineering

Course Out Comes:
Upon the successful completion of course, student will be able to
1. Select engine along with its component, chassis to build a vehicle body used for different purpose.
2. To disintegrate engine and transmission system without turning off engine.
3. To vary torque required to propel the vehicle.
4. Select suspension, steering system and tyre for human comfort.
5. Design electric system used in automobile.
6. Adopt new technologies for safety of automobile.

UNIT – I (CO 1) (8Hrs )
Introduction, Automobile history and development, Chassis, articulated and rigid vehicles and vehicles layout. Prime movers Engine construction – Structural components and materials, Fuel supply system, cooling and lubrication system, Filters, water pumps, radiators, Thermostats anti freezing Compounds.

UNIT – II (CO 2) (8 Hrs)

UNIT – III (CO 3) (8 Hrs)

UNIT – IV (CO 4) (8 Hrs)
Steering systems, principle of steering, center point steering Steering linkages, steering geometry and wheel alignment, power Steering, Special steering systems Tyres, tyres specification, factors affecting type performance, Special tyres wheel balancing , suspension systems- Function of Spring and shock absorber, conventional and Independent suspension System, Telescopic shock absorber, linked suspension systems.

UNIT – V (CO 5) (8 Hrs)
Electrical systems – construction. Operation and maintenance of Batteries, Alternator working Principles and Operation of regulators , Starter motor, Battery Ignition and magneto ignition systems ignition timing, Electronics ignition, Lighting, Horn, Side indicator wiper Automobile air-
conditioning Panel board instruments.

Maintenance, Trouble shooting and service, procedures, Overhauling, Engine tune up, Tools and equipment for repair and Overhaul Testing equipments.

UNIT – VI (CO6) (5 Hrs)
Recent Advances in automobiles such as ABS, Electronic Power Steering, Steer by wire, Traction control, Active suspension, Collision avoidance, Intelligent lighting, Navigational aids and Intelligent vehicle highway system.

Text Books

Reference Books :

Elective – III

BMEL508 MODELING AND SIMULATION
(3-0-0-3) Total Hrs: 42

Pree-requisite: Nil

Course Objectives:
1. To study concept of system and system environment.
2. To understand the concept of random number
3. To understand simulation of systems.
4. To study simulation of queuing and inventory.
5. To know about various simulation languages/packages.

Advance topic on subject

Course Out Comes:
1. After successfully completing the course, the students shall be able to
2. CO1. Develop mathematical model for real life system and perform simulation.
3. CO2. Generate and test the random numbers using suitable statistical tool
4. CO3. Calculate the random number variate of various distributions like normal, exponential, uniform, etc.
5. CO4. Conduct simulation study of real life system using random number table
6. CO5. Conduct simulation of simple queuing and inventory systems
7. CO6. Understand various simulation packages/languages preferably related to simulation of manufacturing system, material handling system.

UNIT – I (CO1) (7 Hrs)

SYSTEM AND SYSTEM ENVIRONMENT

System and System Environment: Component of a system continuous and discrete systems Models of a system modeling. Steps in a simulation study.

UNIT – II (CO2) (8 Hrs)

GENERATION OF RANDOM NUMBER
Random Number Generation: Mid Square The mid product method Constant multiplier method Additive congruential method Test for random numbers: the chi-square test, the kolmogorov-Smirnov test, Runs test, Gap test

UNIT – III (CO3) (8 Hrs)

RANDOM VARIATE GENERATION

UNIT – IV (CO4) (8 Hrs)

SIMULATION OF SYSTEMS
Simulation of Systems: Simulation of continuous system Simulation of discrete system Simulation of an event occurrence using random number table.

UNIT – V (CO5) (7 Hrs)

SIMULATION OF QUEuing AND INVENTORY
Simulation of single server queue and a two server queue. Simulation of inventory system

UNIT – VI (CO6) (4 Hrs)

INTRODUCTION TO SIMULATION LANGUAGE/PACKAGES
Introduction to various Simulation languages/packages

Advance topic

Text Books :

References Books :

ELECTIVE-III

BMEL509 INDUSTRIAL ROBOTICS (3-0-0-3)
Total Hrs.45

Pree-requisite:
1. BITL104 Basic of computing
2. BMEL204 Kinematics of machine

Course Objectives:
1. To understand robot anatomy.
2. To study basic control system models.
3. To learn actuation and feedback components.
4. To study sensors and grippers.
5. To learn the applications in material handling, machining, welding, assembly, etc.
6. To study robot cell layouts.

Course Outcomes:
After successfully completing the course, students will be able to
1. CO1: Understand robot anatomy and manipulator kinematics.
2. CO2: Apply control system as per the requirement.
3. CO3: Use various robot actuation and feedback components as per the need
4. CO4: Evaluate alternatives and select robot for material handling applications
5. CO5: Suggest specifications of robots for welding and assembly operations
6. CO6: Design robot work cell considering machine interface and cycle time analysis

UNIT – I (CO1) (7 Hrs)
Automation and Robotics, Robot anatomy, configuration of robots, joint notation schemes, work volume, introduction to manipulator kinematics, position representation, forward and inverse transformations of a 2-DOF arm, a 3-DOF arm in two dimension, a 4-DOF arm in three dimension, homogeneous transformations in robot kinematics, D-H notations, solving kinematics equations, introduction to robot arm dynamics.

UNIT – II (CO2) (7 Hrs)
Basic control system models, slew motion, joint – interpolated motion and straight line motion, controllers like on/off, proportional, integral, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative.

UNIT – III (CO3) (8Hrs)
Robot actuation and feedback components position and velocity sensors, actuators and power transmission devices, mechanical grippers, vacuum cups, magnetic grippers, pneumatic, electric, hydraulic and mechanical methods of power and control signals to end effectors.

UNIT – IV (CO4) (8 Hrs)
General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and Related operations, machine loading and unloading, die casting, plastic molding, forging, machining operations, stamping press operations using robots.

UNIT – V (CO5) (7 Hrs)
Application of robot in spot welding continuous are welding, spray coatings, Robots in Assembly Operations.

UNIT – VI (CO6) (8 Hrs)
Robot cell layouts, multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis.

Text Book:

Reference S Books:

ELECTIVE-III
BMEL 510 METROLOGY AND QUALITY CONTROL (3-0-0-3) (Total Hrs 45)
Pee-requisite: Nil
Course Objectives:
1. To provide understanding of the significance of accuracy of dimensional measurement
2. To provide exposure to the measurement practices as well as systems and standards of measurement
3. To provide basic concept of measurement of flattens and straightness as well as standard practices for measuring profiles of components such as gears, screw threads
4. To provide exposure to newer measuring systems namely CMM
5. To introduce the concept of in process and post process quality control through use of control charts and acceptance sampling.
6. To introduce international quality system ISO 9000, TQM concepts

Advance topic on the subject
Course Outcomes:
1. Read production planning sheet
2. Use comparators and gauges.
3. Measure flatness, gear profile.
4. Measure quality.
5. Apply sampling and inspection techniques.
6. Apply ISO and BIS.

UNIT – I (CO1) Hrs)

UNIT – II (CO2) (7 Hrs)
Measurement Through Comparators: Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production. Screw Thread Measurement: Element of measurement – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT – III (CO3) (8 Hrs)

UNIT – IV (CO4) (8 Hrs)
Quality Control: Definition, Function, Objectives, Characteristics, Quality, Quality Of Design, Quality Of Conformance, process Control Charts And Process Capability Statistical Quality Control.

UNIT – V (CO5) (7 Hrs)
Acceptance Sampling Techniques, O.C Curves, AQL, LTPD, concept of AOQL, Sampling Plans, Single, Double and Sequential Sampling, Inspection Types And Objectives.

UNIT – VI (CO6) (8 Hrs)
Introduction To ISO9000, BIS 14000 Series, TQM Concepts, Quality Assurance, Quality Audit, Quality Circles.

Advanced Topic

Text Books:
Reference Book:

BMEL511 Computational Fluid Dynamics (3-0-0-3)
Course Objectives:
1. To understand finite volume method and different fluid flow model.
2. To understand different discretize technique and apply to different governing equation.
3. To prepared a student for industry in CAE through software.

Course Outcomes:
At the end of this course, students shall be able to
1. Differentiate analytical, experimental and numerical method.
2. Make physical interpretation of various terms in governing equation.
3. Apply implicit and explicit scheme to solve fluid and heat transfer problem.
4. Apply CFD technique to solve 2D conduction problem.
5. Apply governing equation to solve incompressible flow problem.
6. Apply CFD tools effectively for practical problem and research.

Unit-I Introduction (CO 1) [4 Hrs]
What is CFD, scope and application, Difference between analytical, experimental and numerical method, different Commercial CFD software, Pre-processor, Solver and Post-processor

Unit-II Governing Equation(CO 2) [8Hrs]
Flow Modeling, Substantial derivative, Governing equation in differential and integral form, Boundary condition problem.

Unit-III Descretization Technique (CO 3)[10 Hrs]
Types of grids (Structural, unstructured, hybrid, etc), Finite difference approximation using Taylor series , For First order (Forward difference, Backward difference and Central difference approximation), second order (3 node, 5 node), Implicit and Explicit approach applied to 1D transient equation, Couette flow equation using FTCS and Crank-Nicolson’s Method, Stability criteria, Thomas algorithm.

Unit-IV 2D Steady and Transient Heat Conduction (CO 4) [8 Hrs]
Solution of 2-D steady and transient heat conduction equation, ADI Method, Under relaxation and over-relaxation

**Unit-V Convection, Convection-Diffusion system (CO 6)** [8 Hrs]
First order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept and physical interpretation, 1D and 2D steady Convection Diffusion system – Central difference approach, Peclet Number, stability criteria, upwind difference approach.

**Unit-VI Incompressible Fluid Flow (CO 5)** [7 Hrs]
Solution of Navier-Stokes equation for incompressible flow using SIMPLE algorithms and its variation (SIMPLER), Application to flow through pipe, Introduction to Turbulent modeling.

**Advanced Topic**

**Text Books:**

**Reference Books:**
## SEMESTER – III

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### SEMESTER - V

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**Elective — I**

[1] BECL401 Television Engineering
[2] BECL416 Mobile Communication
[3] BECL417 Sensors & Transducers
[4] BECL418 Biomedical Engg
[5] BECL419 Verilog HDL
[7] BECL313 Transmission Lines and Antena

*OPEN ELECTIVES:
### SEMESTER - VII

<table>
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#### Elective-II

- [1] BECL414 Optical Communication
- [2] BCSL308 Language Processors
- [3] BEEL420 PLC and SCADA

#### Elective-III

- [1] BMEL403 Mechatronics
- [3] BECL422 Micro Electro Mechanical Systems
- [4] BECL424 ASIC Design
- [5] BECL425 Real Time Operating System
- [6] BITL302 Computer Networks
- [7] BITL417 Internet of Things
- [8] BCSL422 Bigdata and Hadoop

### SEMESTER - VIII

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THIRD SEMESTER

BAML201 Mathematical Applications in Electronics & Communication Engineering (4-0-4-0) Total Hrs: 45
Pre-requisite: --
Course Objectives:
1. To develop skills to use Laplace Transform and Z- Transform and its applications in the field of Electronics engineering.
2. To introduce Partial Differential Equations and Fourier Series and its applications in the field of Electronics engineering.
3. To introduce complex variables and its application in the field of Electronics engineering.
4. To develop skills to solve problems on Calculus of Variation in the field of Electronics engineering.

Course Outcomes:
1. Effectively apply concepts of Laplace Transform in a clear and concise manner. This will be assessed through class assignments and exams
2. Effectively apply concepts of Z- Transform for analyzing the stability of systems and signal processing. This will be assessed through 1. assignments and exams.
3. Demonstrate ability to think critically by proving mathematical conjectures and establishing 2. theorems from complex variables. This will be assessed through tests and a final exam.
4. Apply concepts of Calculus of Variation to solve engineering problems.
5. Compute the Fourier series representation of a 5. periodic function, in both exponential and sine-cosine forms, evaluate the Fourier transform of a 6. continuous function, and are familiar with its basic.

Unit I: Laplace Transforms (8 Hrs)

Unit II: Z-Transforms (7 Hrs)
Z transform- definition & properties, inverse Z & relation with Laplace Transform. Application to z-transform to solve difference equations with constant coefficients.

Unit III: Complex Variables (8 Hrs)
Analytic Functions, Cauchy Riemann conditions, Conjugate functions, singularities, Cauchy's integral theorem, and integral formula (Statement only). Taylor’s and Laurentz’s Theorem (Statement only). Residue theorem, contour integration.

Unit IV: Calculus of Variation (7 Hrs)
Maxima and minima of functionals, Variation and its properties, Euler’s equations, functionals dependent on first and second order derivatives, Simpler applications.

Unit V: Fourier Series and Fourier Transforms (8 Hrs)
Introduction, the Fourier theorem, Evaluation of Fourier Coefficients. Consideration of symmetry (odd, even rotational) exponential form, Fourier series, Fourier integral theorem, Fourier transforms.

Unit VI: Partial Differential Equation (7 Hrs)
Partial Differential equation of first order first degree i. e. Lagrange’s form. Linear non homogeneous Partial Differential equation of nth order with constant coefficient method of separation of variables. Application to transmission lines. Advanced topics on the subject.

Text Books:

Reference Book:

BECL201 ELECTRONICS DEVICES & CIRCUITS (3-1-0-4) Total Hrs : 45
Prerequisites: Basic Electronics
Course Objectives:
1. To gain knowledge of electronics devices and semiconductor physics.
2. To study need of electronics devices and its applications.
3. To familiarize the students with the analysis and design of analog circuits.
4. To use appropriate experimentation techniques to evaluate circuit performance.

Course Outcome:
Student shall be able to:
1. Understand operation of diodes, types of diodes and their role in design of various electronic applications.
2. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points for various biasing methods and perform small signal analysis.
3. Understand the concepts of feedback and apply the concepts for improvement of performance of amplifier and oscillator;
4. Understand, analyze and design different types of power amplifiers and use methods for reduction of distortions
5. Understand the operation of the Field Effect Transistor (FET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and design FET circuits
6. To understand the characteristics of CMOS circuit construction and perform AC & DC Analysis

Unit I: PN Junction Diode (8 Hrs)
PN junction, forward and reverse bias, VI Characteristics, Dynamic Resistance, Temperature dependence, Avalanche and Zener Break Down, Photo Diode, LED's, LCD's, Varactor Diode, Tunnel Diodes, Half and full wave rectifiers with filters.

Unit II: Bipolar Junction Transistors (10 Hrs)

Unit III: Feedback Amplifiers & Oscillators (6 Hrs)

Unit IV: Power Amplifier (8 Hrs)

Unit V: Unipolar Devices (7 Hrs)
Field Effect Transistor, MOSFET, NMOS, PMOS Principles of operation and characteristics, Biasing arrangement, small signal analysis of CG, CB and CD

Unit VI: CMOS Circuits (6 Hrs)
An introduction to CMOS, Diode and MOSFET, Transistors, MOSFET Switches, Transmission Gate, Inverter - DC, AC Analysis.

Advanced topics on the subject.

Text Books:
1. Millman And Halkies : Electronics Devices And Circuits

Reference Books:
1. Kang : CMOS Integrated Circuits
2. R.J.Bekar : Fundamentals of CMOS Design
3. Theraja & Sedha : Electronics Devices And Ckts

BECP 201 ELECTRONICS DEVICES & CIRCUITS (0-0-2-1) Total Hrs: 20
List of Practicals:
1. Design full wave rectifier with and without filter & calculate ripple factor.
2. Design Clipper circuit and plot the characteristics & perform simulation on Micro-cap.
3. Design clamper circuit and plot the characteristics & perform simulation on Micro-cap.
5. Design emitter follower type of voltage regulator using darlington pair and simulate it on microcap.
6. Design push-pull class A power amplifier and simulate it on microcap.
7. Design a Wein Bridge Oscillator and simulate it on microcap.
8. Design circuit to verify the characteristic of varactor diode.
10. Open Ended Experiments [Design of CMOS Inverter & NAND Gate using Tanner tool]

BEEL201 NETWORK THEORY (3-1-0-4)
Total Hrs : 45
Prerequisite --
Course Objectives:
1. To introduce the concept of circuit elements lumped circuits, circuit laws and reduction.
2. To study the loop and nodal analysis of networks in ac and dc systems.
3. To study the transient response of series and parallel A.C. circuits.
4. To study the concept of coupled circuits and two port networks.

Course Outcomes:
Student shall be able to:
1. Analyze circuits with ideal, independent, and controlled voltage and current sources. using Mesh & Nodal analysis.
2. Determine the equivalent circuits of a network that include passive devices, dependent sources, and independent sources in combination using network theorems.
3. Understand the analysis techniques of electrical networks and also waveform synthesis.
5. Simplify circuits using network reduction approach.
6. Determining two port network parameters and one parameter in terms of other parameters.

Unit I: Nodal & Mesh Analysis (08 Hrs.)
Nodal and Mesh analysis basic equilibrium equations, matrix approach for complicated network, containing voltage, current sources, Mutual Inductances, source transformations, Duality.
Unit II: Network Theorems (08 Hrs.)
Superposition, Reciprocity, Thevenin’s, Norton’s, maximum power transfer, compensation, Tellegen’s theorem as applied to A.C. circuits.

Unit III: Fourier Analysis (07 Hrs.)
Trigonometric and exponential Fourier series. Discrete spectra and symmetry of waveforms, synthesis, steady state response of a network to non sinusoidal periodic inputs. Fourier transforms and continuous spectra.

Unit IV: Laplace Transformation (08 Hrs.)
Laplace transformation and its properties, partial fractions, singularity functions, waveform synthesis. Analysis of RC & RL network with and without initial conditions with Laplace transformation, evaluation of initial & final conditions.

Unit V: Network Function (07 Hrs.)
Transient behaviors, concept of complex frequency, driving points and transfer functions, poles, zeros of admittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and integral solution.

Unit VI: Two Port Network (07 Hrs.)
Two port network parameters and inter connections study of series and parallel resonance in A.C. Three Phase unbalanced circuits and power calculations. Advanced topics on the subject.

Text Books:

BECL202 COMMUNICATION ELECTRONICS (3-1-0-4) Total Hrs : 45
Pre-requisite: - ---
Co-requisite: - ---

Course Objectives:
1. To understand the basic concept of communication and different modulation systems based on basic parameters.
2. To understand the concept of multiplexing.
3. To understand theory of digital modulation.
4. To understand working of radio receivers.

Course Outcome:
Student shall be able to:
1. Understand the propagation of waves and Evaluate the influence of noise on communications signals.
2. Demonstrate knowledge and understanding basic concepts in amplitude modulation and demodulation of analog communication systems
3. Assess and evaluate angle modulation and demodulation of analog signals and the performance of FM receivers.
4. Apply sampling theorem to design analog pulse modulation techniques.
5. Understand the need and limitations of various multiplexing techniques.
6. Understand the practical implementation and limitations of digital modulation techniques like PCM, DM and ADM.

Unit I: Introduction To Communication, Radiation And Propagation (8 Hrs.)
Block Schematic of Communication System, Base Band Signals and their bandwidth requirements, RF Bands, Concept of Radiation and Electromagnetic waves, Mechanism of Propagations: Ground Wave, Sky Wave, Space Wave, Duct, Tropospheric Scatter and Extraterrestrial Propagation. Concept of Fading and diversity reception, Noise Figure Calculations.

Unit II: Amplitude Modulation And Detection (8 Hrs.)
AM Modulators series plate modulated class C amplifiers, efficiency & power calculations, SSB modulation SSB-SC modulation AM demodulators, square law detector, diode peak detector, envelop detector, detectors for SSB and SSB-SC-AM signals, AM using transistors, Block Diagram of AM Receiver, AM Detection: Envelope detection, Synchronous detection, Practical diode detection, AGC, SSB and DSB detection methods.

Unit III: Frequency Modulation And Radio Receivers (8 Hrs.)

Unit IV: Pulse Modulation Techniques (7 Hrs.)
Introduction to Sampling, Sampling theorem, Sampling Techniques, Analog Pulse Modulation methods, Pulse amplitude modulation (PAM), Demodulation of PAM, Transmission of PAM, Drawbacks. Pulse time modulation: Pulse width modulation (PWM), Demodulation and Demodulation of PWM, Pulse position modulation (PPM), Modulation and Demodulation of PWM.

Unit V: Digital Multiplexers (7 Hrs.)
Frequency Division multiplexing, Time Division Multiplexing, PAM/TDM System: Signaling rate, transmission bandwidth, advantages and disadvantages. Introduction to Digital multiplexers and their classification, Multiplexing Hierarchy for Digital Communication.

Unit VI: Digital Modulation Techniques (7 Hrs.)
Pulse code modulation (PCM): PCM systems, Delta modulation, ADPCM, matched filter receiver, Digital Modulation formats, Coherent Binary modulation.
technique, Coherent Binary: PSK, FSK, QPSK, MSK, and DPSK.
Advanced topics on the subject

Text Books:

Reference Books:
2. Denenis Roddy, Electronics Communication, Pearson Publication

BECP202 COMMUNICATION ELECTRONICS (0-0-2-1)
Total Hrs: 20
1. List of Practicals:
   2. Generate Amplitude Demodulation using Envelope Detector and observe the result on Spectrum Analyzer.
   3. Generation of Frequency Modulation and demodulation using VISIM and MATLAB.
   4. Generation of Pre-emphasis and De-emphasis circuit on breadboard system & to plot pre-emphasis and de-emphasis curve.
   5. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms. Observe the demodulated output.
   8. Verify Amplitude Shift Keying (ASK) using MATLAB.
   9. Generation of Frequency Shift Keying (FSK) and observation of mark and space frequencies using MATLAB.
   10. Verify Pulse Code Modulation (PCM) using Simulation in MATLAB.
   11. An open end project

BCSL201 DATA STRUCTURES USING C
(3-1-0-4)
Total Hrs: 45
Pre-requisite: --
Course Objectives:---
1. To understand the way of developing programs based on well defined approach.
2. To develop proficiency in the specification, representation, and to implement Data Types and Data Structures in C language.
3. To understand the analysis of various Algorithms.
4. To get a good understanding of applications of Data Structures in C language.

Course Outcome:

Student shall be able to:

Upon successful completion of the course, students
1. CO1: Acquire and Apply basic concepts of data type and array data structure.
2. CO2: Implement linked list data structure to find solution for given engineering applications.
3. CO3: Design data structure such as stacks and queues to solve various computing problems using C-programming language.
4. CO4: Design tree data structure to solve various computing problems.
5. CO5: Design graph data structure to solve various computing problems.
6. CO6: Design and analyze standard algorithms for searching and sorting.

Unit I: Arrays, Records and Pointers (7 Hrs)
Introduction, Linear Arrays, Arrays as ADT, Representation of Linear in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices

Unit II: Linked List (9 Hrs)
Introduction, Linked Lists , Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection , Insertion into a Linked List, Deletion from a Linked List , Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems

Unit III: Stacks, Queue and Recursion (9 Hrs)
Introduction, Stacks , Array Representation of Stacks , Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues

Unit IV: Trees (10 Hrs)

Unit V: Graphs and their Applications (6 Hrs)
Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall’s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs,
Traversing a Graph, Posets; Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching (4 Hrs)
Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort. 2. Searching and Data Modification, Hashing Advanced topics on the subject

Text Books:

Reference Books:
1. S. Sahani, Data Structures in C,
2. D.Samantha, Classic Data Structure, PHI Publications

BCSP201 DATA STRUCTURES USING C (0-0-2-1) Total Hrs: 20

List of Practicals:
1. Write and execute a program in C to implement an array and find out greatest and smallest number from the array.
2. Write and execute a program in C to merge two sorted arrays.
3. Write and execute a program in C to implement 2-dimensional array and perform the multiplication of two matrices.
4. Write and execute a menu driven program in C to
   - Find factorial of a number.
   - Print first n numbers from Fibonacci series.
5. Write and execute a program in C to implement the Binary search algorithm
6. Write and execute a program in C to implement Insertion sort.
7. Write and execute a program in C to implement selection sort.
8. Write and execute a program in C to implement merge sort.
9. Write and execute a program in C to implement the Bubble Sort.
10. Write and execute a program in C to implement stack using arrays.
11. Write and execute a program in C to implement queue using arrays.
12. Write and execute a program in C to implement simple linked list.
13. Write and execute a program in C to insert a node in a linked list in a sorted fashion.
14. Write a program in c to implement binary trees.
15. Write and execute a program in C to find mirror image of a binary tree.
16. Open ended practical

MBL102 : GENERAL PROFICIENCY-II : German / French/ Spanish Language

Course Objectives:
1. To learn foreign languages to improve interpersonal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.
3. To help communicate at international forums and explore opportunities for employment.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums.

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<td>Pronunciations techniques</td>
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<td>Describing , Present Tense , Furniture , Household articles , Colors</td>
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<td>Project on vocabulary of fruits , Bakery products , Group Activity / Role play</td>
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<td>Telephonic Conversions</td>
<td>How to Ask time , converse on telephone</td>
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<td>Timing and clock (Hours &amp; Minutes )</td>
<td>Self introductions , Role-play</td>
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<tr>
<td>Visit to city</td>
<td>Nature , Directions , Means of transportations , Tenses contd....</td>
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<tr>
<td>In Restaurant / Hotel</td>
<td>Ordering eatables , Table manner &amp; Verbs</td>
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<tr>
<td>Visit to Doctor</td>
<td>Health matters , Illness , Commonly used verbs contd..</td>
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<tr>
<td>Projects</td>
<td>Worksheets</td>
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<tr>
<td>French / German / Spanish culture – monuments, delicacies, wines visa vis Indian culture Diwali festival</td>
<td>Vocabulary of clothes, Accessories, Cuisines, Beverages, Adjectives</td>
<td>Presentations by students, situation based conversations</td>
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<tr>
<td>Receiving Guests/ Entertaining people / Good Bye’s</td>
<td>Customs, Traditions, Manners, welcome &amp; Audie’s</td>
<td>Activities, Role play, Assignments</td>
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FOURTH SEMESTER
BCSL202 COMPUTER ARCHITECTURE & ORGANIZATION (3-1-0-4)
Total Hrs: 45

Pre-requisite: - ---
Course Objectives: ---
1. To make the students acquainted with the organization and architecture issues of digital computers.
2. To understand the design and working of various organizational blocks.
3. To study in detail the operation of the arithmetic units, control units and the concept of pipelining.
4. To study the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcome:
Student shall be able to:
1. To analyze the basic structure and operation of a digital computer.
2. Ability to think critically, independently, and quantitatively about computer processing and sequencing of the instructions.
3. Analyze the arithmetic unit by studying various algorithms for number operations.
4. Be familiar with organization and design of memory Concept, structure and operation of Cache memory and virtual memory.
5. Reason systematically about impact of design and ways of communicating with I/O devices and interfaces.
6. Apply the concept of pipelining to improve the performance of Computer architecture.

Unit I: Basic Structure Of Computers (7 Hrs)
Functional units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.

Unit II: Basic Processing Unit (8 Hrs)
Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Microprogrammed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit (8 Hrs)
Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth’s Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System (8 Hrs)
Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input/Output Organization (7 Hrs)
I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC Philosophy: (7 Hrs)

Text Books:

References Books:

BEEL310 POWER ELECTRONICS (4-0-0-4)
Total Hrs: 45

Pre-requisite: - Basic Electrical
Course Objectives:
1. To study characteristics of modern power electronic devices.
2. Design and application of power electronics circuits in the field of AC /DC power generation.
3. To study transmission and energy conversion using switching devices.
4. To study the design procedure for protection circuits.

Course Outcome:
Student shall be able to
1. Understand the components of power electronics devices, characteristics and practical issues in power electronics circuit design.
2. Understand the need and operation of power converter and design AC to DC converter for given specification.
3. Apply skill to design converter for drive control and AC-AC converters for given specification.
4. Understand the theory and operation of high-frequency switching circuits for different power conversion applications and able to design protection circuits.
5. Understand the need, working principle and design & analyze DC-DC converter for given specification.
6. Apply knowledge and analysis techniques to design AC-DC power converter with given specification and use methods for reduction of harmonics distortions.

Unit I: SCR and Its Characteristics (07 Hrs.)
Gate characteristics, SCR turn off, ratings, series and parallel connections of SCRs. Triac and its applications, Unijunction transistors, Triggering circuits and opto couplers.

Unit II: Line Commutated Converters (08 Hrs.)
Working of single pulse converter, two pulse midpoint converter, three pulse midpoint converter and 3 phase six pulse bridge converter, effect of source inductance in converters, effect of tree wheeling diode.

Unit III: Single Phase And Three Phase Half Controlled Converters (08 Hrs.)
Speed control of d.c. motors using line commutated converters. Cycloconverters (single phase).

Unit IV: Static Controllable Switches (08 Hrs.)
Characteristic and working of MOSFET Gate turn off Thyristers and insulated gate bipolar transistor, protection of SCR gate circuit protection, over voltage and over current protection, snubber circuit design, converter circuit faults and their protection.

Unit V: D.C. Choppers (07 Hrs.)

Unit VI: Single Phase And Three Phase Inverters (07 Hrs.)
Single phase and three phase bridge inverters, commutation and trigger-circuits for forced commutated thyristor inverters. Output voltage control, Harmonics in output voltage waveform, Harmonic attenuation by filters. Harmonic reduction by pulse width modulation techniques. Analysis for single pulse width, modulation. Working of current source inverters few applications of inverters. Advanced topics on the subject

Text Books:

Reference Books:

BEEP310 POWER ELECTRONICS (0-0-2-1) Total Hrs: 20

List of Practicals:
1. Design a circuit to verify V-I characteristics of SCR and determine the break over voltage on state resistance holding current & Latching current.
2. Design a circuit to verify V-I characteristics of TRIAC for both forward and reverse conduction
3. Design a circuit to verify V-I characteristics of UJT
4. Implement a triggering circuit for SCR using UJT as Relaxation Oscillator.
5. Design a circuit and obtain output characteristics and transfer characteristics of IGBT
6. Design series inverter using SCR and Record the frequency of operation & observe its waveforms
7. Design a circuit for Class A commutation of a Thyristor
8. Design a circuit to convert variable DC voltage from fixed DC input voltage & plot a graph of Output voltage v/s Duty cycle
9. Design a 1-phase full wave inverter using MATLAB Software & Plot the characteristics.
10. Design a 3-phase bridge inverter using PSim Software & Plot the characteristics.
11. Design a circuit to control the speed of induction motor using thyristor & Plot speed v/s α
12. Design a circuit to control the speed of DC shunt Motor using thyristor
13. Design a single Phase half wave inverter using SCR with RC triggering
14. Design Parallel Inverter using SCR and Record the frequency of operation & observe its waveforms
15. Open Ended experiment

BECL301 DIGITAL SYSTEM DESIGN (3-1-0-4) Total Hrs: 45
Pre-requisite : Basic Electronics

Course Objectives:
1. To impart fundamentals of digital system design
2. To study system modeling using VHDL.
3. To study CPLD and FPGA Architecture.

Course Outcomes:
Student shall be able to:
1. Demonstrate basic knowledge in the hardware describing language VHDL
2. Able to modify system to remove delay in the sequence of generation by introducing signal driver concept.
3. Able to apply standardization while writing code with standard, package, programs, sub-programs for easy test-simulation
4. Able to write VHDL code for block generation of complex and simple Circuits of digital systems.
5. Able to understand and develop new methods of operation in digital system in finite and infinite loop of iteration cycle for said limit.

Unit I: Introduction (8 Hrs)
Introduction to VHDL, Methodologies, design units, data objects, VHDL data types, Attributes.

Unit II: VHDL Statements and Concept of Delays. (7 Hrs)
Concurrent and sequential statements, inertial and transport delays, delta delay, signal drivers.

Unit III: Programming Concepts. (7 Hrs)
Subprograms – Functions, Procedures, generic, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

Unit IV: Combinational System Design (8 Hrs)
Combinational logic circuit design and VHDL implementation of following circuits – fast adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

Unit V: Sequential System Design (8 Hrs)
Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC).

Unit VI: Introduction to PLDS (7 Hrs)

Advanced topics on the subject

Text Books:

Reference Books:
1. J Bhasker : VHDL Primer Pearson Education
3. Chales H. Roth : Digital System Design Using VHDL
5. Zainalabedin Navabbi : VHDL
6. D. Smith : VHDL

BECP301 DIGITAL SYSTEM DESIGN
(0-0-2-1)
Total Hrs : 20

List of Practicals:
1. Design 4:1 multiplexer and write a VHDL code for same using data flow style of modeling.
2. Design Arithmetic and Logic Unit for 16 bit operation (Addition, Subtraction, Multiplication, Division, ORing, ANDing, XORing, XNORing)
3. Design BCD to seven segment decoder & display “GHRCE”.
4. Design half adder and full adder and write a VHDL code for same using dataflow style of modeling.
5. Design & write Test bench for an 8 bit adder having range 0 to 255 decimal.
6. Design 4-to-16 decoder by combining two 3-to-8 decoders and write a VHDL code for same using structural style of modeling.
7. Write a VHDL code for to design Flip-Flop (D, T, and SR) using behavioral style of modeling.
8. Write a VHDL code for 3-bit up-down counter using sequential style of modeling.
9. Write a VHDL code for high speed two-pole switch for power controlling on FPGA using sensitivity list.
10. Design of Finite state machine to detect a sequence “1011”using Mealy model and write VHDL code for the same.
11. Open ended :Write a VHDL code for to divide clock frequency of 50 Mhz.

BECL205 FIELD THEORY (3-1-0-4)
Total Hrs : 45

Pre-requisite: Applied Physics

Course Objectives:
1. To study electric and magnetic fields from stationary and dynamic charge and current distributions.
2. To study and understand properties of waves its propagation and waveguides.
3. To impart the knowledge of radiations, dipoles and potentials in Electromagnetic fields.
4. To inculcate the fundamentals of Antennas and its parameters

Course Outcomes:
Student shall be able to:
1. Use Gauss’s Law, Coulomb’s law to find fields and potentials for a variety of situations including charge distributions and understand the meaning of divergence to calculate line integrals, surface and volume integrals.
2. An ability to analyze and classify magnetic materials, and solve magnetostatic field problems using Biot-Savart law and Ampere’s circuit law with the associated boundary conditions.
3. Understand Maxwell’s Equations for time-harmonic fields and the boundary conditions across media boundaries.
4. Analyze electromagnetic wave propagation and attenuation in various medium and propagation through boundaries between media be able to compute the Poynting vector and identify the power flow direction.
5. Understand the definition of waveguide and how waveguide modes are formed.
6. Understand antenna characteristics including gain, beamwidth, polarisation and near and far field patterns.

Unit I: Electrostatics (7 Hrs)
Introduction to Cartesian, cylindrical and spherical coordinate systems. Electric field intensity, flux density, Gauss’s law, divergence, divergence theorem, Electric potential and potential gradient.

Unit II: Magnetostatics (7 Hrs)
Current density and continuity equation, B-S law, Ampere’s circuital law and applications, Magnetic flux and Flux density, Scalar and Vector magnetic potentials.

Unit III: Maxwell’s Equations And Boundary Conditions (6 Hrs)
Maxwell’s equations for steady fields. Maxwell’s equations for time varying fields. Electric and magnetic boundary conditions.

Unit IV: Electromagnetic Waves (9 Hrs)
Electromagnetic wave equation, wave propagation in free space, in a perfect dielectric, and perfect conductor, skin effect, Poynting vector and Poynting theorem, reflection and refraction of uniform plane wave at normal incidence plane, reflection at oblique incident angle

Unit V: Waveguides (9 Hrs)
Introduction, wave equation in Cartesian coordinates, Rectangular waveguide, TE, TM, TEM waves in rectangular guides, wave impedance, losses in wave guide, introduction to circular waveguide.

Unit VI: Radiation (7 Hrs)
Retarded potential, Electric and magnetic fields due to oscillating dipole (alternating current element), power radiated and radiation resistance, application to short monopole and dipole. Antenna Efficiency, Beamwidth, Radiation Intensity, Directive Gain Power Gain & Front To Back Ratio.

Advanced topics on the subject

Reference Books:

BECL302 ANALOG SYSTEMS & DESIGN (3-1-0-4) Total Hrs : 45

Pre-requisite: Basic Electronics
Course Objectives:
1. To understand analog circuits and systems.
2. To know linear and nonlinear applications of operational amplifier ICs.
3. To study frequency response of different circuits based on operational amplifier applications.
4. To study and use different ICs such as timers for applications.

Course Outcome:
Student shall be able to:
1. Understand fundamentals, electrical parameters and specifications of operational amplifier.
2. Design op amp circuits for linear applications.
3. Infer the DC and AC characteristics of operational amplifiers and its effect on output.
4. Design filters (up to 6th order) and oscillators (sine, triangular, square and saw tooth) using op amp for real time applications.

5. Develop an intuition for analog circuit behavior in nonlinear operation
6. Use special ICs in analog system design

Unit I: Operational Amplifier Fundamentals (8 Hrs)
Operational Amplifier, Basic Op-Amp Configuration, an Op-Amp with Negative Feedback, Voltage Series and Voltage Shunt Configurations, Difference amplifiers, Instrumentation Amplifier, Specification of an Op-Amp, Offset Voltages and Currents, CMRR, Slew Rate

Unit II: General Linear Applications (8 Hrs)
Constant Current Source and Voltage Source, Summing, Scaling and Averaging Amplifiers, Voltage To Current Converter with Floating And Grounded Load, Current To Voltage Converter, Integrator and Differentiator

Unit III: Structure Of Op-Amp (7 Hrs)
Differential Amplifier, Cascaded Differential Amplifier Stages and Level Translator, AC and DC Analysis of Cascade Amplifier, Design of two stage direct-coupled amplifier.

Unit IV: Active Filters And Oscillators (7 Hrs)
Classification of Filters, Active Filters, First to Sixth –Order Butterworth filter, Multiple–Feedback Filters (Band Pass And Band Reject Filters) IGMF configuration, All Pass Filter, Cascade Design Of Filters, Classification of Oscillators, Design of Op-amp Based Phase Shift And Wein Bridge Oscillators, Square, Triangular And Saw Tooth Wave Generators

Unit V: Non-Linear Circuits (8 Hrs)
Schmitt Trigger, Voltage Comparator, Voltage Limiters And Window Detector, Clippers And Limiters, Peak Detector, Precision Rectifiers, Analog Switches

Unit VI: Special Ics Applications (7 Hrs)
The 555 Timer, Phase Locked Loops IC565, ICL8038 & XR2206 Function Generator, Voltage Controlled Oscillator Basic Operation, IC based Voltage Regulator Circuits, Dual Track Voltage Regulator, Three - Terminal Regulator(Fixed Regulator Voltage Adjustment And Current Boosting Of Fixed Regulator , Merits And Drawbacks Of Linear Regulators

Advanced topics on the subject

Text Books:

Reference Books:

BECP302 ANALOG SYSTEMS & DESIGN (0-0-2-1) Total Hrs : 20
List of Practicals:
1. Design opamp as Adder & Differential Amplifier. Verify its simulation results on microcap.
2. Design opamp as Integrator circuit. Plot frequency response for the same. Verify its simulation results on microcap.
3. Design opamp as Differentiator circuit. Plot frequency response for the same. Verify its simulation results on microcap.
4. Design 1st order & 2nd Low Pass Filter. Plot frequency response characteristics. Verify its simulation results on microcap.
5. Design Clipper Circuit using IC 741. Verify its simulation results on microcap.
7. Design opamp as Wein Bridge Oscillator. Plot frequency response for the same. Verify its simulation results on microcap.
8. Design Square Wave Generator using IC 741. Verify its simulation results on microcap.
10. Design Low Voltage Regulator using IC 723. Simulate and observe the regulated waveform on microcap.

BECP206 MODELING & SIMULATION (0-0-2-1) Total Hrs : 20
Pre-requisite: Basic Electronics
Course Objectives:
1. To select and apply appropriate simulation tools and techniques.
2. To study the modeling of systems using various tools.
3. To obtain and study the results of models designed on advanced simulation tools.

Course Outcomes:
Student shall be able to:
1. Can analyze the structure and characteristics of Basic CMOS design(Inverter, logic gates)
2. Design and analyze memory systems using CMOS technology.
3. Use industry-standard EDA tools for IC design.
5. Design digital and analog circuits at transistor level and develop the corresponding mask layout
6. Perform AC and DC analysis for measuring response

Practical List
1) Introduction of T Spice & Tanner tool
2) Design current mirror using tanner tool,
3) Design sample and hold circuit using tanner.
4) Design cascade current mirror using tanner.
6) Design Three MOSFET voltage divider using tanner
7) Design common source amplifier using tanner.
8) Design Feedback amplifiers.
9) Design a Pulse Code Modulation System using simulink
10) Digital Waveform Generation (Approximating a Sine Wave) using Simulink
11) Design of Signal processing blockset using MATLAB
12) Design of multi-order system using MATLAB and plot its time domain & Frequency domain response
12) Open Ended modeling experiments

MBL103: GENERAL PROFICIENCY-III: Hobby classes
Course Objectives:
1. To enhance the inherent qualities of oneself and provide a platform to show hidden talent.
2. To nurture one's special capability and interest in activities like sports, drama, singing.
3. To help express oneself and be more compatible with outer world in the hobby domain.

Course Outcomes:
Student shall be able to
1. Explore and demonstrate the inherent talents within.
2. Fruitfully engage themselves in creative activities during spare time.
3. Provide logical solution as a result of hobby activity exhibited.
FIFTH SEMESTER

BECL303: MICROPROCESSOR BASED SYSTEMS (3-1-0-4)  Total Hrs : 45
Pre-requisite: --

Course Objectives:
1. To study concepts of microprocessors family
2. To study interfacing of microprocessors with peripheral devices.
3. To understand the design of microprocessor based systems

Course Outcome:
Student shall be able to:
1. Identify and explain functionality of various blocks of microprocessor.
2. Design, code and debug the assembly language programs that demonstrate concepts of processor architecture and program development environment
3. Design and implement floating point operations using co processor.
4. Interface IO devices such as 8255 PPI, A/D, D/A converter and 8253 Timer IC.
5. Design and develop complete microprocessor based real time systems.
6. Understand working prototype for advanced microprocessor.

Unit I: Introduction to 8086 Microprocessor (07 Hrs)
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086 / 8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on- Clock Speed, Concurrent operation of EU and BIU, Memory Organization & Interfacing.

Unit II: 8086 Programming (08 Hrs)
Addressing modes, Instruction set, Programming examples, Pseudo Opcodes, Assembler Directives. Introduction to Software and Hardware tools. [Cross assemblers, Logic analysers, Emulators, Simulators], Architecture.

Unit III: Co-processor Interfacing (07 Hrs)
8086 / 88 Maximum Mode, Architecture and Programming of 8087 and its Interfacing with 8086/8088

Unit IV: 8255 Interfacing (08 Hrs)
Interfacing and programming of Peripheral 8255, Interfacing of ADC, DAC & applications. Interfacing and programming of Peripheral 8253

Unit V: Special Peripheral Interfacing (07 Hrs)
Architecture, Interfacing and programming of Peripherals, 8251 & DMA Controllers 8237.

Unit VI: Advanced Microprocessor Stu(08 Hrs)
80386 Architecture, Real and Protected Mode, Register Model, Memory Management Unit, Latest trends in microprocessors systems.

Advanced topics on the subject

Text Books:

BECP303 MICROPROCESSOR BASED SYSTEMS (0-0-2-1)  Total Hrs : 20

List of Practicals:
1. To study the architecture of µc 8086 microprocessor & do some examples program
   Addition of two 8-bit numbers
   Multiplication of two 16-bit numbers
2. Write a program (WAP) to identify smallest/largest number from given string of 10 bytes data.
3. WAP to arrange a given 6-byte string in ascending/descending order.
4. To write program to convert a 16 bit binary number into equivalent BCD numbers.
5. WAP to find square and cube of number
6. Write assembly program to generate Fibonacci series.
7. WAP to reverse a string from given string of 10 bytes data.
8. WAP to perform inverse of 3X3 matrix & store result in memory location
9. WAP to display “GHRCE"; on monitor screen by using DOS functions.
10. Write assembly program to interface stepper motor with 8086 using dos function.
11. An open end project

BHUL301 ENGINEERING ECONOMICS AND INDUSTRIAL MANAGEMENT (4-0-0-4)  Total Hrs : 40
Pre-requisite: -- Communication Skills
Course Objectives:
1. To deal with the concepts of economics and management with and engineering perspective
2. To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To cultivate the practices of independent learning on the part of the students that will prepare them to function effectively for diverse careers and lifelong learning.
5. To enable students to understand their role as engineers and their impact to society at the national and global context.

Course Outcome:
Student shall be able to:
1. Understand the interaction between engineering, business management, technological environmental spheres in modern society
2. Practice basic principles of managerial economics, accounting and financial management technique for effective business decision making

Unit I (7 Hrs)
Demand Utility and indifference curves, Approach to Analysis of demand, elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity, Marginalism

Unit II (7 Hrs)
Laws of Return and costs, price and output determination under perfect competition, monopoly, monopolistic, competition, oligopoly, Depreciation and methods for its determination.

Unit III (7 Hrs)
Functions of central and commercial banks Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Monetary and cycles, New economic policy, Liberalization, Globalization, Privatization, Market friendly state. Fiscal policy of the government, Meaning and phases of business.

Unit IV (6 Hrs)
Definition, Nature and scope of management, Functions of management- Planning, organizing, Directing, Controlling, Communicating

Unit V (7 Hrs)
Meaning of marketing management, Concept of marketing, Marketing Mix, Administrative and cost plus pricing, Channel of distribution, Advertising and sales promotion.

Unit VI (6 Hrs)

Text Books:
2. Dr D. M. Mithani, Managerial Economics: Theory & Applications, Himalaya publication, 2008

Reference Books:
Different Types Of Signals; Linearity, Time 2.
Invariance And Causality; Impulse Sequence,
Impulse Functions And Other Singularity Functions
Time-Domain Representation And Analysis Of LTI 3.
Systems Based On Convolution And Differential
Equations, Convolution Sum, Convolution Integral

Unit III: Continuous Time Fourier Transform
(Cff) (6 Hrs)
Representation Of Aperiodic Signal, Fourier 5.
Transform For Periodic Signals, Properties Of
CTFT, Properties Of CTFT, Convolution Property

Unit IV: Discrete Time Fourier Transform 6.
(8 Hrs)
Representation Of Aperiodic Signal, Fourier
Transform For Periodic Signals, Properties Of
CTFT, Properties Of CTFT, Convolution Property.

Unit V: Sampling (6 Hrs)
Sampling Theorem, Effect Of Under Sampling, and
Sampling Of Discrete -Time Signals.

Unit VI: Information Theory (8 Hrs)
Information measures, Entropy, Chaney capacity of
discrete & continuous channels, Shannon Hartley
Theorem Huffman Coding(upto 3rd Order).
Advanced topics on the subject

Text Books:
1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid,
2. Fawwaz Ulaby Andrew Yagle, Engineering

Reference Books:
1. James H. McClellan, Signal Processing
First,Volume 1, First Edition, Pearson/Prentice Hall,
Feb 2006
2. P.Ramesh Babu, R.ananda Natrajan, Signals
3. B.P. Lathi, Principles of Signal Processing and
Linear Systems, First Edition, Oxford University
Press, July 2009

BEEL312 CONTROL SYSTEM ENGINEERING
(4-0-0-4) Total Hrs : 40

Pre-requisite: Mathematics – III

Course Objectives:
To impart the knowledge of fundamental concepts
of control systems and mathematical modeling of
the system,
1. To understand the concept of time response and
frequency response of the system and to use for
stability & analysis of the system
2. To study and design compensators and controllers
for control systems.
3. To model systems and signal flow graph and
evaluate the properties of the overall systems.

Course Outcomes:
Student shall be able to:
1. Develop the mathematical model for
electromechanical system used in the analysis and
design of control system

Determine Transient and Steady State behavior of
first and second order systems using standard test
signals.
Analyze linear time invariant systems for absolute
stability and relative stability using Routh–Hurwitz
criterion.
Apply root locus technique to design feedback
control systems and analyze effect of adding poles
and zeros.
Apply different frequency response methods to
analyze the stability of linear system in terms of gain
and phase margins
Analyze the behavior and structure of a state-space
model and obtain transfer-function models using
state space approach

UNIT I : Mathematical Modeling And Control
System Components. (7 Hrs.)
Introduction to need for automation and automatic
control, use of feedback, broad spectrum of system
application, Mathematical modeling, (Electrical &
electromechanical) diff. Equations, transfer
functions, block diagram, signal flow graphs,
application to elementary systems, simplifications,
effect of feedback on parameter variations,
disturbance signal servomechanism and regulators,
Control system components, electrical
electromechanical, their functional analysis and
input output representation.

UNIT II : Time Response Analysis (06 Hrs.)
Time response of system, first order and second
order system, standard inputs, concept of gain and
time constants, Steady state error, type of control
system, approximate methods for higher order
system.

UNIT III: Stability Of Control Systems. (06 Hrs.)
Stability of control systems, conditions of stability,
characteristics equations, Routh–Hurwitz criterion,
special cases for determining relative stability.

UNIT IV: Root Locus Analysis (07 Hrs.)
Root location and its effect on time response,
elementary idea of root locus, effect of addition of
pole and zero on proximity of imaginary axis.

UNIT V : Frequency Response Analysis (7 Hrs.)
Frequency response method of analyzing linear
system, Nyquist and Bode Plots, Stability and
accuracy analysis from frequency response, open
loop and close loop frequency response, Nyquist
Criterion, Effect of variation of gain and addition of
pole and zero on response plot, stability margin in
frequency response.

UNIT VI : State Variable Techniques (07 Hrs.)
State variable method of analysis, characteristics of
system state, choice of state variables,
representation of vector matrix differential equation,
standard form, relation between transfer function
and state variables.

Advanced topics on the control system.

Text Books:
1. B. C. Kuo : Automatic Control Systems

Reference Books:

BEEP312 CONTROL SYSTEM ENGINEERING
List of Practicals:
1. To Plot the characteristics between position and phase of synchro transmitter
2. To measure basic step angle of stepper motor.
3. To plot speed-torque characteristics and speed vs back emf characteristics of ac servomotor.
4. To obtain the time response on a linear simulator kit.
5. To plot characteristics between the position and voltage of potentiometer.
6. To plot the graph between angular position of transmitter and receiver by using synchro transmitter and receiver pair.
7. To determine the transient response of mechanical system by using MATLAB/SIMULINK.
8. Write a program to plot root locus of a any system by using MATLAB software.
9. To find the transient response of second order RLC series circuit by using MATLAB/SIMULINK
10. Write a program to plot Bode plot of any system by using MATLAB software.
11. To implement P, PI and PID controller for a system in MATLAB/SIMULINK.
12. To determine the characteristics of positional error detector by using potentiometer

BECL403 DIGITAL COMMUNICATION (4-0-0-4)
Total Hrs : 45
Pre-requisite: Communication Electronics

Course Objectives:
1. To understand the basic knowledge of digital communication system.
2. To study the issues such as coding, multiple access, error probability, algorithms etc for analog and digital communication.
3. To impart the knowledge of design, analysis & comparison of digital communication systems.

Course Outcome:
Student shall be able to:
1. Understand baseband systems, sampling, quantization and source coding for digital transmission and able to conduct a Matlab-based design project
2. Validate different techniques of modern digital communication systems such as line coding, multiplexing, ISI, correlative coding.
3. Analyse different digital modulation & demodulation techniques and evaluate their performance in terms of Bit Error rate by demonstrating it using MATLAB/Simulink.

Design digital systems using appropriate mathematical techniques such as Grahm-Schmidt Procedure and signal-space concept.
Solve various source/channel coding and error-control coding techniques.
6. Understand spread spectrum Techniques and its performance parameters for any digital communication system.

Unit I (8Hrs)
Digital base band modulation techniques : Bandwidth of digital Data, Base band system, Formating textual Data, Messages, characters, and symbols, Formatting Analog Information, Sources of Corruption, . Uniform and non uniform quantization, Base band Modulation, Correlative Coding, Formatting analogue information.

Unit II (7Hrs)

Unit III (8Hrs)
Baseband Modulation and demodulation techniques: Digital Band pass Modulation techniques, Detection of signals in Gaussian noise, Coherent detection, Non coherent detection, Complex envelop, Error performance for Binary system, M-ary signaling and performance, Symbol error performance for M-ary Systems, Bit error Rate calculations.

Unit IV (7Hrs)
Advanced Modulation Method Gram – Schmitt procedure, signal space representation of modulated signals nonlinear modulation methods with memory error probability and optimum receivers for AWGN channels. The signal space concept

Unit V (7Hrs)
Block and convolutional channel codes Linear block codes, generator matrix and parity check matrix, some specific linear block codes, cyclic codes, transfer function of a convolution code, optimum decoding of convolutional codes- Viterbi algorithm distance properties of binary convolutional codes

Unit VI (8Hrs)

Advanced topics on Digital Communication

Text Books:

Reference Books:
BECP305 ELECTRONIC WORKSHOP
PRACTICE-I (0-0-2-2)
Total Hrs: 20
Pre-requisite: -

Course Objectives:
1. To use & analyze and identify the different types of Integrated Circuits
2. To understand the identification and computer aided design of PCB layout using different software tools.
3. To enable firsthand experience of components, their purchase, assembly, testing and trouble shooting.
4. To perform single sided and double sided PCB design using TFT machine by using a various method (Etching, Drilling, Mounting and Soldering of Components).
5. To do Mini Projects using Analog and Digital IC’s, active and passive components for Linear and Non-linear electronics circuits by organizing and managing time and resources effectively.
6. To familiarize students with modern engineering software tools and equipment to analyze Electronics and Telecommunication engineering problems

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Demonstrate familiarity with electronic components and related measurement equipments
2. Understand use of meters and test equipment to measure electrical quantities.
3. Identify practical issues that arise in circuits and design PCB using artwork.
4. Understand & demonstrate different kinds of PCB soldering and desoldering methods for problem solving
5. Design PCB using exposing & Etching methods.
6. Apply the basic principles of embedded system design and development, including using a contemporary computer environment and development board to implement a microcontroller-based embedded system design

List of Practicals:
- Study of electronics and Surface Mounting Devices (SMD) components and their identifications
- Study of operation of CRO and Multi-meter
- Pattern identification and working test of electronics components using CRO, Multi-meter, LCR-O-meter.
- Study of printed circuit board (PCB) layout designing and preparation of PCB artwork using Graph
- Perform soldering and disordering on dot printed circuit board.
- Measuring value for different type of Transformers, Switches, and Relays. Using multimeter.
- Preparing of PCB artwork using OrCAD.
- Knowing various Cables, & Connectors. used in electronics system design.
- Design and learning PCB Exposing methods & Etching methods.
0. Understand 8051 Microcontroller & downloading program using Power lab.

BECP 311 Self study:
CO1. Analyse recent trends and advanced topics in the Electronics & allied areas to meet desire needs with appropriate consideration for societal applications.
CO2. Understand the technological enhancement in the Electronics & allied areas and proposed solution for advancement.
CO3. Select and use appropriate techniques, skill & modern software simulation tools for advanced engineering practices.
CO4. Design & develop real time applications.
CO5. Apply knowledge to demonstrate electronics engineering practices.
CO6. Assembled E-learning resources like MOOC’s, NPTEL, Virtual Labs etc. with application development
SIXTH SEMESTER
BECL306 MICROWAVE ENGINEERING (3-0-0-3)  Total Hrs : 45

Pre-requisite: - Field Theory

Course Objectives:
1. To understand the concepts of microwave engineering
2. To study of microwave components, and microwave circuits.
3. To study and understand microwave test bench using Klystron amplifier and oscillator and its applications
4. To study carcantron and magnetron.

Course Outcomes:
Student shall be able to:
1. Developing an understanding the fundamental principles of Microwave antenna and its characteristics.
2. Able to describe microwave vacuum tubes such as klystron, TWT, magnetron amplifier and oscillator
3. Be able use S parameter to determine circuit properties of passive/active microwave devices
4. Able to describe characteristic of various diodes and transistors at microwave frequency.
5. Able to apply analysis method to determine circuit property of MIC
6. Able to handle microwave equipment and Measure VSWR, attenuation, frequency and other parameter

Unit I: Antenna (8 Hrs)
Two elements arrays and their directional characteristics, linear arrays analysis, broadside and end fire arrays pattern multipication, binomial arrays, design of broadest array for a specific pattern Basic principles of parabolic reflectors, analysis and power pattern, lens antennas folded dipole turnstile and Yagi antenna, log –periodic antennas horn antennas, traveling wave antennas and case grain antennas Microstrip antenna – Basic Characteristics, Feeding Methods, Method of 1. analysis Smart Antenna : Introduction, Benefits of 2. Smart Antennas

Unit II: Microwave Tubes (8 Hrs)

Unit III: Waveguide Components And Applications (8 Hrs)

Unit IV: Microwave Solid State Devices (8 Hrs)
Transit time limitation in transistor, microwave bipolar junction transistor ,Power frequency limitation, Microwave FET, HEMT. TEDs – Introduction, Gunn diode & its modes of operation. Avalanche Transit Time Devices– Introduction, IMPATT and TRAPATT Diodes – Principle of operation and characteristics. Comparison , parametric amplifier

Unit V: Strip Lines & Monolithic Microwave Integrated Circuits (8 Hrs)
Microstrip lines : Introduction , Hybrid Model Analysis, characteristic impedance ,losses, quality factor of Microstrip lines . Slot line and coplanar strip lines. Microstrip circuit design – Impedance transformers, Filters, Isolator and Phase-shifter ,parallel strip lines , distributed lines MMIC : Introduction , substrate materials, conductor materials, dielectric materials , resistive materials , MMIC growth , Fabrication technique , examples

Unit VI: Microwave Measurements (5 Hrs)

Text Books:
Monojit Mitra, Microwave Engineering

Reference Books:

BECP306 MICROWAVE ENGINEERING (0-0-2-1)  Total Hrs : 20

List of Practicals:
1. To verify relationship between power & repellar voltage in Reflex Klystron
2. To verify relationship between frequency & repellar voltage in Reflex Klystron.
3. To measure and verify power distribution of E-plane and H-plane Tee & determine isolation and coupling co-efficient.
4. To verify power distribution of Magic Tee.
5. To determine coupling factor and directivity of directional coupler.
6. To determine isolation & Insertion loss of Circulator.
To plot standing wave ratio using Slotted line section & find out guide wavelength.
To determine the frequency and wavelength in a rectangular wave guide working on TE10 mode.
To measure the polar pattern and gain of a wave guide horn antenna.
To plot the V-I Characteristics of the PIN diode.
An open end project

BCSL410  SOFT COMPUTING (3-0-0-3) Total Hrs : 45

Course Objectives:
1. To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.
2. Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world problems.
3. To familiarize with soft computing concepts.
4. To introduce the ideas of Neural networks, fuzzy logic and use of heuristics based on human experience.
5. To introduce the concepts of Genetic algorithm and its applications to soft computing using some application

Course Outcome:
Students shall be able to
1. Understand and evaluate the soft computing technique, Recognize it's feasibility for design of 1. models.
2. Apply neural network learning to pattern classification and regression problems along with 2. mathematical background for carrying out the optimization .
3. Understand basics of fuzzy logic and apply it for reasoning to handle uncertainty and solve 1. engineering problems
4. Evaluate and compare solutions by various soft 2. computing approaches for a given problem
5. Identify and apply existing software tools of Fuzzy logic to solve real problems and their roles in 3. building intelligent machines.
6. Familiarize with genetic algorithms and other 4. random search procedures and apply it to combinatorial optimization problems

Unit I  Comparison Of Soft Computing Methods (7 Hrs)

Unit II  Neural Networks (8 Hrs)

Unit III  Fuzzy Set Theory (8 Hrs)

Unit IV  Neuro-Fuzzy Modelling (7 Hrs)

Unit V  Neuro-Fuzzy Controller In Engineering Applications (8 Hrs)

Unit VI  Genetic Algorithm (7 Hrs)

Text Books:

Reference Books:
Jack N. Zurada, Introduction to Neural Network, Jaico Publishers
Krishna Mehrotra, Sanjay Ranka,Chilukuri Mohan, Elements of Artificial Neural Networks, Penram International Publishing Pvt. Ltd.
David E. Goldberg, Genetic Algorithm, Pearson Education
Amritvalli, Neural Networks and Fuzzy System, Prentice Hall of India Pvt.Ltd.

BECL404 SWITCHING THEORY & AUTOMATA (3-0-0-3) Total Hrs: 45
Pre-requisite: - Digital system Design

Course Objectives:
To provide adequate knowledge of Switching theory & automata
Students must show mastery in the three basic areas of mathematics: analysis, algebra, and topology /geometry on a basic level in lower division courses
To understand design of combinational logic.

Course Outcome:
Student shall be able to:
1. Use Boolean algebra in performing computations and simplification of algebraic expressions.
2. Design minimum contact network by using different methods.
3. Design Threshold elements of the network.
4. Design, identify and detect fault detection in combinational logic circuits using various methods.
5. Design state elements and finite state machine (FSMs) for various applications.
6. Analyze and design sequential digital systems for various sequential machines.

**Unit I:** (8 Hrs)
Switching algebra and functions, Boolean algebra, Boolean functions, Minimization of Booleans. Function using tabulation method, sets, relation and lattices, venn diagram.

**Unit II:** (8 Hrs)
Design of combinational logic circuits, contact networks, functional decomposition and symmetric functions.

**Unit III:** (8 Hrs)
Threshold logic, threshold elements, capabilities and limitations of threshold logic, elementary properties, linear separability, unite functions, synthesis of threshold functions, cascading of threshold elements.

**Unit IV:** (8 Hrs)
Reliable design and fault diagnosis, fault detection in combinational circuits, fault location experiments, fault detection by Boolean differences, path, sensitizing method, multiple fault detection using map method failure-tolerant design.

**Unit V:** (8 Hrs)
Finite state machine- Mealy and Moore synchronous sequential circuits, Design capabilities, Minimization and transformation of sequential machine, Design of fundamental mode and pulse mode circuits.

**Unit VI:** (5 Hrs)
Structure of sequential machine, lattice of closed partitions, state assignment using partitions, Reduction of output dependency, Input Independence and autonomous clock, homing sequence, synchronizing sequence, Adaptive Distinguishing experiments.

**Practical:** Minimum 8 experiments based on above syllabus. Practical should include experiments on fault – finding and trouble – shooting.

Advanced topics on Switching theory.

**Text Books:**

**Reference Books:**
2. Radomir S. Stanković, Jaakko Astola, From Boolean Logic to Switching Circuits and Automata, Springer.

Adesh K. Pandey, An Introduction to Automata Theory & Formal Languages, S. K. Kataria & Sons

**BECL405 DIGITAL SIGNAL PROCESSING**
(4-0-0-4) Total Hrs : 45
Pre-requisite: Signal & System

**Course Objectives:**
To study signals for different kinds of applications in general and infer information from deterministic and random signals.
1. To understand the implementation and design digital filters.
2. To analyze signals using the discrete Fourier transform.
3. To understand circular convolution, its relationship to linear convolution.

**Course Outcomes:**
Student shall be able to:
1. Plot, identify and evaluate discrete-time signals (CO1).
2. Perform mathematical analysis of discrete signals using Fourier transform and Z transforms.
3. Apply appropriate filters (IIR, FIR) for discrete signal processing for various applications.
4. Design different filters using various methods in simulation environment.
5. Apply different methods for faster computation of DSP processor.

**Unit I**
(7Hr)
Discrete time signals and systems, classification of discrete time systems and its properties, Linear convolution, Cross Correlation, Autocorrelation of discrete signals, sampling theorem & sampling process.

**Unit II**
(8Hr)
Frequency domain representation of discrete time signals and systems, Fourier transform of discrete time signals, properties of discrete time, Fourier transform.
The Z-transform, Definition, properties of ROC for the Z-transform, Properties of Z-transform, Inverse Z-transform using contour integration, complex convolution theorem, Unilateral Z – transform.

**Unit III**
(8Hr)
Transform analysis of LTI system & structure for discrete – time system. Frequency response of LTI system, Relationship between magnitude & phase response, Block diagram representation & signal flow graph representation of IIR and FIR systems. Linear constant coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures.

**Unit IV**
(7Hr)
Filter design Techniques: Design of discrete time IIR filters from continuous time filters, Frequency transformation of low pass IIR filters, Design of FIR filters.
filters by windowing, FIR filter design by Kaiser and Hamming window method.

**Unit V** *(8Hr)*

**Unit VI** *(7Hr)*

Advanced topics on DSP

**Text Books:**

**Reference Books:**

**BECP405 DIGITAL SIGNAL PROCESSING (0-0-2-1)** *(Total Hrs.: 20)*

**List of Practicals:**

**DIGITAL SIGNAL PROCESSING**

1. Write a MATLAB program to plot standard discrete time signals (unit sample, unit step, unit ramp, exponential, sine & cosine signals)
2. Write a MATLAB program to evaluate the linear convolution between given discrete time sequences x(n) and h(n)
3. Write a MATLAB program to perform auto correlation & cross correlation of the given discrete time sequences
4. Write a MATLAB program to obtain frequency response of the first order system with transfer function $H(z)=\frac{1}{(z-1)(z+0.8)}$
5. Write a MATLAB program to verify the sampling theorem.
6. Write a MATLAB program to find the impulse response of a given system.
7. To study and verify the convolution property of Z-transform using MATLAB given that $X_1(z)=z^2+4z+5z^{-1}$

**BECL401 TELEVISION ENGINEERING [3-0-0-3]** *(Elective – I)* *(Total Hrs.: 45)*

**Pre-requisite:** - --

**Course Objectives:**
1. To introduce the study and analyze of transmission & reception for audio and video systems.
2. To study the principle of monochrome and color TV.
3. To study the principle of CCTV, MATV, CATV, HDTV.
4. To study the principle of LED TV and LCD TV.

**Course Outcomes:**
Student shall be able to:
1. Understand the fundamental concepts of Television Transmitter & Receiver Systems
2. Compare performance of various camera tubes. Demonstrate Television Receiver & justify the importance of troubleshooting & repair
3. Understand the different types of picture tubes
4. Study the various Color Television systems with a greater emphasis on PAL system
5. Co-relate the fundamentals with modern television technologies Trouble-shoot, test & align television systems

**Unit I:** *(8 Hrs)*
Brief Introduction to TV transmission and reception, Interlaced scanning, TV picture: resolution, brightness, Video Bandwidth, Line and frame wave frequency, blanking synchronizing ad equalizing pulses, complete composite video signal, VSB transmission and Reception.

**Unit II:** *(8Hrs)*
Monochrome TV camera tubes: image Orthicon, Vidicon and Plumbicon tubes, Monochrome TV transmitter block diagram, and TV transmitting and receiving antenna.

**Unit III:** *(8 Hrs)*
Monochrome TV Receiver block diagram, Balun, RF tuner, Video IF amplifier, Video detector, Intercarrier sound system, Sound take off circuit, Sound IF and FM detector, Transistorized Keyed...
AGC circuit, Horizontal and Vertical deflection circuits, EHT generator.

Unit IV: [7 Hrs]

Unit V: [7 Hrs]
Color signal transmission and reception, frequency interleaving, modulation of color – difference signals. PAL color TV system, choice of sub – carrier frequency, PAL color receiver, comparison of PAL with NTSCa and SECAM system.

Unit VI: [7 Hrs]
Satellite TV technology- Cable TV ,digital television – Transmission and reception, projection Television – Flat panel display TV receiver , Stereo sound in TV ,3D TV, HDTV ,Digital equipments for TV studios. Introduction to Plasma, LED TV Advanced topics on the subject.

Text Books:

Reference Books:

BECL416 MOBILE COMMUNICATION (3-0-3) (Elective –I) Total Hrs: 45

Course Objectives:
1. To understand the radio wave propagation and interference in mobile communications.
2. To understand the basic knowledge about the generations of mobile communication.
3. To study different architectures of mobile communication and its related parameters.
4. To impart the knowledge about applications of mobile communication.

Course Outcomes:
Student shall be able to:
1. Understand basics of mobile communication and developments towards modern systems.
2. Analyze Propagation characteristics like attenuation, fading of Mobile Communication system.
3. Apply Modulations techniques & Multiple access 2. technologies for resource sharing with TDMA, FDMA, CDMA & SDMA.
4. Apply the knowledge of different diversity, 1. Equalization & Channel coding techniques to improve the performance of mobile communication.
5. Design GSM and CDMA systems and apply concepts of GPS technology for various applications.
6. Understand & apply the knowledge of new trends in mobile technology like 3G & above.

Unit I: [7Hrs]
The cellular concept, Evolution of mobile radio 2. communication, Cellular telephone system, frequency reuse concept, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system.

Unit II: [7 Hrs]
The mobile radio environment, causes of propagation path loss, causes of fading – long term and short term, definition of sample average, probability density function, cumulative probability distribution, level crossing rate and average duration of fade, delay spread, coherence bandwidth, inter symbol interference.

Unit III: [8 Hrs]
Modulation techniques and multiple access technique for mobile communication: BPSK, QPSK. Transmission and detection techniques in mobile, 4 QPSK transmission and detection techniques. QAM, GMSK Technique. Multiple access Techniques: Introduction to multiple access, FDMA, TDMA, spread Spectrum Multiple Access, Frequency Hope Multiple access (FHMA) ,Code Division multiple access (CDMA),Space Division Multiple access (SDMA).

Unit IV: [7 Hrs]
Equalization, diversity and channel coding: fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity, fundamentals of channel coding.

Unit V: [8 Hrs]
GSM – Global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing GSM, introduction to CDMA, digital cellular standard. GPS Technology, GPS Receiver.

Unit VI: [7 Hrs]
Introduction to 3G: UMTS ,CDMA (IS-95) Frequency and channel specification ,forward CDMA channel ,Reverse CDMA channel,

Advanced topics on mobile Communication and Generations

Text Books:

Reference Books:

BECL417 SENSORS & TRANSUDCERS (3-0-0-3) (Elective –I) Total Hrs.: 45

Course Objectives:
To impart knowledge about the measuring instruments and the methods of measurement.
To understand different Sensors, Transducers and Bus Architectures.
3. To study and practice calibration and testing of different instrumentation systems.
4. To understand transducers types and ranges its selection for particular applications.

**Course Outcome:**
Student shall be able to:
1. Understand the characteristics of Instrumentation systems and transducers.
2. Select and make use of appropriate sensors and transducers for various applications.
3. Design system for measurement of physical quantities using various Sensors & transducers.
4. Apply and perform various signal conditioning techniques using standards for system design.
5. Detect & identify faults in various test equipments.

**Unit I**
Generalized Instrumentation system, Active and Passive transducers, Digital and Analog mode of operation static and dynamic characteristics and performance of instruments. Stastical treatment of measurement of errors, causal distribution, probability tables, Combination of errors.

**Unit II**
Resistance type Transducers - potentiometer, strain gauge; Inductive type – LVDT; piezoelectric transducer Sensing elements: Temperature sensing elements – RTD, thermistor, thermocouple, cold junction compensation.

**Unit III**
Motion measurement: relative and absolute motion measurement of displacement, velocity and acceleration; Pressure sensing elements – manometers, elastic elements, Bourdon tube, diaphragm, bellows; electrical type, McLeod gauge, Pirani gauge; Flow sensing type – head meters (orifice, venturi), area meters, rotameters, electromagnetic flowmeter, Coriolls flow meter; Ultrasonic flowmeter; pH measurement.

**Unit IV**
Pyrometers, Piezoelectric transducer, Magnetostriective, IC sensor, Digital transducers, Smart sensor, Fiber optic transducer, Signal conditioning techniques used in various transducers, Linearization, gain, clipping, filtering, differential amplification, shielding techniques, various standards for signal transmission like 4-20mA current loop converter etc.

**Unit V**
Recording of data CRO, data acquisition system, Industry Standard Bus architecture: PCI Bus, ISA Bus, EISA Bus, protocols, test equipments like Multimeter, signal generator, signal analyzer.

**Unit VI**
Calibration of measuring Instruments, Theory and Principles (absolute and secondary or comparison method), Setup, Modeling, Sensor calibration and testing. Analytical methods in calibrating, Realization in standard laboratories, maintenance and reproduction, test and review.

Advanced topics on sensor technology.

**Text Books:**

**Reference Books:**

**BECL418 BIOMEDICAL ENGINEERING**
(3-0-0-3) (Elective –I)

**Course Objectives**
1. To understand ECG, EMG,
2. To study biomedical electronics
3. To understand medical instrumentation

**Course Outcomes:**
Student shall be able to:
1. Understand & design basic model of bio signal measurements by using skin contact sensor.
2. Model on stress and strain measurement in blood vessels and heart tissue
3. Understand the effect of mechanical forces on various cardiovascular cells
4. Analyse pulsatile blood flow in devices and systems.
5. Formulate and design to apply signal processing, algorithms to be used in neural engineered systems
6. Integrate knowledge of materials properties and biological responses for rational design of biomaterials for medical applications.

**Unit I**
Introduction To Biomedical System (07 Hrs)
Introduction to Biomedical System, Man Machine Interface, Bio-electric Signals, Types of Electrodes, Electrodes for ECG, EMG, EEG, Transducers and sensors related to biomedical measurements including respiration, Skin contact impedance, Motion artifacts.

**Unit II**
Cardiovascular System (08 Hrs)

**Unit II**
Electrocardiography (08 Hrs)
Electrocardiography, Phonocardiography, Echocardiography, Vector Cardiography, Stress Testing System, Beside Monitors, Central
Monitoring System, Pacemakers, Defibrillators, Grounding and Shielding, Patient Safety

Unit IV: Laboratory Equipments  
(08 Hrs)  

Unit V: Electroencephalography  
(07 Hrs)  
Nervous System-Anatomy, Human Brain Recording of EEG Signal, EEG Amplifier, Analysis of Diseases using EEG Electromyography

Unit VI: Medical Imaging  
(07 Hrs)  
Diagnostic Medical instruments such as CT Scan, MRI, Ultrasonic Doppler Machine, Lasers in Medicine- Vision Correction, Dermatological. Advanced topics on Biomedical.

Text Books:
1. Cromwell, “Biomedical Instrumentation and Measurement”, PHI.  
2. R. S. Khandpur, “Biomedical Instrumentation”.  
Reference Books:
1. Carr and Brown, “Biomedical Instrumentation”.  
2. Webster, “Application and Design of Medical 2. Instruments”.

BECL419 VERILOG HDL  
(3-0-0-3)  
(Elective –I)  
Total Hrs: 45.

Course Objectives:
1. To provide adequate knowledge in Verilog HDL.  
2. To understand programming technologies  
3. To understand system design with PLD’s.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Apply the concepts of HDL, structural, data flow and 8. behavioral models  
2. Design of PAL ,PLA Synthesis methods for FPGA  
3. Design of complex PLDs CPLD Altera Max 7000 series  
4. Design control path of a digital system and implement it using Finite State Machines (FSMs)  
5. Describe the architecture, programming and use of 1. FPGAs, and distinguish appropriate areas of application for each technology  
6. Use basic skill to design application specific model

Unit I:  
(10 Hrs)  
Introduction to Verilog, Module, delays, descriptions, Language elements, Expressions, Gate-level modeling User defined primitives, Dataflow modeling, Behavioural modeling, Structural modeling, Tasks and functions

Unit II: 
(6 Hrs)  
Programming Technologies – ROMs & EPROMs  
PLA : PAL gate Arrays Programmable gate arrays and applications, Antifuse FPGA, Synthesis methods for FPGA

Unit III:  
(6 Hrs)  
Programmable Logic Devices: Basis concept, structure of standard PLD’s, complex PLDs CPLD. Altera Max 7000 series. AMD Match 4 structure.

Unit IV:  
(8 Hrs)  
System Design with PLD’S : Design of combinational and sequential circuits using PLD’s, Programming PAL devices, using PALASM. Design of state machines using algorithmic state machines ASM chart as a design tool

Unit V:  
(10 Hrs)  
Introduction to FPGA: types of FPGA, Xilinx XC3000 series, Logic Cell Array (LCA), Configurable Logic Blocks (CLB), Input/Output Blocks (I/OB), Programmable interconnection Points (PIP)

Unit VI:  
(5 Hrs)  
Introduction to ACT 2 family and Xilinx4000 families, Design example.

Advanced topics on System Modeling and Devices.

Books:

BCSL312 COMPUTER GRAPHICS & VISUALIZATION  
(3-0-0-3)  
(Elective –I)  
Total Hrs: 45.

Course Objectives:
1. To impart basic fundamentals of computer graphics  
2. To aim at developing fundamental data structures and algorithm for modeling.  
3. To understand the programming in Video Games, Virtual Reality Applications, Computer Simulations, CAD and web design.  
4. To impart the skills necessary for the generation of polygons and implementation of various polygon filling algorithms.

Course Outcomes:
Student shall be able to:
1. Be familiar with the fundamentals of computer graphics, various display devices and able to perform basic object generation.
2. Implement various filling and clipping algorithms for objects
3. Implement various transformation techniques for animation
4. Apply various projection and hidden surface removal techniques
5. Be familiar with curve generation techniques and visualization techniques
6. Be familiar with advanced modeling techniques and tools in the area of computer graphics

Unit-I Introduction (7 Hrs)
Introduction to Computer Graphics and Image 4. Processing, Basic fundamentals of random scan, raster scan devices, Stereoscopic and Virtual Reality Systems, line and circle drawing algorithms

Unit-II Polygon Filling Methods (8 Hrs)
Seed fill, fence fill, edge flag algorithm, scan conversion techniques, aliasing and antialiasing techniques, clipping algorithms

Unit-III Transformations (9 Hrs)
Basic 2D transformation, composite transformations- translation, rotation, scaling, reflection, shear views, windowing, Introduction to 3D transformation

Unit-IV Projections And Eliminations (8 Hrs)
Three dimensional display methods, parallel, perspective projections and types, hidden line and surface elimination techniques, shading and rendering.

Unit-V Curve Generation (8 Hrs)
Curve Generation: Cubic Spine, Braziers, B-Spline, blending of curves and other interpolation techniques, Introduction to Visualization, Applications, Visualization Techniques- parallel coordinates – a, charts (pie chart, bar chart, histogram, function graph, scatter plot, etc., graphs (tree diagram, network diagram, flowchart, existential graph, etc.) Venn diagram Euler diagram etc

Unit-VI Trends and Applications (5 Hrs)
Recent trends in Computer Graphics and Visualization, Advanced topics & its Application

Text Books:

BECL313 Transmission Lines and Antennas (3-0-0-3) (Elective –I) Total Hrs: 45

Course Objectives:
1. To understand transmission line fundamentals and apply them to the basic problem.
2. To analyze and understand the Uniform plane wave propagation in various media
3. To analyze and understand the fundamental of antenna
4. To solve the electric field and magnetic fields for various antenna

Course Outcomes:
At the end of the course the student shall be able to:

1. Understand the concepts like skin effect, wavelength, velocity of propagation, of transmission line
2. Apply techniques for the measurement of basic transmission line parameters, such as the reflection coefficient, standing wave ratio, and impedance.
3. Analyze the Smith chart, its application to matching, and experimental verification
4. Apply knowledge of antenna including: directivity, antenna gain, effective area, radiation resistance, and far-field calculation
5. Apply and analyze dipole antenna for various application
6. Analyze radiation pattern, specifications, features and applications of various array antenna

Unit I : Transmission Lines (7 Hr)
Line parameters, inductance of a line of two parallel round conductors, coaxial line, skin effect, A line of cascaded T sections, general solution, physical significance of the equations; the infinite line, wavelength, velocity of propagation,

Unit II : The Line at Radio Frequency (7 Hr)
The distortion less line, Inductance loading of telephone cables, Reflection on a line not terminated in Z0, reflection coefficient, open and short circuited lines, reflection factor and reflection loss, T and pi sections equivalent to lines. Voltages and currents on the dissipation less line, standing wave ratio, Input impedance of dissipation less line, Input impedance of open- and short-circuited lines, Power and impedance measurement on lines, Reflection losses on the unmatched line, quarter wave line;

Unit III : Impedance Matching and Smith Chart (7 Hr)
Impedance matching, Single-stub impedance matching on a line, The circle diagram for the dissipation less line, Application of the circle diagram, The Smith circle diagram, Application of the Smith chart for calculating impedance and admittance

Unit IV : Antenna Fundamentals (8 Hr)
Introduction, Types of Antenna, Radiation Mechanism. Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation efficiency, effective length, effective area, reciprocity. Radiation Integrals: Vector potentials A, J, F, M. Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation

Unit V : Wire Antennas (8 Hr)
Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna. Complete Analytical treatment of all these elements.

Unit VI : Antenna Arrays (8 Hr)
Antenna Arrays: Two element array, pattern multiplication N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non uniform amplitude, array factor, binomial. Planar Array, Circular Array, Structural details, imensions, radiation pattern, specifications, features and applications of Log Periodic Antenna, Yagi Uda Antenna Hertz & Marconi antennas

Text Books


Reference Books


MBL105- General Proficiency –V (2-0-0-2)
Course Objectives: -
1. To make students communicate their knowledge and feelings with a purpose.
2. To perform effectively in one to one and group discussion meetings and in public.
3. To make students more focused for enhancing employability prospects.

Course Outcomes:
Student shall be able to:
1. Write more accurate and effective technical reports.
2. Create favorable environment for better recruitment.
3. Perform better in group discussion and interview.
   • GD (Group discussion)
   • PI (Personal Interview)
   • Technical report writing
   • CV (Curriculum Vitae)

MBL106- General Proficiency -VI
Research Methodology Workshop
Course Objectives: -
1. To orient the students for research in the area of interest.
2. To provide step wise procedure for carrying out research.
3. To introduce various mathematical, analytical and simulation tools useful for research.
4. To learn methods for safeguarding the intellectual property rights.

Course Outcomes:
Student shall be able to:
1. Understand the need and importance of research.
2. Carry out research in a scientific manner.
3. Prepare research report and publish research findings.

BECP 307 -Minor Project
Pre-requisite: Electronics Workshop - I
Course Objectives :-
   • To provide hands on practice for Electronic application

Course Outcomes:-
   • An ability to work as a member of diverse technical team and to develop products

OPEN ELECTIVE: Please refer the syllabus provided in the last

BECL 417 SENSORS & TRANSDUCERS (3-0-0-3)
Course Objectives:
1. To gain knowledge about the measuring instruments and the methods of measurement
2. To use different Sensors transducers and Bus Architecture.
3. To be able to calibrate and testing of different sensors
4. To differentiate between the types of transducers available

Course Outcome
Student shall be able to
1. To do error analysis associated with measurement.
2. To analyze and use the functions of various instrumentation systems.
3. To identify and Measure the sensors output for various applications.

Unit I Generalized Instrumentation system, Active and Passive transducers, Digital and Analog mode of operation, Static and Dynamic characteristics and Performance of instruments. Stastical treatment of measurement of errors, Gaussian error distribution, Probability tables, Combination of errors.

Unit II. Resistance type Transducers - Potentiometer, Strain gauge; Inductive type - LVDT; Piezoelectric Transducer; Sensing elements: Temperature sensing elements - RTD, Thermistor, Thermocouple; Cold Junction Compensation.

Unit III. Motion measurement: Relative and Absolute motion measurement of displacement, Velocity and Acceleration; Pressure sensing elements - Manometers, Elastic elements, Bourdon tube, Diaphragm, Bellows; Electrical type, McLeod gauge, Pirani gauge; Flow sensing type - Head meters [Orifice, Venturi], Area meters, Rotameters, Electromagnetic Flowmeter, Coriolis Flowmeter, Ultrasonic Flowmeter; pH measurement.

Unit IV. Pyrometers, Piezoelectric transducer, Magnetostriective, IC sensor, Digital transducers, Smart
sensor, Fiber optic transducer, Signal conditioning techniques used in various transducers, Linearization, Gain, Clipping, Filtering, Differential amplification, Shielding techniques, Various standards for signal transmission like 4 - 20mA current loop converter etc.


Books:
1. Measurement system, application and design: E.D.doeblin, McGraw Hill Kogalcusha
2. Electrical & Electronic Measurements and Instrumentation: A.K. Sawhney
3. Instrumentation, measurement and feed back : B.E.Jones, McGraw hills
4. Sensors and Transducers: Patranabis D, Prentice Hall of India

BMEL401 NANOTECHNOLOGY (3-0-0-3) Total Hrs. 36

Course Objectives:
1. To create awareness about inter disciplinary issues.
2. To create awareness regarding emerging trend for cutting edge technology.
3. Introduce students to Fuzzy Logic concepts and techniques and foster their abilities in designing and implementing for real-world problems.

Course Outcomes
Students shall be able to
1. Understand the fundamentals and basics of nanotechnology.
2. Understand significance and potential opportunities to create better materials and products.

Unit I Fundamentals And Overview Of Nanoscience (5 Hrs)
Nanorevolution of the XX century, Basic concepts of Nano science and technology ,Properties at nanoscale (optical, electronic and magnetic). Theory, definitions and scaling.

Unit II Different Classes Of Nanomaterials (5 Hrs)
Carbon based nano materials and other nanomaterials, Metal and Semiconductor Nanomaterials, Quantum Dots, Wells and Wires, Molecule to bulk transitions, Bucky balls and Carbon Nanotubes. Introduction to Nano composites

Unit III : Synthesis Of Nanomaterials (7 Hrs)
Top-down (Nanolithography, CVD), Bottom-up (Sol-gel processing, chemical synthesis). Wet Deposition techniques, Self-assembly (Supramolecular approach), Molecular design. Microwave Synthesis of materials

Unit IV Characterization Of Nano Materials (7 Hrs)
TEM, SEM and SPM technique, Fluorescence Microscopy and Imaging.

Unit V Properties Of Nano Materials (6 Hrs)
Properties and technological advantages of nano materials in different industrial sectors such as semi conductors, sensors, nanostructured bioceramics and nanomaterials for drug delivery applications etc.

Unit VI Diversified Applications (6 Hrs)
Applications of Nanotechnology in different industrial sectors such as chemical industries, Biology and Medicines, Electrical and Electronics etc.

Advance topic on the subject

Text Book
8. Nanostructures & Nanomaterials Synthesis, Properties & Applications, Published by Imperial College Press 57 Shelton Street Covent Garden London WC2H 9HE

Reference Books
SEVENTH SEMESTER

BECL406 CMOS VLSI DESIGN (3-0-0-3)  
Total Hrs: 45

Pre-requisite: Analog System Design

Course Objectives:
1. To study fundamental concepts in VLSI systems design.
2. To understand computer-aided techniques used in the design verification of VLSI systems using CMOS technology.
3. To study evaluation procedure and the performance parameters of CMOS designs.
4. To learn different processing technologies used for 3 VLSI design.

Course Outcome:
Students shall be able to:
1. Ability to understand the structure of MOS, NMOS, PMOS and CMOS transistor.
2. Able to describe the structure and operating characteristics of CMOS inverter with delays.
3. Understand the structure and operating characteristics of CMOS combination logic (logic gates, latches) and design styles (static CMOS, dynamic CMOS, Domino & Zipper).
4. Understand the parasitic effects and able to estimate complementary CMOS circuit performance, size and noise margin.
5. To reproduce the cross section and layout of a CMOS inverter, and relate this information to CMOS layout design rules and design rules check (DRC) methods.
6. Evaluate and apply the performance limitations of CMOS circuits, impact of scaling, variability, fan-in, fan-out and future technology trends.

Unit I: (8 Hrs)
Review of MOS devices, MOS transistor models. PMOS, NMOS, CMOS

Unit II: (8 Hrs)
CMOS Inverter- Basic electrical properties & ckt concepts: The NMOS inverter & transfer characteristics, pull up & pull down ratios of NMOS, alternative forms of pull up the CMOS inverter & transfer characteristics CMOS inverter delays

Unit III: (7 Hrs)
Study of CMOS logic- Combination logic, gates, Compound gates, Multiplexers, memory elements. Static & Dynamic logic ckt's, Domino & Zipper logic

Unit IV: (8 Hrs)
Circuit characterization and performance, resistance and capacitance estimation, switching characteristics, power dissipation

Unit V: (7 Hrs)
CMOS processing technology- basic CMOS technology, layout design rules, stick diagram representation, latch up.

Unit VI: (7 Hrs)
CMOS circuit and logic design – transistor sizing, fan in, fan out, physical design of simple logic gates, CMOS logic structures, clocking strategies. Advanced topics on Transistor design

Text Books:

Reference Books:

BECL409 DIGITAL IMAGE PROCESSING (4-0-0-4)  
Total Hrs: 45

Pre-requisite:

Course Objectives:
1. To study the basic theory & algorithms used in digital image processing.
2. To expose students to current technologies and issues those are specific to image processing systems.
3. To understand and study the issues like segmentation, transforms etc used for the image processing.
4. To understand MATLAB tool boxes and their uses for applications of image processing.

Course Outcome:
Student shall be able to:

1. Understand the fundamentals of the human visual system and perception with knowledge of imaging systems and processing units.
2. Demonstrated understanding of spatial filtering techniques, including linear and nonlinear methods, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
3. Demonstrated understanding of 2D Fourier transform concepts, including the 2D DFT and FFT, and other transforms (DCT, Haar, WHT) and their use in frequency domain filtering.
4. To recognise degradation problem in digital image processing, and to decide upon appropriate methodologies in their solution and to understand the principles of image compression.
5. Able to employ morphological filtering techniques to clean up and cluster image for further analysis.
6. Detect/Extract regions of interest from an image using various thresholding and segmentation techniques and apply these techniques to solve real-world image processing problems.

Unit I:
Origins of digital image processing. Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit II:
Basic intensity transformation and spatial filtering, Image negatives, log transforms, power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit III:
Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit IV:

Unit V:
Some basic morphological algorithms, Boundary extraction, convex hull, thinning, skeletons, 2. morphological Reconstruction. Color image processing, color models, RGB color models, CMY 3. and CMYK color models the HSI color models.

Unit VI:
Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding. 5. Region-based segmentation, watershed segmentation algorithm Applications of 6. segmentation.
Advanced topics on Image processing technology and algorithms.

Text Books:

Reference Books:

BECP409 DIGITAL IMAGE PROCESSING (0-0-2-1)  Total Hrs: 20

List of Practicals:
1. To Read image from MATLAB tool box.
2. To adjust GRAY LEVEL of image by using MATLAB tool box.
3. To study Brighten of Darken image by using MATLAB tool box.
4. To adjust CONTRAST of an image by using MATLAB tool box.
5. To study INTENSITY of transform image by using MATLAB tool box.
6. To change the enhancement of an image using Histogram.
7. To remove salt and pepper noise by using filter.
8. To remove the Gaussian noise from image by using adaptive filter.
9. To study Rayleigh noise Distribution on the image by using MATLAB.
10. Edge detection using sobel & prewitt operation.
11. Open Ended experiments

BECL410 EMBEDDED SYSTEMS (4-0-0-4)  Total Hrs: 45
Pre-requisite: Microprocessor Based System

Course Objectives:
To study and understand various embedded systems. (8 Hrs)
To understand the design parameters of embedded systems applications.
To study and impart different tools for embedded system design.

Course Outcome:
Student shall be able to
Select Appropriate Microcontroller (8 Hrs), Techniques & understand the Architecture of 8051.
Design 8051 Programs For Embedded Applications.
Design and Interface memory for Real Time applications using LED & LCD.
Understand & design Programs for ARM base applications.
Make Use Of ARM7 Controller For Designing Of Embedded Applications
Select And Make Use of Appropriate Bus Standard for Design application of Embedded systems.

Text Books:

Unit I: (8 Hrs)

Unit II: (7 Hrs)
8051 Instruction Set, Addressing modes & programming. 8051 Timers, Serial I/O

Unit III: (8 Hrs)
Memory Interfacing. Programming, Real time interfacing with LED, LED display, LCD display

Unit IV: (7 Hrs)
RISC Controller : ARM Micro-controllers – overview; features, ARM 7 –architecture, Thumb, Register Model, Addressing modes, Instruction set.

Unit V: (8 Hrs)
Real-time Versus Conventional Software, Software Engineering Issues, Study of Embedded OS-Win CE, R TLINUX

Unit VI: (7 Hrs)
Industrial Interfacing Buses: PCI, ESA, EISA, I2C, USB, RS232.

Advanced topics on embedded system

Reference Books:

BECP410 EMBEDDED SYSTEMS (0-0-2-1) Total Hrs: 20

List of Practicals:
1. Study of Microcontroller tools
2. Write a program to perform arithmetic Operation using 8051 Microcontroller.
3. Write a program to perform addition of two arrays using 8051 Microcontroller
4. Write a program to perform Array Sorting
5. Write a program to perform Interrupt Operation
6. Write a program to interface with LED Display
7. Write a program to perform arithmetic Operation using PIC Microcontroller
8. Write a program to perform addition of two arrays using PIC Microcontroller
9. Write a program to perform arithmetic Operation using ARM7 Microcontroller
10. Write a program to perform addition of two arrays using ARM7Microcontroller
11. Write a program in C for interfacing the Display using PIC Microcontroller
12. Open Ended Mini Project

Elective-II (3-0-0-3)
BECL414 OPTICAL COMMUNICATION
BCSL308 LANGUAGE PROCESSORS
BEEL420 PLC & SCADA
BECL421 PROGRAMMABLE DEVICES & TESTING
BECL428 WIRELESS SENSOR NETWORKS (E-II)

Elective-II (3-0-0-3)
BECL414 OPTICAL COMMUNICATION (3-0-0-3) (E-II) Total Hrs:48

Course Objectives:
1. To understand the basic concepts of fiber optical Communication.
2. To understand photonic systems, modulation formats and multiplexing technologies
   To study and understand optical switching and fiber optical measurement.

Course Outcome:
Student shall be able to
1. Ability to demonstrate an understanding of optical fibre propagation characteristics and transmission properties.
2. Demonstrate basic fiber handling skills, including connectors and splicing
3. Calculate the attenuation and signal degradation due to intermodal and intramodal distortion.
4. Develop capacity of understanding of light sources including the principles of laser action in semiconductors, the characteristics of optical sources based on semiconductor.
5. Ability to describe the principles of photo detectionand optical receiver
6. Ability to apply relevant scientific and engineering principles to solve real world optical engineering

Unit I: (8 Hrs)
Overview of Optical fiber Communications, Principle of optical communication – Attributes and structures of various fibers such as step index, graded index mode and multi mode fibers. Propagation in fibers – ray mode, Numerical aperture and multi path dispersion in step index and graded index fibers. Material dispersion and frequency response. Self phase modulation, combined effect of dispersion and self phase modulation

Unit II: (08 Hrs.)
Electromagnetic wave equation in step index and graded index fibers modes and power flow in fibers. Manufacture of fibers and cables, fiber joints, splices and connectors.

Unit III: (08Hrs)

Unit IV: (06 Hrs)
Optical sources – LED and laser diode, principles of operation, concepts of line width, phase noise, switching and modulation characteristics – typical LED and LD structures.

Unit V (08 Hrs.)
Photo detector – Pn detector, pin detector, avalanche photodiode – Principles of operation, concepts of responsivity, sensitivity and quantum efficiency, noise in detection.

Unit VI: (08 Hrs.)
Optical switching Fiber Optical Measurements. ANALOG AND DIGITAL LINKS: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over
fiber, key link parameters, Radio over fiber links, microwave photonics. Digital links – Induction, point-to-point links, System considerations, link power budget, resistive budget, short wave length band, and transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

Advanced topics on Optical Communications

Text Books:

Reference Books:

BCSL308 : LANGUAGE PROCESSORS (3-0-0-3) (E-II) Total Hrs: 45

Pre-requisite: --

Course Objectives:
1. To provide adequate knowledge in Language processors.
2. To understand syntax analysis.
3. To gain knowledge of code optimization
4. To understand storage allocation & error handling

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Apply and analyze basic concepts of language processors.
2. Design and analyze different parsing techniques
3. Apply knowledge of semantic analysis and construct three address code.
4. Acquire the knowledge concept of storage management.
5. Apply and analyze various optimization techniques
6. Acquire the knowledge of runtime environment for code generation

Unit I (8 Hrs)
Introduction to Compilers: Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer, LEX.

Unit II (7 Hrs)
Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers.

Unit III (8 Hrs)
Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations: postfix, syntax tree, TAC, translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit IV (7 Hrs)
Storage allocation & Error Handling: Run time storage administration, stack allocation, symbol table management, Error detection and recovery: lexical, syntactic, semantic.

Unit V (8 Hrs)

Unit VI (7 Hrs)
Recent trends in Language Processor. Advanced topics & its Application

Text Books:
Steven Bird, Ewan Klein & Edward Loper, Natural Language processing with python, O’Reilly Media Final Release, June 2009
Christopher Manning, Foundations of Statistical Natural Language Processing, The MIT Press Cambridge, Massachusetts, May 1999

Reference Books:
Daniel Jurafsky and James H. Martin, Speech and Language Processing, Prentice Hall, Englewood Cliffs, New Jersey 07632
Daniel Jurafsky and James H. Martin, Principles of Programming Languages, Kadambri Agarwal

BEEL420 PLC & SCADA (3-0-0-3) (E-II) Total Hrs: 45

Pre-requisite: --

Course Objectives:
1. To develop understanding and application skills for the programming of PLCs.
2. Demonstrate knowledge of systems associated with PLCs
3. Demonstrate and apply knowledge of PLC hardware/software concepts

Course Outcomes:
Student shall be able to
1. Understand the basics of PLC Controllers and SCADA system
2. Learn the monitoring and supervisory function of SCADA and Data acquisition in the Industry
3. Learn SCADA system components
4. Study of Architecture of IEC 61850
5. Learn communication technology of SCADA

Unit I: (07 Hrs)
Introduction: Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC.

Unit II: (07 Hrs)
Data acquisition systems, Evolution of SCADA, 6. Communication technologies, Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries.

**Unit III (07 Hrs)**
SCADA System Components: Schemes- Remote Terminal Unit [RTU], Intelligent Electronic Devices [IED], Programmable Logic Controller [PLC], Communication Network, SCADA Server, SCADA/HMI Systems.

**Unit IV: (08 Hrs)**
SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture - IEC 61850

**Unit V: (08 Hrs)**
SCADA Communication: various industrial communication technologies - wired and wireless methods and fiber optics. open standard communication protocols

**Unit VI (08 Hrs)**

Latest developments in PLC & SCADA.

**Text Books:**
1. Gary Dunning, , Introduction to Programmable logic Controllers, Delmar Publisher, 2006
2. Webb & Reis, Programmable logic Controllers, Prentice Hall of India, 2003

**Reference Books:**
2. BCSL421 PROGRAMMABLE DEVICES & TESTING (E-II) (3-0-0-3) Total Hrs: 45

**Pre-requisite:**

**Course Objectives:**
1. To give sufficient background for understanding programmable devices
2. To give knowledge of system design
3. To make aware students to test devices and find out fault in the system

**Course Outcome:**
Upon successful completion of the course, students will be able to
1. Understand basic programmable logic architectures.
2. Design and analyze Combinatorial logic and Sequential logic circuits using PLD’s.
3. Use skills, and techniques of Xilinx logic families to design, implement and test digital systems on FPGAs.
4. Test and perform fault finding in digital electronics circuits.
5. Design a digital system to be fault-tolerant and avoidance.

Know the different forms of redundancy and different classes of digital systems

**Unit I: (8 Hrs)**
Programmable Logic Devices: Basic concept, Programming technologies, Programmable logic elements, programmable logic array, programmable array logic, structure of standard PLD’s, complex PLD’s CPLD, Altera Max 7000 series, AMD Mach 4 structure

**Unit II: (8 Hrs)**
System Design with PLD’s : Design of combinational and sequential circuits using PLD’s, Programming PAL devices using PALASM, Design of state machines using algorithmic state machines ASM chart as a design tool.

**Unit III: (8 Hrs)**
Introduction to FPGA: types of FPGA, Xilinx XC3000 series, Logic Cell Array (LCA), Configurable Logic Blocks (CLB), Input/Output Blocks (I/OB), Programmable Interconnection Points (PIP), Introduction to ACT 2 family and Xilinx4000 families, Design example

**Unit IV: (7 Hrs)**
Fault Testing in Digital Circuits: Detection and Location of fault in combinational logic circuit, Path sensitizing method, Boolean difference method, Fault detection and location in synchronous sequential circuit, Design for testability, built in self-test

**Unit V: (7 Hrs)**
Fault Tolerant system: Fault avoidance and fault tolerance, technique for fault tolerance, Hardware fault tolerance.

**Unit VI: (7 Hrs)**
Static, Dynamic and Hybrid redundancy, fault tolerance in memories, software fault tolerance, design for fault tolerant software.

Advanced topics on Programming Devices.

**Text Books:**

**Reference Books:**

**BCSL415 CLOUD COMPUTING(E-II) (3-0-0-3) Total Hrs : 45**

**Course Objectives:**
1. Understand the current technologies in Internet world
2. Explain Public and Private Cloud
3. Discuss Cloud and (new) Service Level Management
4. Discuss how to approach and evaluate a Cloud business case
5. Describe Cloud and Risk Management
6. Discuss the case studies and learn recent trends in computing

**Course Outcome:**
Upon successful completion of the course, students will be able to

1. Understand the importance of virtualization, components and characteristics of cloud computing.
2. Use Cloud as the infrastructure for existing and new services.
3. Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
4. Design and develop various applications using cloud platforms
5. Understand non trivial issues in the Cloud, such as load balancing, identity and authorization management.

**Unit I: Introduction to Cloud Computing**

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**Unit II: Cloud Computing Architectural Framework**

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<tr>
<td></td>
<td>(7 Hrs)</td>
<td>Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.</td>
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**Unit III: Exploiting Cloud Services**

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**Unit IV: Cloud Application Development**

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<td>(7 Hrs)</td>
<td>Role of business analyst, Technical architecture 1. considerations, Service creation environments to develop cloud based applications, Technologies and 2. the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and 3. disadvantages, Cloud Economics,</td>
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**Unit V: Cloud Security and Risk Management**

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**Unit VI: Analysis on Case study**

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<th>CO6</th>
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**Text Books:**

2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

**References:**

6. Design wireless sensor networks applications.

Unit I: (8Hrs)
Introduction – motivation, applications, sensors, architectures, platforms for WSN, Actual Systems - Berkeley motes, TinyOS and nesC.

Unit II: (8Hrs)
How to program actual WSN. Wireless Radio Realities – radio irregularities and impact on protocols, MAC protocols – B-MAC, multi-channel MAC, Routing.

Unit III: (8Hrs)
Directed Diffusion, Clock Synchronization, Localization – TDOA, Walking GPS, range free solutions

Unit IV: (7Hrs)
Power Management – per node, system-wide, sency services, sensing coverage, Data Services and Databases – architectures, queries (SQL),

Unit V: (7Hrs)
Data dissemination, Programming Abstractions – 1. programming models, EnviroTrack, new APIsSecurity and Privacy – problems, attacks, solutions.

Unit VI: (7Hrs)
Case Study: A Complete System – surveillance and tracking application

Advanced topics on WSN.

Text Books:

Reference Books:

BECP 408: Project Phase-I: Project Seminar
Pre-requisite: Minor Project

Course Objectives:-
1. To understand and study the process of literature review and to put forward the findings.
2. To get the detailed practical knowledge about latest technology by designing any system or prototypes by using acquired technical knowledge and skills.

Course Outcome:-
The student shall able to
1. Use the acquired technical knowledge to solve any problem related engineering, environmental, social.
2. Propose and convince design method through effective presentation
3. Participating as a member of a team.

Search and study literatures from conference , journals in concern area
Make proper documentation of project via project report.
Implement propose design through prototype or software

Elective-III (3-0-0-3)
[1] BMEL403 Mechatronics
[3] BECL422 MEMS
[4] BECL424 ASIC Design
[5] BECL425 RTOS
[6] BITL 302 Computer Networks

BMEL403 MECHATRONICS (3-0-0-3)
( E-III)
Total Hrs: 45

Pre-requisite:

Course Objectives:
To impart and demonstrate how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products.
To understand continuous-time control design using software, for the manipulation, transmission, and recording of data.
To study parameters of actuators and sensors their suitability for applications.

Course Outcome:
Student shall be able to
Understand the concept of mechanical, electronics, control and computer engineering in the design of mechatronics systems.
Identify the basic element used in an electrical actuation system and explain their underlying principles of operation.
Apply knowledge about the working principle of hydraulic pumps and actuators.
Integrate the various sensor and actuation systems using Adon cards and various communication mode for development of mechatronic system.
Use techniques, skills, and modern engineering tools necessary for engineering practice.
Use neural network to integrate and develop various applications of mechatronics system.

Unit I [7 Hrs]
Need and scope of the subject recent trend of designing machine units along with electronic circuits for operation and supervision of mechanisms. Techniques of interfacing mechanical device with computer hardware and development of software for driving them.

Unit II [8 Hrs]
Basic principles and specific applications of armature and field and control of D.C. Motors. Variable voltage and variable frequency control of 3 phase and single phase Induction motors, speed control of Synchronous motors. Different types of stepper motors , hold on torques and position control of stepper motors.
Unit III  [8 Hrs]  2. Comprehend radar measurements and fundamentals of radar tracking
Evaluate overall performance and operation under the environment effects and techniques to confront and top level measure opeformance.
Develop specialized insight in the field of satellite communication.
Use relevant methods to understand and reduce atmospheric effects on satellite communication.
6. Understand and use Satellite navigation system for day to day applications.

Unit-I  (8Hrs)
RADAR Range Equation, CW and FM modulated RADAR, MTI and Pulse Doppler RADAR, Tracking RADAR.

Unit-II  (8Hrs)
RADAR antennas, parabolic reflector, Scanning field reflector, Lens antennas.
RADAR Receivers, Displays and Duplexer, Detection of RADAR; signals in noise.

Unit-III  (8Hrs)
RADAR clutter, Effects of weather on RADAR, Detection of targets in Precipitation, Synthetic Aperture RADAR, HF over the Horizon RADAR.

Unit-IV  (7Hrs)
Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem. Satellite link design: System noise temperature and $T/T$ ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified $(C/N)$.

Unit-V  (7Hrs)
Propagation on satellite: Earth’s path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature.

Unit-VI  (7Hrs)
Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station.

Advanced Study on Radar Technology

Text Books:

Reference Books:

BECL415  RADAR & SATELLITE COMMUNICATION. (3-0-0-3)  (E-III)
Total Hrs: 45
Pre-requisite:  
Course Objectives:
1. To impart working principles and concepts of radar and satellite communication system.
2. To impart knowledge of different components in Radar and satellite communication.
3. To understand the orbital aspects and components of a satellite communication system.
4. To study the link budget of a satellite communication system and study of satellite orbits 1. and launching.

Course Outcome:
Student shall be able to
1. Understand the basic concepts, operation and application of modern radar system and able to 1. specify the subsystem performance requirements in radar system.
BECL422 MEMS (MICRO-ELECTRO-MECHANICAL SYSTEM) (3-0-0-3) (E-III)  
Total Hrs : 45  
Pre-requisite: --  
Course Objectives:  
1. To study functionality of Micro Electro Mechanical systems  
2. To understand design of sensors and actuators.  
3. To impart the knowledge of interfacing mechanical systems with computer and electronics systems.  
Course Outcome:  
Student shall be able to  
1. understand Microelectromechanical systems and devices.  
2. Qualitatively describe surface and bulk micromachining technologies for MEMS.  
3. Describe the basics of different MEMs Sensors & Actuators.  
4. Analyze microsystem technology for technical feasibility as well as practicality.  
5. Design MEMS using simulators for RF applications.  
6. Apply the various packaging techniques for different MEMS devices and systems.  
Unit I: (08Hrs)  
An introduction to Microsensors and MEMS, Evolution of Microsensors & MEMS, Microsensors & MEMS applications.  
Unit II: (08Hrs)  
Microelectronic technologies for MEMS, Micromachining Technology, Surface and Bulk Micromachining, Micromachined.  
Unit III: (08Hrs)  
MEMS sensors and actuators, Micro sensors, Mechanical, Inertial, Biological, Chemical, Acoustic,  
Unit IV: (07Hrs)  
Microsystems Technology, Integrated Smart Sensors and MEMS, Interface Electronics for MEMS.  
Unit V: (07Hrs)  
MEMS Simulators, MEMS for RF Applications.  
Unit VI: (07Hrs)  
Bonding & Packaging of MEMS, RF MEMS, and Optical MEMS.  
Advanced topics on MEMS.  
Text Books:  
Reference Books:  
BECL424 ASIC DESIGN (3-0-0-3) (E-III)  
Total Hrs: 45  
Pre-requisite: --  
Course Objectives:  
To study the need and requirements of application specific integrated circuits  
To understand different techniques of application specific integrated circuits  
To impart a thorough understanding of the concepts of design of application specific integrated circuits.  
Course Outcomes:  
Student shall be able to  
1. Analyze the application specific integrated circuits with their design constraints and distinguish different designing tools, compilers, standard cell, cell libraries etc.  
2. Ability to use modern hardware and software design tools to develop digital systems.  
3. Differentiate between VHDL, Verilog and ASIC Design techniques and their designing constraints.  
4. The ability to code and simulate any digital function in Verilog HDL.  
5. Ability to carry optimized routing  
6. Demonstrate the ASIC design successfully.  
Unit I: (15 Hrs)  
Design flow – Economics of ASICs – ASIC cell libraries – CMOS logic cell data path logic cells – I/O cells – cell compilers.  
Unit II: (10 Hrs)  
Transistors as resistors – parasitic capacitance – logical effort programmable ASIC design software: Design system – logic synthesis.  
Unit III: (10 Hrs)  
Half gate ASIC, Low level design entry: Schematic entry – low level design languages – PLA tools – EDIF – An overview of VHDL and Verilog.  
Unit IV: (10 Hrs)  
Logic synthesis in Verilog and VHDL simulation.  
ASIC Construction – Floor planning & placement – Routing.  
Advanced topics on VLSI Design.  
Text Books:  
Reference Books:  
Course Objective:
Student shall be able to
1. Orientation in the area of design cycle of real-time 1. applications.
2. Design applications based on real-time operating systems.
3. Distinguish a real-time system from other systems 2. And identify the functions of operating system principles.
4. Evaluate the need for real-time operating system and implement the real-time operating system principles.
5. Analyse real time systems with regard to keeping time and resource restrictions.
6. Approp use of architectures and behaviors of 2. embedded systems.

Unit I: (8 Hrs)

Unit II: (8 Hrs)

Unit III: (7 Hrs)
DECLARATIVE SPECIFICATIONS: Regular Expressions and Extensions, Traditional Logics- 2. Propositional Logic, Predicates, Temporal logic, Real time Logic.


Unit IV: (8 Hrs)

Unit V: (7 Hrs)

Unit VI: (7 Hrs)
OPERATING SYSTEMS: Real Time Functions and Services, OS Architectures-Real Time UNIX and POSIX, Issues in Task management- Processes and Threads, Scheduling, Synchronization and communication.

Advanced topics on RTOS Text Books:
Richard Barry, Using the free RTOS Real Time Kernal (Standard Edition), Paperback, 172 pages Published January 1st 2010 by Real Time Engineers Ltd (Standard Copyright License) By Chowdary Venkateswara Penumuchu, Simple Real-time Operating System, Publisher: Trafford Publishing (7 August 2007)

Reference Books:
Qing Li, Caroline Yao, Real-Time Concepts for Embedded Systems, Published by CMP Books an imprint of CMP Media LLC.

BITL302 COMPUTER NETWORKS (3-0-0-3) (Elective-III) Total Hrs: 45
Pre-requisite: --
Course Objective: To understand the computer network architectures. To make aware of design and performance perspective of network architectures. To discuss current trends in communication

Course Outcome: Student shall be able to
1. Understand circuit switching and packet switching technologies and their pros and cons with respect to different traffic types.
2. Apply and interpret different types of addressing and routing techniques in computer networks
3. Understand how a data-packet is transmitted from source to destination
4. Apply basic probability models of network phenomena
5. Interpret Internet addressing, naming, and routing, congestion control, and QoS
6. Analyze key networking algorithms in simulation.

Unit I: Introduction (9Hrs)
The use of computer networks. Network hardware. LAN’s, Man’s, WAN’s, internet works, Network software, protocol hierarchies, design issues for layers, interfaces and services, Connectionless oriented and connectionless services, service primitives, relationship of Services to protocols, the OSI reference model, TCP/IP
reference model, comparison of OSI And TCP/IP 2. reference model.

Unit-II: Physical Layer (8 Hrs) 3.
The theoretical basis for data communication-Fourier analysis, bandwidth-limited signals, Maximum data rate of a channel, transmission 4. media-magnetic media, and twisted pair coaxial Cable, fiber optics. Wireless transmission, microwave transmission. Multiplexing, switching, 5. Narrow and ISDN - services, architecture, interface, perspective on N-ISDN, broadband ISDN & ATM- virtual circuits versus circuit switching, transmission in ATM networks, ATM Switches.

Unit-III: Data Link Layer (8 Hrs)
Design issues - services provided to the network 1. Layer, framing, error control, flow control, Error 2. correcting & detecting codes, elementary data link 3. protocols, simplex stop and wait Simplex protocols for noisy channel, sliding window protocols-one bit protocol, go back Protocol, selective repeat protocol. The medium access sub layer - static and dynamic channel Allocation in LANs and MANs, 1. Multiple access protocols - ALOHA, CSMA, collision free Protocols, limited contention protocols, IEEE 2. 802.11 wireless LAN protocols, IEEE Standards 802 for LAN and MANs-802.3 & Ethernet, token 3. bus. Token ring.

Unit-IV: The Network Layer (9 Hrs)
Design issues, services provided to the transport layer, internal organization, comparison of Virtual 5. circuit and datagram subnets, routing algorithms. Optimality principle, shortest path Routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical Routing, broadcast & multicast routing, congestion control algorithms, general principles Prevention policies, traffic shaping, flow specifications, congestion control in virtual circuit Subnets. choke packets, load shedding, jitter control. IP protocol, IP address. Subnets, internet Control protocols, OSPF, BGP.

Unit V: Transport and Application Layer (8 Hrs)
Transport and Application Layer - services provided to the upper layer, Quality of Service, Transport service primitives, elements of transport protocols, addressing, establishing a Connection, releasing a connection, flow control & buffering, multiplexing, crash recovery

Unit VI: Trends And Applications (3 Hrs)
Bluetooth protocol stack, Bluetooth connections, piconets and scatternets, WiFi and WiMAX Standard
Recent trends and advanced topics.

Text Books:

Reference Books:

BITL417 INTERNET OF THINGS (3-0-0-3) (Elecctive-III) Total Hrs: 45

Course Objectives:
Understand IoT Market perspective.
Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcome:
Understand the evolution of IOT from M2M & Market perspective of IoT.
Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.
Apply IoT design constraints to hardware for device integration.
Building IoT architecture with standard considerations.
Building the Web of Things from the Cloud of Things for industrial automation.

Unit-I:M2M to IoT CO1
The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

Unit-II:M2M to IoT A Market Perspective CO2

Unit-III: M2M and IoT Technology Fundamentals-CO3
Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit-IV: IoT Architecture-State of the Art – CO4

Unit-V: IoT Reference Architecture- CO5
Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the

Reference Books:

Textbook:

BECP 408 : Project Phase-I: Project Seminar
Pre-requisite: Minor Project
Course Objectives:-
1. To understand and study the process of literature review and to put forward the findings.
2. To get the detailed practical knowledge about latest technology by designing any system or prototypes by using acquired technical knowledge and skills.

Course Outcomes:
The student shall able to
1. Use the acquired technical knowledge to solve any problem related engineering, environmental, social.
2. Propose and convince design method through effective presentation
3. Participating as a member of a team.
4. Search and study literatures from conference, journals in concern area
5. Make proper documentation of project via project report.
6. Implement propose design trough prototype or software

Semester VIII
BECP 411 - Project Internship (Phase-II)
Total Hrs: 30

Course Objectives :-
1. To provide opportunity for working on projects, prepare a prototype and conclusions in the form of reports.
2. To provide opportunity for selection of projects considering their usability to the industry and society with environmental aspects.
3. To undertake innovative and research based projects.

Course Outcomes:-
The student shall able to
1. Apply the knowledge gained in theory and to integrate theory with practice followed in industry
2. Realize sense of responsibilities in view of project implementation
3. To understand the functional behavior of organization

Work as a member of diverse technical team and to develop project/product
Use software, hardware, testing and simulation tools and platforms used in industry for project/product design and development
Present, prepare and deliver seminar as a member of project team and Interpret results to present conclusions.
# ELECTRONICS & TELECOMMUNICATION ENGINEERING

## SEMESTER-III

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ELECTIVE –I

BCSL312  Computer Graphics & Visualization
BECL427  Communication Protocol Design
BECL406  CMOS VLSI Design
BECL417  Sensors & Transducers
BECL313  Transmission lines and Antenna

*OPEN ELECTIVES
### DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

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#### Elective –II
- BECL409 DIGITAL IMAGE PROCESSING
- BECL424 APPLICATION SPECIFIC INTEGRATED CIRCUITS DESIGN
- BMEL403 MECHATRONICS
- BECL428 WIRELESS SENSOR NETWORKS
- BECL415 COMMUNICATION
- BCSL415 CLOUD COMPUTING

#### Elective-III
- BMEL420 ROBOTICS
- BECL422 MICROELECTROMECHANICAL SYSTEMS (MEMS)
- BECL425 RTOS
- BECL416 MOBILE COMMUNICATION
- BEEL420 PLC & SCADA
- BITL417 INTERNET OF THINGS

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THIRD SEMESTER

BAML201
APPLIED MATHEMATICS – III
[4-0-0-4]
Total Hr.[60 Hrs]

Course-Prerequisite:
Applied Mathematics-I (BAML101)
Applied Mathematics-II (BAML102)

Course Objectives:
1. To develop skills to use Laplace Transform and Z-Transform and its applications in the field of Electronics and Telecommunication engineering.
2. To introduce Partial Differential Equations and Fourier Series and its applications in the field of Electronics and Telecommunication engineering.
3. To introduce complex variables and its application in the field of Electronics and Telecommunication engineering.
4. To develop skills to solve problems on Calculus of Variation in the field of Electronics and Telecommunication engineering.

Course Outcomes:

Student shall be able to

CO1: Effectively apply concepts of Laplace Transform in a clear and concise manner.

CO2: Effectively apply concepts of Z-Transform for analyzing the stability of systems and signal processing.

CO3: Demonstrate ability to think critically by proving mathematical conjectures and establishing theorems from complex variables.

CO4: Apply concepts of Calculus of Variation to solve engineering problems.

CO5: Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms, evaluate the Fourier transform of a continuous function, and are familiar with its basic.

CO6: Effectively apply concepts of Partial Differential Equation for analyzing network theory and micro engineering

Course Content:

Unit -I: Laplace Transforms: (10 Hrs)
Laplace transform: definition and their simple properties, transform of derivatives and integrals, evaluation of integrals by L.T., inverse L.T., &its properties, convolution theorem, Laplace transforms of periodic function & Unit step function, applications of Laplace transforms to solve ordinary differential equations & partial differential equations.

Unit -II: Z-Transforms: (10 Hrs)
Z transform- definition & properties, inverse Z & relation with Laplace Transform. Application to z-transform to solve difference equations with constant coefficients.

Unit -III: Complex Variables: (10 Hrs)
Analytic Functions, Cauchy Riemann conditions, Conjugate functions, singularities. Cauchy's integral theorem and integral formula (Statement only). Taylor’s and Laurent’s Theorem (Statement only). Residue theorem, contour integration.

Unit -IV: Calculus of Variation: (10 Hrs)
Maxima and minima of functionals, Variation and its properties, Euler's equations, functionals dependent on first and second order derivatives, Simpler applications.

Unit-V: Fourier Series and Fourier Transforms: (10 Hrs)
Introduction, the Fourier theorem, Evaluation of Fourier Coefficients. Consideration of symmetry (odd, even rotational) exponential form, Fourier series, Fourier integral theorem, Fourier transforms.

Unit –VI: Partial Differential Equation: (10 Hrs)
Partial Differential equation of first order first degree i.e. Lagrange’s form. Linear non homogeneous Partial Differential equation of nth order with constant coefficient method of separation of variables. Application to transmission lines.

Text Books:

Reference Books:

BECL 201
ELECTRONIC DEVICES & CIRCUITS
[3-1-2-5] Total Hr.:[60 Hrs]

Course-Prerequisite:
Applied Physics (BPHL102),
Basic Electronics (BPHL105)

Course-Co requisite : Network Theory (BEEL201)

Course Objectives:

1. To gain knowledge of electronics devices and semiconductor physics.
2. To study need of electronics devices and its applications.
3. To familiarize the students with the analysis and design of analog circuits.
4. To use appropriate experimentation techniques to evaluate circuit performance.

Course Outcomes:

Student shall be able to
CO1: Understand operation of diodes, types of diodes and their role in design of various electronic applications.

CO2: Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points for various biasing methods and perform small signal analysis.

CO3: Understand the concepts of feedback and apply the concepts for improvement of performance of amplifier and oscillator;

CO4: Understand, analyze and design different types of power amplifiers and use methods for reduction of distortions

CO5: Understand the operation of the Field Effect Transistor (FET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and design FET circuits

CO6: To understand the characteristics of CMOS circuit construction and perform AC & DC Analysis

Course Content:
Unit I: PN JUNCTION DIODE (10Hrs)
PN junction, forward and reverse bias, VI Characteristics, Dynamic Resistance, Temperature dependence, Continuity Equation, Avalanche and Zener Break Down, Zener diode as voltage regulator, Photo Diode, LED's, LCD's, Varactor Diode, Tunnel Diodes, Half and full wave rectifiers with filters

Unit II: BI-POLAR JUNCTION TRANSISTORS (10Hrs)
Theory of operation, Static Characteristics, Breakdown voltages, Current voltage, Power Limitations, Ebers-moll Model, Biasing BJT, Different Biasing arrangement, Stability factor, thermal runaway, Power Transistors, CE, CB, CC Classification and Characteristics, Small Signal Analysis

Unit III: FEEDBACK AMPLIFIERS & OSCILLATORS (10 Hrs)
Feedback Amplifiers, Classification of Oscillators, Stability, Barkhausen Criteria, Design of RC, LC and Crystal Oscillators, Emitter follower, Applications

Unit IV: POWER AMPLIFIER (10 Hrs)
Classification A, B, AB, C, Efficiency, Push-Pull Configuration (A, B, AB) Complementary symmetry, Second Harmonic and Cross over Distortion., Design of Power Amplifiers (Class A and Class AB), Design of class A Small signal amplifiers

Unit V: UNIPOLAR DEVICES (10 Hrs)
Field Effect Transistor, MOSFET, NMOS, PMOS, Principles of operation and characteristics, Biasing arrangement, small signal analysis of CG, CB and CD.

Unit VI: CMOS Circuits (10 Hrs)

An introduction to CMOS, MOSFET Switches, Transmission Gate, Inverter - DC, AC Analysis, Advance topics on the subject.

Text Books:
4. Sedra And Smith Microelectronic Circuits, Oxford Press University Fifth Edition

Reference Books:

BECP 201 ELECTRONIC DEVICES & CIRCUITS
[0-0-2-2] Total Hrs : [20hr.]

LIST OF EXPERIMENTS:
1. To calculate ripple factor of full wave rectifier with and without filter.
2. To plot the characteristics of clipper circuit & to perform simulation on Micro-cap.
3. To plot the characteristics of clamper circuit & to perform simulation on Micro-cap.
4. To design Zener Diode as a Voltage Regulator & to perform simulation on Micro-cap.
5. To design a transistor shunt voltage regulator
6. To design emitter follower type of voltage regulator using Darlington pair and simulate it on microcap.
7. To design push-pull class A power amplifier and simulate it on microcap.
8. To design class AB audio power amplifier and simulate it on microcap.
9. To design Hartley oscillator and simulate it on microcap.
10. To design a Wein Bridge Oscillator and simulate it on microcap.
11. To design RC Phase Shift Oscillator and simulate it on microcap.
12. To plot the drain & transfer characteristics of FET in CS mode & to perform simulation on micro-cap.
13. To verify frequency response of single stage RC coupled amplifier & to perform simulation on micro-cap.
14. To design a CMOS inverter using microwind.
15. Open Ended experiments

BEEL201 NETWORK THEORY
[3-1-0-4] Total Hr.:[60Hrs.]

Course Prerequisite:
Basic Electrical (BEEL106)
Course-Co requisite:
Electronic Devices & Circuits (BECL 201),
Applied Mathematics – III (BAML201)

Course Objectives:
1. To introduce the concept of circuit elements lumped circuits, circuit laws and reduction.
2. To study the loop and nodal analysis of networks in ac and dc systems.
3. To study the transient response of series and parallel A.C. circuits.
4. To study the concept of coupled circuits and two port networks.

Course Outcomes:
Student shall be able to

CO1: Analyze circuits with ideal, independent, and controlled voltage and current sources using Mesh & Nodal analysis.
CO2: Determine the equivalent circuits of a network that include passive devices, dependent sources, and independent sources in combination using network theorems.
CO3: Understand the analysis techniques of electrical networks and also waveform synthesis.
CO4: Understand and measure the transient and sinusoidal Steady-state
CO5: Responses of simple RC and RLC circuits
CO6: Simplify circuits using network reduction approach.
CO7: Determining two port network parameters and one parameter in terms of other parameters.

Course Content:
Unit I: Nodal & Mesh Analysis (10 Hrs.)
Nodal and Mesh analysis basic equilibrium equations, matrix approach for complicated network, containing voltage, current sources, Mutual Inductances, source transformations, Duality.

Unit II: Network Theorems (12 Hrs.)
Superposition, Reciprocity, Thevenin’s, Norton’s, maximum power transfer, compensation, Tellegen’s theorem as applied to A.C. circuits.

Unit III: Fourier Analysis (10 Hrs.)
Trigonometric and exponential Fourier series. Discrete spectra and symmetry of waveforms, synthesis, steady state response of a network to non sinusoidal periodic inputs. Fourier transforms and continuous spectra.

Unit IV: Laplace Transformation (10 Hrs.)
Laplace transformation and its properties, partial fractions, singularity functions, waveform synthesis. Analysis of RC & RL network with and without initial conditions with Laplace transformation, evaluation of initial & final conditions.

Unit V: Network Function (10 Hrs.)
Transient behaviors, concept of complex frequency, Driving points and transfer functions, poles, zeros of admittance function, their properties, sinusoidal response from Pole-zero locations, convolution theorem and integral solution.

Unit VI: Two Port Network (08 Hrs.)
Two port network parameters and inter connections study of series and parallel resonance in A.C. Three Phase unbalanced circuits and power calculations. Advance topics on the subject

Text Books:

Reference Books:

BECL202 COMMUNICATION ELECTRONICS
(3-1-2-5) Total Hr.: [60 Hrs.]

Course-Prerequisite:
Basic Electronics (BPHL105)

Course-Co requisite:
Electronic Devices & Circuits (BECL 201), Applied Mathematics – III (BAML201)

Course Objectives:
1. To understand the basic concept of communication and different modulation systems based on basic parameters.
To understand the concept of multiplexing.
To understand theory of digital modulation.
To understand working of radio receivers.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Understand the propagation of waves and Evaluate the influence of noise on communications signals.
CO2: Demonstrate knowledge and understanding basic concepts in amplitude modulation and demodulation of analog communication systems
CO3: Assess and evaluate angle modulation and demodulation of analog signals and the performance of FM receivers
CO4: Apply sampling theorem to design analog pulse modulation techniques.
CO5: Understand the need and limitations of various multiplexing techniques
**CO6:** Understand the practical implementation and limitations of digital modulation techniques like PCM, DM and ADM.

**Course Content:**

**Unit I: Introduction to Communication, Radiation and Propagation (10 hrs.)**
Block Schematic of Communication System, Base Band Signals and their bandwidth requirements, RF Bands, Concept of Radiation and Electromagnetic waves, Mechanism of Propagations: Ground Wave, Sky Wave, Space Wave, Duct, Tropospheric Scatter and Extraterrestrial Propagation. Concept of Fading and diversity reception, Noise Figure Calculations.

**Unit II: Amplitude Modulation And Detection (10 Hrs.)**
AM Modulators series plate modulated class C amplifiers, efficiency & power calculations, SSB modulation SSB-SC modulation AM demodulators, square law detector, diode peak detector, envelop detector, detectors for SSB and SSB-SC-AM signals, AM using transistors, Block Diagram of AM Receiver, AM Detection: Envelope detection, Synchronous detection, Practical diode detection, AGC, SSB and DSB detection methods.

**Unit III: Frequency Modulation And Radio Receivers (10 hrs.)**

**Unit IV: Pulse Modulation Techniques (10 Hrs.)**
Introduction to Sampling, Sampling theorem, Sampling Techniques, Analog Pulse Modulation methods, Pulse amplitude modulation (PAM), Demodulation of PAM, Transmission of PAM, Drawbacks. Pulse time modulation: Pulse width modulation (PWM), Modulation and Demodulation of PWM, Pulse position modulation (PPM), Modulation and Demodulation of PWM.

**Unit V: Digital Multiplexers (10 hrs.)**
Frequency Division multiplexing, Time Division Multiplexing. PAM/TDM System: Signaling rate, transmission bandwidth, advantages and disadvantages. Introduction to Digital multiplexers and their classification, Multiplexing Hierarchy for Digital Communication.

**Unit VI: Digital Modulation Techniques (10hrs.)**
Pulse code modulation (PCM): PCM systems, Delta modulation, ADPCM, matched filter receiver, Digital Modulation formats, Coherent Binary modulation technique, Coherent Binary: PSK, FSK, QPSK, MSK, and DPSK. Advance topics on the subject

**Text Books:**

**Reference Books:**

**BECP202 COMMUNICATION ELECTRONICS**

**LIST OF EXPERIMENTS :**
2. Generate Amplitude Demodulation using Envelope Detector and observe the result on CRO and Verify using MATLAB.
3. Generation of FM using IC XR 2206 and calculate modulation index and Verify the results using MATLAB
4. Generation of Pre-emphasis and De-emphasis circuit on breadboard system & to plot pre-emphasis and de-emphasis curve.
5. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms and Verify results using Microcap.
8. Verify Amplitude Shift Keying (ASK) using MATLAB
9. Generation of Frequency Shift Keying (FSK) and observation of mark and space frequencies using MATLAB.
10. Verify Pulse Code Modulation (PCM) using MATLAB
11. To perform Phase Shift keying (PSK).
12. To perform Quadrature Phase Shift keying (QPSK).
13. To perform Delta modulation and observe the waveforms.
14. To observe the slope overload errors of Delta modulation.
15. Open Ended experiments
Course-Prerequisite:
Basics of Computing (BITL104)

Course Objectives:
1. To understand the way of developing programs based on well defined approach.
2. To develop proficiency in the specification, representation, and to implement Data Types and Data Structures in C language.
3. To understand the analysis of various Algorithms.
4. To get a good understanding of applications of Data Structures in C language.

Course Outcomes:
1. CO1: Acquire and Apply basic concepts of data type and array data structure.
2. CO2: Implement linked list data structure to find solution for given engineering applications.
3. CO3: Implement data structure such as stacks and queues to solve various computing problems using C-programming language.
4. CO4: Design tree data structure to solve various computing problems.
5. CO5: Design graph data structure to solve various computing problems.
6. CO6: Design and analyze standard algorithms for searching and sorting.

Course Content:

Unit I: Arrays, Records and Pointers (10 Hrs)
Introduction, Linear Arrays, Arrays as ADT, Representation of Linear in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; 2. Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices

Unit II: Linked List (10 Hrs)

Unit III: Stacks, Queue and Recursion: (10 Hrs)
Introduction, Stacks , Array Representation of Stacks , Linked Representation of Stacks, Stack as ADT, 6. Arithmetic Expression; Polish Notation , Application of Stacks Recursion, Towers of Hanoi, 7. Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues Deques, Priority Queues, Applications of Queues

Unit IV: TREES (10 Hrs)

Unit V: Graphs and their Applications (10 Hrs)
Introduction , Graph Theory Terminology , Sequential Representation of Graphs; Adjacency Matrix; Path Matrix , Warshall’s Algorithm; Shortest Paths , Linked Representation of a Graph , Operations on Graphs , Traversing a Graph, Posets; Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching (10 Hrs)
Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort Radix Sort, Searching and Data Modification, Hashing

Text Books:

LIST OF EXPERIMENTS:
Write and execute a program in C to implement stack using arrays
Write and execute a program in C to implement queue using arrays
Write and execute a program in C to implement simple linked list
Write and execute a program in C to implement stack using linked list
Write and execute a program in C to implement queue using linked list
Write and execute a program in C to implement doubly linked list
Write and execute a program in C to implement circular linked list.
Write and execute a program in C to reverse a singly and doubly linked list
9. Write and execute a program in C to insert a node in a linked list in a sorted fashion.
10. Write and execute a program in C to implement binary tree, finding the depth of a tree.
11. Write and execute a program in C to implement in-order, pre-order and post-order traversals.
12. Write and execute a program in C to find if two trees are identical.
13. Write and execute a program in C to implement graph using linked list.
14. Write and execute a program in C to implement bubble sort and selection sort using menu driven program.
15. Write and execute a program in C to implement merge sort.
16. Open ended practical.

MBL102 General Proficiency-II: German/ French / Spanish Languages
[1-0-2-3]

Course Objectives:
1. To learn foreign languages to improve inter personal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.
3. To help communicate at international forums and explore opportunities for employment.

Course Outcomes:
At the end of the course the student shall be able to:
1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums.

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<td>Day timing, Daily routines, forms of respects, Vocabulary</td>
<td>Describing neighborhood, Present Tense</td>
<td>Furniture, Household articles, Colors</td>
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<td>Family and relations</td>
<td>Shapes and colors, Possessive Pronouns, Gender, Negative Sentence</td>
<td>Relations, Day of week</td>
<td>Learning the shopping etiquettes, vocabulary of food items, converting with shopkeepers etc, Plurals</td>
<td>Project on vocabulary of vegetables and fruits, Bakery products, Group Activity / Role play</td>
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FOURTH SEMESTER

BEEL310
POWER ELECTRONICS
(4-0-2-5) Total Hr.: [60 Hrs.]
Course Prerequisite:
Basic Electrical (BEE106),
Basic Electronics (BPHL105),
Electronic Devices & Circuits (BEC201),
Applied Mathematics-III (BAML201)

Course Co-requisite:
Analog Systems And Design (BECL302)

Course Objectives:
1. To study characteristics of modern power electronic devices.
2. Design and application of power electronics circuits in the field of AC/DC power generation.
3. To study transmission and energy conversion using switching devices.
4. To study the design procedure for protection circuits

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Understand the components of power electronics devices, characteristics, and practical issues in power electronics circuit design.

CO2: Understand the need & operation of power converter and design AC to DC converter for given specification.

CO3: Apply skill to design converter for drive control and AC-AC converters for given specification.

CO4: Understand the theory and operation of high-frequency switching circuits for different power conversion applications and able to design protection circuits.

CO5: Understand the need, working principle and design & analyze DC-DC converter for given specification.

CO6: Apply knowledge and analysis techniques to design AC-DC power converter with given specification and use methods for reduction of harmonics distortions.

Course Content:
Unit I: SCR and Its characteristics: (10 Hrs.)
Gate characteristics, SCR turn off, ratings, series and parallel connections of SCRs. Triac and its applications, Unijunction transistors, Triggering circuits and opto couplers.

Unit II: Line commutated converters: (10 Hrs.)
Working of single pulse converter, two pulse midpoint converter. three pulse midpoint converter and 3 phase six pulse bridge converter, effect of source inductance in converters, effect of tree wheeling diode.

Unit III: Single phase and three phase half controlled converters: (10 Hrs.)
Speed control of D.C. motors using line commutated converters. Cycloconverters (single phase).

Unit IV: Static controllable switches: (10 Hrs.)
Characteristic and working of MOSFET Gate turn off Thyristors and insulated gate bipolar transistor, protection of SCR gate circuit protection, over voltage and over current protection, snubber circuit design, converter circuit faults and their protection.

Unit V: D.C. Choppers: (10 Hrs.)

Unit VI: Single phase and three phase invertors: (10 Hrs.)
Single phase and three phase bridge invertors, commutation and trigger-circuits for forced commutated thyristor inverters. Output voltage control, Harmonics in output voltage waveform, Harmonic attenuation by filters. Harmonic reduction by pulse width modulation techniques. Analysis for single pulse width, modulation. Working of current source inverters few applications of inverters. Advance topics on the subject

Text Books:

Reference Books:

BEEP310
POWER ELECTRONICS
[0-0-2-2] Total Hrs: [30hr.]

LIST OF EXPERIMENTS:
1. To study and plot V-I characteristics of SCR
2. To study and plot V-I characteristics of TRIAC
3. To study and plot V-I characteristics of UJT
4. To study UJT as Relaxation Oscillator
5. To study and plot IGBT characteristics
6. To study and verify the operation of single phase Cycloconverters and plot the waveforms
7. To study parallel inverter
8. To study Class A commutation of a Thyristor
9. To study and plot characteristics of DC chopper
10. To study and plot the characteristics of single-phase converter
11. To Plot the characteristics of 1-phase full wave converter in MATLAB Software.
12. To Plot the characteristics of 3-phase bridge inverter in PSIM Software.
13. Open Ended experiments

BCSL202 COMPUTER ARCHITECTURE & ORGANIZATION (3-1-0-4) Total Hr.[60 Hrs.]

Course-Prerequisite:
Basics Of Computing (BITLE104),
Basic Electronics (BPHL105)
Course-Co requisite:
Digital System Design (BEC301)

Course Objectives:
1. To make the students acquainted with the organization and architecture issues of digital computers.
2. To understand the design and working of various organizational blocks.
3. To study in detail the operation of the arithmetic units, control units and the concept of pipelining.
4. To study the different ways of communicating with I/O devices and standard I/O interfaces

Course Outcomes:
At the end of the course the student shall be able to:

CO1: To analyze the basic structure and operation of a digital computer.

CO2: Ability to think critically, independently, and quantitatively about computer processing and sequencing of the instructions.

CO3: Analyze the arithmetic unit by studying various algorithms for number operations.

CO4: Be familiar with organization and design of memory Concept, structure and operation of Cache memory and virtual memory.

CO5: Reason systematically about impact of design and ways of communicating with I/O devices and interfaces.

CO6: Apply the concept of pipelining to improve the performance of Computer architecture

Course Content:
Unit I: Basic Structure of Computers (6 Hrs.)
Functional Units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.

Unit II: Basic Processing Unit (10 Hrs.)
Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro-programmed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit (12 Hrs.)
Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth's Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System (12 Hrs.)
Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input / Output Organization (10 Hrs.)
I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC Philosophy (10 Hrs.)

Text Books:

Reference Books:

BECL301 DIGITAL SYSTEM DESIGN (3-1-2-5) Total Hr.: [60 Hrs.]

Course-Prerequisite:
Basic Electronics (BPHL105),
Electronic Devices & Circuits (BECL 201)
Course-Co requisite:
Analog Systems And Design (BECL302)

Course Objectives:
1. To impart fundamentals of digital system design
2. To study system modeling using VHDL.
3. To study CPLD and FPGA Architecture.

Course Outcomes:
At the end of the course the student shall be able to:

**CO1:** demonstrate basic knowledge in the hardware describing language VHDL

**CO2:** able to modify system to remove delay in the sequence of generation by introducing signal driver concept.

**CO3:** able to apply standardization while writing code with standard, package, programs, subprograms for easy test-simulation.

**CO4:** able to write VHDL code for block generation of complex and simple Circuits of digital systems.

**CO5:** able to understand and develop new methods of operation in digital system in finite and infinite loop of iteration cycle for said limit.

**CO6:** Design, Simulate and synthesize programming models for digital circuits using Simulators

**Unit I: Introduction** (12 Hrs.)
Introduction to VHDL, Methodologies, design Units, data objects, VHDL data types, Attributes.

**Unit II: VHDL Statements and concept of delays** (08 Hrs.)
Concurrent and sequential statements, inertial and transport delays, delta delay, signal drivers.

**Unit III: Programming concepts** (08 Hrs.)
Subprograms – Functions, Procedures, generic, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

**Unit IV: Combinational System Design** (12 Hrs.)
Combinational logic circuit design and VHDL implementation of following circuits – fast adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

**Unit V: Sequential System Design** (10 Hrs.)
Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC)

**Unit VI: Introduction to PLDS** (10 Hrs.)

**Text Books:**

**Reference Books:**

**BECP301**
**DIGITAL SYSTEM DESIGN**

<table>
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<th>Total Hrs</th>
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**LIST OF EXPERIMENTS**
1. Write a VHDL code for different logic gates.
2. Design 4:1 multiplexer and write a VHDL code for same using data flow style of modeling.
3. Design 4-to-16 decoder by combining two 3-to-8 decoders and write a VHDL code for same using behavioral style of modeling.
4. Design BCD to & segment decoder and write a VHDL code for same using behavioral style of modeling.
5. Design of F/F and write a VHDL code for same using behavioral style of modeling.
6. Design half adder and full adder and write a VHDL code for same using dataflow style of modeling.
7. Design a 9-bit Parity generator circuit and write a VHDL code for the same using structural style of modeling.
8. Design a Decade Counter using J-K flip-flops and write a VHDL code for the same using structural style of modeling.
9. Design Three –bit up-down counter and write a VHDL code for the same using structural style of modeling.
10. Design of Finite state machine to detect a sequence "1011" using Mealy model and write VHDL code for the same.
11. Implementation & Testing of Counter on Xilinx FPGA
12. Implementation & Testing of Clock circuits on Xilinx FPGA.
13. Design a 4 bit comparator
14. Design BCD to seven segment decoder.
15. Design Arithmetic And Logic Unit.

BECL205 FIELD THEORY
[3-1-0-4] Total Hr.: [60 Hrs.]

Course-Prerequisite:
Applied Mathematics I (BAML101)
Applied Mathematics II (BAML102)
Applied Mathematics III (BAML201)
Basic Electronics (BPHL105)
Basic Electrical (BEEL106)

Course Objectives :
1. To study electric and magnetic fields from stationary and dynamic charge and current distributions.
2. To study and understand properties of waves its propagation and waveguides.
3. To impart the knowledge of radiations, dipoles and potentials in Electromagnetic fields.
4. To inculcate the fundamentals of Antennas and its parameters

Course Outcomes :
At the end of the course the student shall be able to:

CO1: Use Gauss’s Law, Coulomb’s law to find fields and potentials for a variety of situations including charge distributions and Understand the meaning of divergence to calculate line integrals, surface and volume integrals

CO2: Analyze and solve magneto static field problems using Biot-Savart law and Ampere’s circuit law with the associated boundary conditions.

CO3: Understand Maxwell’s Equations for static and time-harmonic fields and the boundary conditions across media boundaries.

CO4: Analyze electromagnetic wave propagation and attenuation in various medium and propagation through boundaries between media; be able to compute the Pointing vector and identify the power flow direction.

CO5: Make use of Electromagnetic field concepts to understand the definition of waveguide and how waveguide modes are formed.

CO6: Understand antenna characteristics including gain, beam width, polarization and near and far field patterns and calculate radiated power.

Course Content:
Unit I: Electrostatics (10Hrs)
Introduction to Cartesian, cylindrical and spherical coordinate systems. Electric field intensity, flux density, Gauss’s law, divergence, divergence theorem, Electric potential and potential gradient.

Unit II: Magnetostatics (10Hrs)
Current density and continuity equation, B-S law, Ampere’s circuitual law and applications, Magnetic flux and Flux density, Scalar and Vector magnetic potentials.

Unit III: Maxwell’s Equations And Boundary Conditions (08Hrs)
Maxwell’s equations for steady fields. Maxwell’s equations for time varying fields. Electric and magnetic boundary conditions.

Unit IV Electromagnetic Waves (12Hrs)
Electromagnetic wave equation, wave propagation in free space, in a perfect dielectric, and perfect conductor, skin effect, Pointing vector and Pointing theorem, reflection and refraction of uniform plane wave at normal incidence plane, reflection at oblique incident angle

Unit V: Waveguides (12Hrs)
Introduction, wave equation in Cartesian coordinates, Rectangular waveguide, TE, TM, TEM waves in rectangular guides, wave impedance, loses in wave guide, introduction to circular waveguide.

Unit VI: Radiation (08Hrs)
Retarded potential, Electric and magnetic fields due to oscillating dipole (alternating current element), power radiated and radiation resistance, application to short monopole and dipole. Antenna Efficiency, Beamwidth, Radiation Intensity, Directive Gain Power Gain & Front To Back Ratio. Advance topics on the subject

Text Books:

Reference Books:

BECL302 ANALOG SYSTEMS AND DESIGN
[3-1-2-5] Total Hr.: [60 Hrs.]

Course-Prerequisite:
Basic Electronics (BPHL105),
Applied Mathematics – III (BAML201)

Course-Co requisite:
Digital System Design (BECP301)
Course Objectives:
1. To understand analog circuits and systems.
2. To know linear and nonlinear applications of operational amplifier ICs.
3. To study frequency response of different circuits based on operational amplifier applications.
4. To study and use different ICs such as timers for applications.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Understand fundamentals, electrical parameters and specifications of operational amplifier.
CO2: Design op amp circuits for linear applications
CO3: Infer the DC and AC characteristics of operational amplifiers and its effect on output
CO4: Design filters (up to 6th order) and oscillators (sine, triangular, square and saw tooth) using op amp for real time applications.
CO5: Develop an intuition for analog circuit behavior in nonlinear operation
CO6: Use special ICs in analog system design

Course Content:

Unit I: Operational Amplifier Fundamentals (12hrs)
Operational Amplifier, Basic Op-Amp Configuration, an Op-Amp with Negative Feedback, Voltage Series and Voltage Shunt Configurations, Difference amplifiers, Instrumentation Amplifier, Specification of an Op-Amp, Offset Voltages and Currents, CMRR, Slew Rate

Unit II: General Linear Applications (9Hrs)
1. Constant Current Source and Voltage Source
2. Summing, Scaling and Averaging Amplifiers, Voltage To Current Converter with Floating And Grounded Load, Current To Voltage Converter
3. Integrator and Differentiator

Unit III: Structure of OP-AMP (9Hrs)
4. Differential Amplifier, Cascaded Differential Amplifier
5. Stages and Level Translator, AC and DC Analysis of Cascade Amplifier, Design of two stage direct-coupled amplifier.

Unit IV: Active Filters And Oscillators (10 Hrs)
Classification of Filters, Active Filters, First to Sixth –Order Butterworth filter, Multiple-Feedback Filters (Band Pass And Band Reject Filters), IGMF configuration, All Pass Filter, Cascade Design Of Filters, Classification of Oscillators, Design of Op-amp based Phase Shift And Wein Bridge Oscillators, Square, Triangular And Saw Tooth Wave Generators

Unit V: Non-Linear Circuits (10 hrs)
Schmitt Trigger, Voltage Comparator, Voltage Limiters And Window Detector, Clippers And Clamps, Peak Detector, Precision Rectifiers, Analog Switches

Unit VI: Special ICS Applications (10 hrs)
The 555 Timer, Phase Locked Loops IC565, ICL8038 & XR2206 Function Generator, Voltage Controlled Oscillator Basic Operation, IC based Voltage Regulator Circuits, Dual Track Voltage Regulator, Three - Terminal Regulator(Fixed Regulator) Voltage Adjustment And Current Boosting Of Fixed Regulator, Merits And Drawbacks Of Linear Regulators, Advance topics on the subject

Text Books:

Reference Books:

BECP302 ANALOG SYSTEMS AND DESIGN [0-0-2-2] Total Hrs :[30hr.]

LIST OF EXPERIMENTS

Design and simulate buffer amplifier using IC 741.
1. Design and verify gain and frequency response of Inverting and Non-inverting amplifier using IC 741. Show its simulation results on microcap.
4. Design and verify Multivibrator circuits using IC 555.
5. Design any regulator IC application on breadboard.
A) To design a Zener Shunt Voltage Regulator.
B) Simulate the Zener Shunt Voltage Regulator and observe the waveform using microcap.
A) To design a WEIN Bridge Oscillator.
B) Generate the oscillations in microcap using Wein Bridge oscillator.
A) To design 2nd order Low Pass Filter.
B) To study the frequency Vs gain characteristic of Low Pass Filter using Microcap
A) Study of Low Voltage Regulator using IC 723.
B) Simulate and observe the regulated waveform on microcap.
A) To design a Emitter Follower type of Voltage Regulator.
B) Simulate the Emitter Follower type of Voltage Regulator and observe the waveform using microcap.

13. To design RC-phase shift oscillator and simulate using microcap.

14. Verify and simulate positive and negative clamper .

15. Design and verify VCO circuit using 555

**BECP206**

**MODELING & SIMULATION**

(0-0-2-1) Total Hrs :[30hr.]

*Course Prerequisite:
Basic Electronics (BPHL105),
Digital System Design (BECP301),
Analog Systems And Design(BECL302)

*Course Objectives :*
1. To select and apply appropriate simulation tools and techniques.
2. To study the modeling of systems using various tools.
3. To obtain and study the results of models designed on advanced simulation tools.

*Course Outcomes :
At the end of the course the student shall be able to:*

CO1: analyze the structure and characteristics of Basic CMOS design(Invertor, logic gates)

CO2: Design and analyze memory systems using CMOS technology.

CO3: Use industry-standard EDA tools for IC design.

CO4: Design various combinational circuits using Gates and Transistors.

CO5: Design digital and analog circuits at transistor level and develop the corresponding mask layout.

CO6: Perform AC and DC analysis for measuring response.

**LIST OF EXPERIMENTS**

1. Introduction of T Spice & Tanner tool
2. Design current mirror using tanner tool,
3. Design sample and hold circuit using tanner.
6. Design Three MOSFET voltage divider using tanner
7. Design common source amplifier using tanner.
9. Design a Pulse Code Modulation System using simulink
10. Digital Waveform Generation (Approximating a Sine Wave) using Simulink
11. Design of Signal processing blockset using MATLAB
12. Design of multi-order system using MATLAB and plot its time domain & Frequency domain response
13. Open Ended modeling experiments

**AUDIT COURSE**

**MBL103:**

**GENERAL PROFICIENCY-III: SOFT SKILLS**

[1-0-2-3]
FIFTH SEMESTER

BECL303
MICROPROCESSOR BASED SYSTEMS
[3-1-2-5] Total Hr.: [60Hrs.]

Course-Prerequisite:
Basic Electronics (BPHL105),
Digital System Design (BECP301),
Data Structures Using C (BCSL201),
Computer Architecture & Organization (BCSL202)

Course Objectives:
1. To study concepts of microprocessors family
2. To study interfacing of microprocessors with peripheral devices.
3. To understand the design of microprocessor based systems.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Identify and explain functionality of various blocks of microprocessor.
CO2: Design, code and debug the assembly language programs that demonstrate concepts of processor architecture and program development environment.
CO3: Design and implement floating point operations using co-processor.
CO4: Interface IO devices such as 8255 PPI, A/D, D/A converter and 8253 Timer IC.
CO5: Design and develop complete microprocessor based real time systems.
CO6: Understand working prototype for advanced microprocessor.

Course Content:
Unit I: (12 Hrs)
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086 / 8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on- Clock Speed, Concurrent operation of EU and BIU, Memory Organization, Interfacing addressing modes, Instruction set, Programming examples, Pseudo OpCodes, Assembler Directives.

Unit II: (10 Hrs)
Introduction to Software and Hardware tools. [Cross assemblers, Logic analysers, Emulators, Simulators], Architecture, Interfacing and programming of Peripheral 8255, Interfacing of ADC, DAC & Traffic controller, Stepper Motor.

Unit III: (08Hrs)

Unit IV: (10 Hrs)
Architecture, Interfacing and programming 8253-PIT, 8279 – Keyboard Display Mode, Sensor matrix Mode, 8237 DMA Controllers and Organization, Control Words.

Unit V: (10 Hrs)
8086 / 88 Maximum Mode, Architecture and Programming of 8087 and its Interfacing with 8086/8088

Unit VI: (10 Hrs)
80386 Architecture, Real and Protected Mode, Register Model, Memory Management Unit, Latest trends in microprocessors systems.

Text Books:
D.V. Hall, Programming & Interfacing of 8086 / 8088, 3rd edition, TMH, 2012

Reference Books:

BECP303
MICROPROCESSOR BASED SYSTEMS
[0-0-2-2] Total Hrs : [30hr.]

LIST OF EXPERIMENTS:
1. Study of 8086 microprocessor, Assembler/Cross Assembler/Simulator and basic programs like addition of two 16 bit, 32 bit numbers and series addition [complete architecture, segmentation and pin diagram].
   Write an ALP to compare a string by using string related instructions of 8086.
   Write an assembly language program for 8086 to generate Fibonacci series and store it from memory location 0050H.
   Write an ALP to find the Number in Memory Array.
5. Write an ALP to arrange a string in Ascending/Descending order.
   Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED’s.
   Interface 8253 with 8086 microprocessor
   Interface 8251 with 8086 microprocessor
   Interface peripheral device Analog to Digital Converter ADC with 8086 using 8255
   Open ended experiment.
BECL 304 SIGNAL & SYSTEMS [3-1-0-4]  
Total Hr.: [60 Hrs.]

Course-Prerequisite:  
Applied Mathematics III (BAML201),  
Network Theory (BEEL201),  
Communication Electronics (BECL 202)  
Course-Co requisite:  
Television Engineering (BECL 401)

Course Objectives:  
1. To introduce the fundamental characteristics, concept and technique of signal and systems.  
2. To familiarize with time and frequency domain representation of linear systems and understanding the inter-relationship between two domains.  
3. To study development of mathematical skills like Fourier series, Transforms, Random Theory are analyze using signal & System with transform techniques.  
4. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.

Course Outcomes:  
At the end of the course the student shall be able to:  
CO1: To derive the probability density functions of transformations of random variables and use these techniques to generate data from various distributions.  
CO2: Classify signals and systems based on their properties and to evaluate and analyze Linear Time Invariant systems.  
CO3: To understand the nature of the Fourier Transform of a signal and predict the general nature of a signal in the time domain, via knowledge of their properties and spectrum.  
CO4: To understand and apply Discrete Time Fourier Transform for the analysis of discrete time systems.  
CO5: To demonstrate the effect of sampling on continuous time signals by the Nyquist Criterion and to understand aliasing.  
CO6: To define channel capacities and properties using Shannon’s Theorem and calculate the information content from its probability distribution.

Course Content:  
UNIT I: Discrete time signals and systems, classification of discrete time systems and its properties, Linear convolution, Cross Correlation, Autocorrelation of discrete signals, sampling theorem & sampling process.  
UNIT III: Transform analysis of LTI system & structure for discrete – time system. Frequency response of LTI system, Relationship between magnitude & phase response, Block diagram representation & signal flow graph representation of IIR and FIR systems. Linear constant coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures  
UNIT IV: Filter design Techniques: Design of discrete time IIR filters from continuous time filters, Frequency transformation of low pass IIR filters, Design of FIR filters by windowing, FIR filter design by Kaiser and Hamming window method.  

Text Books:  

Reference Books:  
1. B.P.Lathi, Signals & systems, Berkeley Cambridge Pr, 1987
BECL 401 TELEVISION ENGINEERING
[3-1-2-5] Total Hr.: [60 Hrs.]

Course-Prerequisite:
Communication Electronics (BECL 202)

Course-Co requisite:
Signal & Systems (BECL 304)

Course Objectives:
1. To introduce the study and analyze of transmission & reception for audio and video systems.
2. To study the principle of monochrome and color TV.
3. To study the principle of CCTV, MATV, CATV, HDTV.
4. To study the principle of LED TV and LCD TV.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Understand the fundamental concepts of Television Transmitter & Receiver Systems.
CO2: Compare performance of various camera tubes.
CO3: Demonstrate Television Receiver & justify the importance of troubleshooting & repair.
CO4: Understand the different types of picture tubes.
CO5: To study the various Color Television systems with a greater emphasis on PAL system.
CO6: Co-relate the fundamentals with modern television technologies.

Course Content:

Unit II: Color Television Receiver: RF Tuner, IF Subsystem, Video amplifier, Sound section, Sync separation and processing, Deflection circuits, 6. Scanning Currents in the yoke, DC power supplies, Chroma decoder, Separation of U and V colour phasors, Synchronous demodulators, Sub carrier generation and control, Matrixing for drive circuits.


Unit V: ATSC & DVB Modulation: ATSC 8-VSB Modulation, ATSC Data Framing, ATSC Concatenated Channel Coder, ATSC Channel Capacity, DVB Modulation, DVB Channel Coding, DVB Channel Capacity, DVB tele-text, DVB subtitling system.

Unit VI: Global View of transmission and reception process, Composition of Integrated Decoder CATV, projection Television – Flat panel display TV receiver, Stereo sound in TV, 3D TV Evolution of the set top box, High-Definition Television (HDTV), Digital TV over IP, Digital terrestrial television for mobiles.

Text Books:

Reference Books:

BECL 401 TELEVISION ENGINEERING [0-0-2-2] Total Hr.: [20 Hrs.]

LIST OF EXPERIMENTS:
Introduction to Monochrome Picture tube.
To demonstrate RF Tuner Section and perform analysis of faults in the tuner section.
Testing of Sound IF section and perform analysis of faults in the audio section.
Testing of Video IF Section and perform analysis of faults in the Video section.
To demonstrate circuit description of Sync & Horizontal oscillator section and perform analysis of faults in color & Monochrome TV.
To demonstrate circuit description of Vertical oscillator section and perform analysis of faults in color & Monochrome TV.
To demonstrate circuit description of Video and Chroma section and perform analysis of faults.
To demonstrate circuit description of system control section & perform analysis of faults in color & Monochrome TV.
Testing of various types of antenna and their...
radiation pattern.
10. To demonstrate an Audio & Video signals over satellite link.
11. To change different combinations of uplink & downlink frequencies and check the communication link
12. To transmit & receive function generator waveforms through satellite link
13. To study LCD Television
14. To study the block diagram of HDTV Receiver.
15. To observe voltages and waveforms of different test points and fault switches in HDTV Receiver.

BECL 403 DIGITAL COMMUNICATION
[3-1-2-5] Total Hr.: [60 Hrs.]

Course Prerequisite:
Communication Electronics (BECL 202),
Applied Mathematics – III (BAML201)

Course Co-requisite:
Signal & Systems (BECL 304),
Television Engineering (BECL 401)

Course Objectives:
1. To understand the basic knowledge of digital communication system.
2. To study the issues such as coding, multiple access, error probability, algorithms etc for analog and digital communication.
3. To impart the knowledge of design, analysis & comparison of digital communication systems.

Course Outcomes:
At the end of the course the student shall be able to:
CO 1: Understand baseband systems, sampling, quantization and source coding for digital transmission and able to conduct a Matlab-based design project
CO 2: Validate different techniques of modern digital communication systems such as line coding, multiplexing, ISI, correlative coding.
CO 3: Analyse different digital modulation & demodulation techniques and evaluate their performance in terms of Bit Error rate by demonstrating it using MATLAB/Simulink.
CO 4: Design digital systems using appropriate mathematical techniques such as Graham-Schmidt Procedure and signal-space concept.
CO 5: Solve various source/channel coding and error-control coding techniques.
CO 6: Understand spread spectrum Techniques and its performance parameters for any digital communication system.

Course Content:
Unit I: (8Hrs)
Digital base band modulation techniques:
Bandwidth of digital Data, Base band system, Formatting textual Data, Formatting Analog Information, Sources of Corruption, Uniform and non uniform quantization, Base band Modulation, Correlative Coding, Information Theory: Source

Unit II: (7Hrs)
Digital data transmission systems and transmission media:
Line coding, Pulse shaping, Scrambling, Regenerative repeater, Detection- Error Probability, M-ary communication, Digital multiplexing, Transmission media, Inter symbol interference, Eye Pattern

Unit III: (8Hrs)
Baseband Modulation and demodulation techniques:
Digital Band pass Modulation techniques, Detection of signals in Gaussian noise, Coherent & Non coherent detection, Complex envelop, Error performance for Binary system, M-ary signaling and performance, Symbol error performance for M-ary Systems, Bit error Rate calculations.

Unit IV: (7Hrs)
Advanced Modulation Method: Gram – Schmidt procedure, signal space representation of modulated signals, nonlinear modulation methods with memory, error probability and optimum receivers for AWGN channels, signal space concept

Unit V: (7Hrs)
Block and convolutional channel codes
Linear block codes, generator matrix and parity check matrix, some specific linear block codes, cyclic codes, transfer function of a convolution code, optimum decoding of convolutional codes- Viterbi algorithm distance properties of binary convolutional codes

Unit VI: (8Hrs)
Spread Spectrum techniques:
Spread Spectrum Overview, Pseudo noise Sequences, Direct-Sequence Spread Spectrum systems, Frequency hopping systems, Synchronization, Jamming consideration., Advanced topics on Digital Communication

Text Books:

Reference Books:
LIST OF EXPERIMENTS:
1. To Study and observe the performance of Return to Zero (RZ) types of line codes.
2. To Study and observe the performance of Non-Return to Zero (NRZ) types of line codes.
3. To perform TDM-PCM Transmission and Reception.
4. To Study and perform Error Detection and Correction codes.
5. To understand the concept of Delta Modulation and to achieve the Delta Modulation / De-Modulation.
6. To study the performance of adaptive Delta modulator/De-modulator circuits.
7. To Study and observe the performance of Digital carrier system-ASK.
8. To Study and observe the performance of Digital carrier system- FSK.
9. To Study and observe the performance of Digital carrier system-PSK.
10. To Study and observe the effect of signal Distortion using EYE-Diagram.
11. MATLAB Simulation of various communication techniques.

BITL302
COMPUTER NETWORKS
[4-0-0-4] Total hr.: [60 Hrs.]
Course Prerequisite:
Computer Architecture & Organization (BCSL 202)

Course Objectives:
4. To understand the computer network architectures.
5. To make aware of design and performance perspective of network architectures.
6. To discuss current trends in communication networks.

Course Outcomes:
Student shall be able to

CO1: Understand circuit switching and packet switching technologies and their pros and cons with respect to different traffic types.
CO2: Apply and interpret different types of addressing and routing techniques in computer networks.
CO3: Understand how a data-packet is transmitted from source to destination.
CO4: Apply basic probability models of network phenomena.
CO5: Interpret Internet addressing, naming, and routing, congestion control, and QoS.

CO6: Design key networking algorithms in simulation.

Course Content:
Unit-I: (12 Hrs)

Unit-II: (12 Hrs)
Physical Layer - The theoretical basis for data communication-Fourier analysis, bandwidth-limited signals, maximum data rate of a channel, transmission media-magnetic media, twisted pair coaxial cable, fiber optics. Transmission, microwave transmission, infrared and millimeter waves, light wave transmission. Telephone system structure, politics of telephones, local loop, trunks and multiplexing, switching, narrowband ISDN - services, architecture, interface, perspective on N-ISDN, broadband ISDN & ATM-virtual circuits versus circuit switching, transmission in ATM networks, ATM switches.

Unit-III: (10 Hrs)
Data Link Layer - design issues - services provided to the network Layer, framing, error control, flow control, error correcting & detecting codes, elementary data link protocols, simplex stop and wait simplex protocol for noisy channel, sliding window protocols-one bit protocol, go back protocol, selective repeat protocol. The medium access sub layer - static and dynamic channel allocation in LANs and MANs, Multiple access protocols - ALOHA. CSIIA, collision free protocols, limited contention protocols, wavelength division multiple access protocols, wireless LAN protocols, IEEE Standards 802 for LAN and MANs-802.3 & Ethernet, token bus. token ring, comparison 802.6, 802.2.

Unit-IV: (12 Hrs)
The Network Layer - Design issues, services provided to the transport layer, internal organization, comparison of virtual circuit and datagram subnets, routing algorithms. Optimality principle, shortest path routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical routing, broadcast & multicast routing, congestion control algorithms, general principles prevention policies.
traffic shaping, flow specifications, congestion control in virtual circuit subnets, choke packets, load shedding, jitter control, congestion control for multicasting. Internetworking - how networks differ, concatenated Virtual circuits, connectionless Internetworking tunneling, internet work routing, fragmentation, firewalls, the Network layer in the internet - IP protocol, IP address, subnets, internet control protocols, OSPF, BGP, internet, Multicasting.

Unit V: (10Hrs)
Transport and Application Layer - services provided to the upper layer, Quality of Service, transport service primitives, elements of transport protocols, addressing, establishing a connection, releasing a connection, flow control & buffering, multiplexing, crash recovery, network security - traditional cryptography, fundamental principles, secret-key algorithms, public key algorithms, authentication protocols, digital signatures, social issues.

Unit VI: (4 Hrs)
Recent trends and advance topics.

Text Books:

Reference Books:

BECP 305
ELECTRONICS WORKSHOP PRACTICE-I
[ 0-0-2-1 ]
Course Objectives:
1. To use & analyze and identify the different types of Integrated Circuits
2. To understand the identification and computer aided design of PCB layout using different software tools.
3. To enable firsthand experience of components, their purchase, assembly, testing and trouble shooting.
4. To perform single sided and double sided PCB design using TFT machine by using a various method (Etching, Drilling, Mounting and Soldering of Components).
5. To do Mini Projects using Analog and Digital IC’s, active and passive components for Linear and Non-linear electronics circuits by organizing and managing time and resources effectively.
6. To familiarize students with modern engineering software tools and equipment to analyze Electronics and Telecommunication engineering problems

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Demonstrate familiarity with electronic components and related measurement equipments.

CO2: Understand use of meters and test equipment to measure electrical quantities.

CO3: Identify practical issues that arise in circuits and design PCB using artwork.

CO4: Understand & demonstrate different kinds of PCB soldering and de-soldering methods for problem solving

CO5: Design PCB using exposing & Etching methods.

CO6: Apply the basic principles of embedded system design and development, including using a contemporary computer environment and development board to implement a microcontroller-based embedded system design

LIST OF EXPERIMENTS :
To identify electronics and Surface Mounting Devices (SMD) components.
To perform Component testing using Measuring Instruments.
To perform testing of electronics components using CRO, Multi-meter, & LCR-Q meter.
To identify different type of Transformers, Switches, Relays, Cables, & Connectors.
To design Printed Circuit Board (PCB) Layout & preparation of PCB artwork using graph & OrCAD Software.
To perform PCB Exposing & Etching by various methods.
To perform soldering and de-soldering on dot printed circuit board.
To study 8051 Microcontroller & downloading program using Power lab.
Mini Project
To design Printed Circuit Board using wave Soldering (single wave) Machine.

BECP311
SELF STUDY
[0-0-2-2]
Course Objectives:
To use advanced communication tools for analysis and modeling the communication based techniques
To introduce the advanced topics based on Electronics Engineering and Electronics and Telecommunications Engineering.

Course Outcomes:
At the end of the course the student shall be able to:
**CO1:** Analyze recent trends and advanced topics in the Electronics & allied areas to meet desire needs with appropriate consideration for societal applications.

**CO2:** Understand the technological enhancement in the Electronics & allied areas and proposed solution for advancement.

**CO3:** Select and use appropriate techniques, skill & modern software simulation tools for advanced engineering practices.

**CO4:** Design & develop real time applications.

**CO5:** Apply knowledge to demonstrate electronics engineering practices.

**CO6:** Assembled E-learning resources like MOOC’s, NPTEL, and Virtual Labs etc. with application development.

**AUDIT COURSE**

**MBL104**

**GENERAL PROFICIENCY-IV: ADVANCED COMMUNICATION SKILL**

**CourseObjective:**

1. To make them aware of advanced techniques of public speaking, one to one interaction and social ethics.
2. To communicate and express efficiently and assertively.

**Course Outcomes:**

**At the end of the course the student shall be able to:**

**CO1:** Deliver the thoughts and speech in an effective way.

**CO2:** Employ appropriate speech in formal business situations.

**CO3:** Exhibit social responsibilities and ethics.

**CO4:** Possess reading techniques by using phonetics and phonology.

**CO5:** Prepare reports and proposals expected of a corporate professional.

**CO6:** Deliver power-point presentations using effective presentation skills.
SIXTH SEMESTER

BECL 315
TELEMATICS
[3-0-2-4] Total Hr.: [45 Hrs.]

Course-Prerequisite:
Communication Electronics (BECL 202),
Signal & Systems (BECL 304),
Television Engineering (BECL 401),
Digital Communication (BECL 403)

Course Objectives:
1. To identify the difference setting of Telephone receiver.
2. To describe the operation of cordless telephone.
3. To study the different Digital Switching system.
4. To study Principal and Service Provided by ISDN.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Understand concepts of automatic switching system
CO2: To provide the student with an understanding of advanced multiple access techniques
CO3: Understand working principles of Traffic Engineering
CO4: Demonstrate Computer Communication over Telephone lines.
CO5: Understand digital cellular systems (GSM, cdmaOne, GPRS, EDGE, cdma2000, W-CDMA, and LTE)
CO6: To analyze and design wireless and mobile cellular systems.

Course Content:
Unit I: (08 Hrs)
Introduction: Telephone Hardware And Telephone Line, Elements Of Switching Systems, Folded, Non-Folded, Non-Blocking, Blocking & Other Types Of Network Configurations, Two Wire And Four Wire Systems And Conversions, Echoes And Equalization, Signaling. Direct Control, Step By Step Switching & Other Switching, Rotary Dial Mechanism, Crossbar Control System, CCITT Standards Signaling. Pulse & Tone Dialing [DTMF], Choice Of Tone Frequency And Associated Problems.

Unit II: (07 Hrs)
Electronic Switching: Time Multiplexed Time Switch, Time Multiplex Space Switch, Time Division Space Switch, Time Slot Interchanging; Dual Processor Configuration, Reliability and Availability Criteria.

Unit III: (06 Hrs)

Unit IV: (08 Hrs)


Unit V: (08 Hrs)
ISDN and BISDN: Overview, ISDN Channels, User Access, ISDN Protocol, EPBAX Systems, DTMF, GSM, CDMA

Unit VI: (08 Hrs)
Asynchronous Transfer Mode: Protocol Architecture, ATM Logic Connections & Cells, Transmission of ATM Cells, ATM Adoption Layer, Traffic Control ATM in ISDN.

Text Books:

Reference Books:

BECP 315
TELEMATICS
[0-0-2-2] Total Hrs : [20hr.]

LIST OF EXPERIMENTS
Minimum 10 Practical from list given below
1. To Execute the AT commands using GSM Trainer Kit
2. To Track & Analyze the PRN Code of satellite using complete GPS Environment
3. Analyze & Plot the Tx/Rx IQ signals of GMSK Modulation using Mobile Trainer Kit
4. Analyze & Plot the Signal Constellation of GMSK Signal Using Mobile Trainer Kit.
5. To Analyze the Vibrator in GSM handset Using Mobile Trainer Kit
6. To Measure the PWM signal of the Vibrator in GSM handset Using Mobile Trainer Kit
7. To Measure the PWM signal of the Buzzer in GSM handset Using Mobile Trainer Kit
8. Analyze the Audio Signal using Cobba IC
9. To Analyze and detect Switched Fault insertion using Mobile Trainer Kit.
10. To Analyze the working of Voltage dropper and key matrix section using DTMF Telephone Trainer Kit
11. To Analyze and Measure the ring Detection phenomena using EPABX Trainer System
12. Introduction to EPABX unit and To analyze & measure the Trunk Relay Switching.
13. To Analyze of the working of Dialer Section & of DTMF Signals using High Pass Filter and Low Pass Filter
14. To Analyze the working of CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
15. To analyze buzzer & charging phenomenon in GSM handset

BECL 405 DIGITAL SIGNAL PROCESSING
[3-0-2-4] Total Hr.:[45 Hrs.]

Course-Prerequisite:
Signal & Systems (BECL 304), Communication Electronics (BECL202), Applied Mathematics –III (BAML201)

Course-Co requisite:
Control System Engineering (BEEL312)

Course Objectives:
1. To study signals for different kinds of applications in general and infer information from deterministic and random signals.
2. To understand the implementation and design digital filters.
3. To analyze signals using the discrete Fourier transform.
4. To understand circular convolution, its relationship to linear convolution.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Plot, identify and evaluate discrete-time signals.
CO2: Perform mathematical analysis of discrete signals using Fourier transform and Z transforms.
CO3: Apply appropriate filters (IIR, FIR) for discrete signal processing for various applications.
CO4: Design different filters using various methods in simulation environment.
CO5: Apply different methods for faster computation of DSP processor.
CO6: Understand the basic architecture and functioning of TMS320 DSP processors with its functioning & applications.

Course Content:
Unit I: (07 Hrs) Discrete time signals and systems, classification of discrete time systems and its properties, Linear convolution, Cross Correlation, Autocorrelation of 2 discrete signals, sampling theorem & sampling process.

Unit II: (08 Hrs) The Z transform, Definition, properties of ROC, for the Z-transform, Properties of Z-transform, Inverse Z transform using contour integration, complex convolution theorem, Unilateral Z transform.

Unit III: (08 Hrs) Transform analysis of LTI system & structure for discrete – time system. Frequency response of LTI system, Relationship between magnitude & phase response. Block diagram representation & signal flow graph representation of IIR and FIR systems. Linear constant coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures.

Unit IV: (07 Hrs) Filter design Techniques: Design of discrete time IIR filters from continuous time filters, Frequency transformation of low pass IIR filters, Design of FIR filters by windowing, FIR filter design by Kaiser and Hamming window method.

Unit V: (08 Hrs) circular convolution using DFT-IDFT method


Text Books:

Reference Books:

BECP 405 DIGITAL SIGNAL PROCESSING
[0-0-2-2] Total Hrs:[20 hr.]

LIST OF EXPERIMENTS:
Study of basic discrete time signals such as Unit impulse, step, ramp, real and complex exponential and its representations using MATLAB functions.

Use of MATLAB functions to obtain linear convolution of discrete signals.

Write a program for computing cross-correlation and auto-correlation of the given sequences.

Write a program to test stability of given discrete-time system.

Write a program to find frequency response of given system.
6. Write a program to find DFT and FFT of given sequences.
7. Write a program to find circular convolution of given sequences.
8. Digital IIR filter design using MATLAB functions.
11. Study of DSP Processor using TMS 5416 and TMS 6713 starter kits.
13. Open ended experiment.

BHUL301
ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT
[3-0-0-3] Total Hr.: [45 Hrs.]

Course-Prerequisite:
General Proficiency-I (MBL101)
General Proficiency-II (MBL102)
General Proficiency-III (MBL103)
General Proficiency-IV (MBL104)

Course Objectives:
1. To deal with the concepts of economics and management with an engineering perspective
2. To produce graduates with the ability to adopt a systems approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To cultivate the practices of independent learning on the part of the students that will prepare them to function effectively for diverse careers and lifelong learning.
5. To enable students to understand their role as engineers and their impact to society at the national and global context.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: The students should be able to understand the basics of Economics, which shall be helpful in their engineering career.

CO2: The students should be able to understand the concept of depreciation and apply it to relevant problem.

CO3: The students should be able to understand the Macro-Economic problems, and shall be able to apply it to relevant industry.

CO4: The student should be able to understand and analyze different functions of Management which is applicable in any organization.

CO5: The student should be able to understand the relevance of Marketing and shall be able to apply it to the Industrial scenario.

CO6: The student should be able to understand the importance of Finance in running business successfully.

Course Content:
Unit I: (7 Hrs)
Demand Utility and indifference curves, Approach to Analysis of demand, elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity, Marginalism.

Unit II: (8 Hrs)
Laws of Return and costs, price and output determination under perfect competition, monopoly, monopolistic competition, oligopoly, Depreciation and methods for its determination.

Unit III: (7 Hrs)
Functions of central and commercial banks Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Monetary and cycles, New economic policy, Liberalization, Globalization, Privatization, Market friendly state. Fiscal policy of the government, Meaning and phases of business.

Unit IV: (8 Hrs)
Definition, Nature and scope of management, Functions of management- Planning, organizing, Directing, Controlling, Communicating

Unit V: (7 Hrs)
Meaning of marketing management, Concept of marketing, Marketing Mix, Administrative and cost plus pricing, Channel of distribution, Advertising and sales promotion.

Unit VI: (8 Hrs)

Text Books:
1. K.K.Dewett, Modern economics theory, S Chand & Co, 2006
2. Dr D. M. Mithani, Managerial Economics: Theory & Applications, Himalaya publication, 2008

Reference Books:

BEEL312
CONTROL SYSTEM ENGINEERING
[3-0-0-3] Total Hr.: [45 Hrs.]

Course Prerequisite:
Signal & Systems (BECL 304), Applied Mathematics III (BAML201)
Course-Co requisite:
Digital Signal Processing (BECL 405)

Course Objectives:
1. To impart the knowledge of fundamental concepts of control systems and mathematical modeling of the system,
2. To understand the concept of time response and frequency response of the system and to use for stability & analysis of the system
3. To study and design compensators and controllers for control systems.
4. To model systems and signal flow graph and evaluate the properties of the overall systems.

Course Outcomes :
At the end of the course the student shall be able to:
CO1: Develop the mathematical model for electromechanical system used in the analysis and design of control system
CO2: Determine Transient and Steady State behavior of first and second order systems using standard test signals.
CO3: Analyze linear time invariant systems for absolute stability and relative stability using Routh –Hurwitz criterion.
CO4: Apply root locus technique to design feedback control systems and analyze effect of adding poles and zeros.
CO5: Apply different frequency response methods to analyze the stability of linear system in terms of gain and phase margins
CO6: Analyze the behavior and structure of a state-space model and obtain transfer-function models using state space approach

Course Content:
Unit I : Mathematical modeling and control system components. (10 Hrs.)
Introduction to need for automation and automatic control,use of feedback, broad spectrum of system application, Mathematical modeling,(Electrical & Electromechanical) diff. Equations., diff. transfer 1. functions, block diagram, signal flow graphs, application to elementary systems, simplifications, effect of feedback on parameter variations, disturbance signal servomechanism and regulators, Control system components, electrical electromechanical, their functional analysis and input output representation.

Unit II : Time response analysis (08 Hrs.)
Time response of system, first order and second order system, standard inputs, concept of gain and time constants, Steady state error, type of control system, approximate methods for higher order system.

Unit III: Stability of control systems. (05 Hrs.)
Stability of control systems, conditions of stability, characteristics equations, Routh- Hurwitz criterion, special cases for determining relative stability.

Unit IV : Root locus analysis (08 Hrs.)
Root location and its effect on time response, elementary idea of root locus, effect of addition of pole and zero on proximity of imaginary axis.

Unit V : Frequency response analysis (8 Hrs.)
Frequency response method of analyzing linear system, Nyquist and Bode Plots, Stability and accuracy analysis from frequency response, open loop and close loop frequency response, Nyquist Criterion, Effect of variation of gain and addition of pole and zero on response plot, stability margin in frequency response.

Unit VI : State variable techniques (06 Hrs.)
State variable method of analysis, characteristics of system state, choice of state variables, representation of vector matrix differential equation, standard form, relation between transfer function and state variables. Advance topics on the control system.

Text Books:

Reference Books:

ELECTIVE- I

BCSL312
COMPUTER GRAPHICS & VISUALIZATION
[3-0-0-3] Total Hr.:[45 Hrs]
Course-Prerequisite:
Applied Mathematics III (BAML201),
Computer Architecture & Organization (BCSL 202)

Course Objective :
To impart basic fundamentals of computer graphics
To aim at developing fundamental data structures and algorithm for modeling.
To provide carrier opportunities in developing Video Games, Virtual Reality Applications, Computer Simulations, Computer Aided Design and web design.
To impart the skills necessary for the generation of polygons and implementation of various polygon filling algorithms.

Course outcomes:
At the end of the course the student shall be able to:
CO 1: Be familiar with the fundamentals of computer graphics, various display devices and able to perform basic object generation.
CO2: Implement various filling and clipping algorithms for objects
CO3: Implement various transformation techniques for animation
CO4: Apply various projection and hidden surface removal techniques
CO5: Be familiar with curve generation techniques and visualization techniques
CO6: Be familiar with advanced modeling techniques and tools in the area of computer graphics

Course Content:
Unit-I: (8 Hrs)
Introduction to Computer Graphics and Image Processing, Basic fundamentals of random scan, raster scan devices, Stereoscopic and Virtual Reality Systems, line and circle drawing algorithms

Unit-II: (8 Hrs)
Polygon filling methods-seed fill, fence fill, edge flag algorithm, scan conversion techniques, aliasing and animalizing techniques, clipping algorithms

Unit-III: (8 Hrs)
Basic 2D transformation, composite transformations- translation, rotation, scaling, reflection, shear views, windowing, Introduction to 3D transformation

Unit-IV: (8 Hrs)
Three dimensional display methods, parallel, perspective projections and types, hidden line and surface elimination techniques, shading and rendering.

Unit-V: (5 Hrs)
Curve Generation: Cubic Spine, Braziers, B-Spline, blending of curves and other interpolation techniques, Introduction to Visualization, Applications, Visualization Techniques- parallel coordinates—a, charts (pie chart, bar chart, histogram, function graph, scatter plot, etc.), graphs (tree diagram, network diagram, flowchart, existential graph, etc.) Venn diagram Euler diagram etc.

Unit-VI: (8 Hrs)
Recent trends in Computer Graphics and Visualization, Advanced topics & its Application.

Text Books:

Reference Books:

BECL 427
COMMUNICATION PROTOCOL DESIGN

Course Prerequisite:
Digital Communication (BECL 403)

Course Objective:
1. To study about Protocols and Services.
2. To study about Security Methods.
3. To be able to assign IP address to computer
4. To be able to identify the network problems

Course Outcomes:
At the end of the course the student shall be able to:

CO1:
CO2:
CO3:
CO4:
CO5:
CO6:

Course Content:
Unit I: (8 Hrs)

Unit II: (8 Hrs)

Unit III: (8 Hrs)
Basic Protocol Mechanisms: Sequence control and error control, Flow control, Indication of change of peer state, change of service mode, Multiplexing and splitting, segmentation and reassembly, Prioritism.

Unit IV: (8 Hrs)

Unit V: (7 Hrs)
General principles of naming and routing, addressing structures, routing, congestion. Protocol encoding: simple binary encoding, TLV encoding, ASN.1 encoding, ASCII encoding.

Unit VI: (6 Hrs)
Protocols in the OSI lower layers, Applications support protocols, Applications Protocols: FTP, Distributed transaction processing, message handling, hypertext and WWW, web services, Latest development in protocol design.

Text Books:

Reference Books:
1. König, Hartmut, Protocol Engineering, Springer

BECL 406
CMOS VLSI DESIGN
[3-0-0-3] Total Hr.:[ 45 Hrs.]

Course Prerequisite:
Basic Electronics (BECL105), Electronic Devices & Circuits (BECL 201), Modeling & Simulation(BECP 206)

Course Objectives:
1. To study fundamental concepts in VLSI systems design.
2. To understand computer-aided techniques used in the design verification of VLSI systems using CMOS technology.
3. To study evaluation procedure and the performance parameters of CMOS designs.
4. To learn different processing technologies used for VLSI design.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Ability to understand the structure of MOS, NMOS, PMOS and CMOS transistor.

CO2: Able to describe the structure and operating characteristics of CMOS inverter with delays.

CO3: Understand the structure and operating characteristics of CMOS combination logic (logic gates, latches) and design styles (static CMOS, dynamic CMOS, Domino & Zipper).

CO4: Understand the parasitic effects and able to estimate complementary CMOS circuit performance, size and noise margin.

CO5: To reproduce the cross section and layout of a CMOS inverter, and relate this information to CMOS layout design rules and design rules check (DRC) methods.

CO6: Evaluate and apply the performance limitations of CMOS circuits, impact of scaling, variability, fan-in, fan-out, and future technology trends.

Course Content:
Unit I: (08 Hrs)
Review of MOS devices, MOS transistor models. PMOS, NMOS, CMOS

Unit II: (8 Hrs)
CMOS Inverter- Basic electrical properties & ckt concepts: The NMOS inverter & transfer characteristics, pull up & pull down ratios of NMOS, alternative forms of pull up the CMOS inverter & transfer characteristics CMOS inverter delays

Unit III: (8 Hrs)
Study of CMOS logic- Combination logic, gates, Compound gates, Multiplexers, memory elements. Static & Dynamic logic ckt's, Domino & Zipper logic

Unit IV: (8 Hrs)
Circuit characterization and performance, resistance and capacitance estimation, switching characteristics, power dissipation

Unit V: (7 Hrs)
CMOS processing technology- basic CMOS technology, layout design rules, stick diagram representation, latch up.

Unit VI: (6 Hrs)
CMOS circuit and logic design – transistor sizing, fan in, fan out, physical design of simple logic gates, CMOS logic structures, clocking strategies, recent trends in CMOS VLSI Design.

Text Books:

Reference Books:
BECL417
SENSORS & TRANSDUCERS
[3-0-0-3] Total Hr.: [45 Hrs.]

Course Objectives:
1. To impart knowledge about the measuring instruments and the methods of measurement
2. To understand different Sensors, Transducers and Bus Architectures.
3. To study and practice calibration and testing of different instrumentation systems.
4. To understand transducers types and ranges its selection for particular applications.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Understand the characteristics of Instrumentation system and transducers.
CO2: Select and make use of appropriate sensors and transducers for various applications.
CO3: Design system for measurement of physical Quantities using various Sensors & transducers.
CO4: Apply and perform various Signal conditioning techniques using standards for system design.
CO5: Detect & identify faults in various test equipments.
CO6: Perform testing, Modeling and Calibration of measuring Instruments with multiple method.

Course Content:
Unit I: (8 Hrs)
Generalized Instrumentation system, Active and Passive transducers, Digital and Analog mode of operation static and dynamic characteristics and performance of instruments. Stastical treatment of measurement of errors, caussian error distribution, probability tables, Combination of errors.

Unit II: (8 Hrs)
Resistance type Transducers - potentiometer, strain gauge; Inductive type – LVDT; piezoelectric transducer Sensing elements: Temperature sensing elements – RTD, thermistor, thermocouple, cold junction compensation.

Unit III: (8 Hrs)
Motion measurement: relative and absolute motion measurement of displacement, velocity and acceleration; Pressure sensing elements – manometers, elastic elements, Bourdon tube, diaphragm, bellows; electrical type, McLeod gauge, Pitot gauge; Flow sensing type – head meters, orifice, venturi, area meters, rotameters, electromagnetic flowmeter, Coriolis flow meter, Ultrasonic flowmeter; pH measurement

Unit IV: (8 Hrs)
Pyrometers, Piezoelectric transducer, Magnetostriective, IC sensor, Digital transducers, Smart sensor, Fiber optic transducer, Signal conditioning techniques used in various transducers, Linearization, gain, clipping, filtering, differential amplification, shielding techniques, various standards for signal transmission like 4-20mA current loop converter etc.

Unit V: (07 Hrs)
Recording of data CRO, data acquisition system, Industry Standard Bus architecture: PCI Bus, ISA Bus, EISA Bus, protocols, test equipments like Multimeter, signal generator, signal analyzer.

Unit VI: (06 Hrs)

Text Books:

Reference Books:
1. Patranabis D, Sensors and Transducers, Prentice Hall of India
2. E.D.doeblin, Measurement system, application and design, McGraw Hill

BECL313
TRANSMISSION LINES AND ANTENNA [3-0-0-3]

Teaching Scheme: Theory
Evaluation Scheme:
Lectures: 3 Hrs /Week
Teachers Assessment (TAE): 20 Marks
Credits: 3
Class Asses. Exam (CAE): 20 Marks
End Semester Exam (ESE): 60 Marks
Total: 100 Marks

Course-Prerequisite:
Field Theory (BECL 205)

Course Objectives:
1. To understand transmission line fundamentals and apply them to the basic problem.
2. To analyze and understand the Uniform plane wave propagation in various media
3. To analyze and understand the fundamental of antenna
4. To solve the electric field and magnetic fields for various antenna

Course Outcomes:
At the end of the course the student shall be able to:
CO1: understand the concepts like skin effect, wavelength, velocity of propagation, of transmission line

CO2: Apply techniques for the measurement of basic transmission line parameters, such as the reflection coefficient, standing wave ratio, and impedance.

CO3: Analyze the Smith chart, its application to matching, and experimental verification

CO4: Apply knowledge of antenna including: directivity, antenna gain, effective area, radiation resistance, and far-field calculations

CO5: Apply and analyze dipole antenna for various application

CO6: Analyze radiation pattern, specifications, features and applications of various array antenna

Course Content:

UNIT I: Transmission Lines (7 Hrs.)
Line parameters, inductance of a line of two parallel round conductors, coaxial line, skin effect, A line of cascaded T sections, general solution, physical significance of the equations; the infinite line, wavelength, velocity of propagation, the distortion less line, Inductance loading of telephone cables, Reflection on a line not terminated in Z0, reflection coefficient, open and short circuited lines, reflection factor and reflection loss, T and pi sections equivalent to lines.

UNIT II: The Line at Radio Frequency (7 Hrs.)
Voltages and currents on the dissipation less line, standing wave ratio, Input impedance of dissipation less line, Input impedance of open- and short-circuited lines, Power and impedance measurement on lines, Reflection losses on the unmatched line, quarter wave line; impedance matching, Single-stub impedance matching on a line, The circle diagram for the dissipation less line, Application of the circle diagram, The Smith circle diagram, Application of the Smith chart for calculating impedance and admittance

UNIT III: Wave Propagation in free space (7 Hrs.)

UNIT IV: Antenna Fundamentals (8 Hrs.)
Introduction, Types of Antenna, Radiation Mechanism. Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation efficiency, effective length, effective area, reciprocity. Radiation Integrals: Vector potentials A, J, F, M, Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation

UNIT V: Wire Antennas (8 Hrs.)
Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna. Complete Analytical treatment of all these elements.

UNIT VI: Antenna Arrays (8 Hrs.)
Antenna Arrays: Two element array, pattern multiplication N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non-uniform amplitude, array factor, binomial. Planar Array, Circular Array, Structural details, imensions, radiation pattern, specifications, features and applications of Log Periodic Antenna, Yagi Uda Antenna Hertz & Marconi antennas

Text Books:

U.A. Bakshi, A.V. Bakshi, Transmission Lines & Waveguides, Technical publication Pune
C.A. Balanis Antenna Theory - Analysis and Design John Wiley.

Reference Books:

CO3: Participating as a member of a team.
CO4: Search and study literatures from conference, journals in concern area
CO5: Make proper documentation of project via project report.
CO6: Implement propose design through prototype or software

AUDIT COURSE
MBL105
GENERAL PROFICIENCY V
[2-0-0-2] Teaching Scheme:
Lectures: 2Hrs/Week

Course Objectives:
4. To make students communicate their knowledge and feelings with a purpose.
5. To perform effectively in one to one and group discussion meetings and in public.
6. To make students more focused for enhancing employability prospects.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
CO2: Respond to written, spoken, or visual messages in a manner that ensures effective communication.
CO3: Locate, select, organize, and document information using appropriate technology and information systems.
CO4: Analyze, evaluate, and apply relevant information from a variety of sources.
CO5: Show respect for the diverse opinions, values, belief systems, and contributions of others.
CO6: Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.

MBL106:
GENERAL PROFICIENCY –VI
[2-0-0-2] Teaching Scheme:
Lectures: 2Hrs/Week

Course Objectives:
5. To orient the students for research in the area of interest.
6. To provide step wise procedure for carrying out research.
7. To introduce various mathematical, analytical and simulation tools useful for research.
8. To learn methods for safeguarding the intellectual property rights.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Understand the need, importance & thrust area in research.

CO2: Carry out research in a scientific manner.
CO3: Understand the importance of Literature Review.
CO4: Apply the knowledge in patent filing & product designing.
CO5: Apply knowledge in writing technical papers.
CO6: Prepare Report for funding opportunity.

OPEN ELECTIVES
Syllabus for Open electives is provided in the last
SEVENTH SEMESTER

BECL 306:
MICROWAVE ENGINEERING
[3-0-2-4]  Total Hr.: [45Hrs.]

Course-Prerequisite:
Communication Electronics (BECL 202), Field Theory (BECL 205)

Course Objectives:
1. To understand the concepts of microwave engineering
2. To study of microwave components, and microwave circuits.
3. To study and understand microwave test bench using Klystron amplifier and oscillator and its applications

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Developing an understanding the fundamental principles of Microwave antenna and its characteristics.
CO2: Able to describe microwave vacuum tubes such as klystron, TWT, magnetron amplifier and oscillator.
CO3: Be able use S parameter to determine circuit properties of passive/active microwave devices.
CO4: Able to describe characteristic of various diodes and transistors at microwave frequency.
CO5: Able to apply analysis method to determine circuit property of MIC
CO6: Able to handle microwave equipment and Measure VSWR, attenuation, frequency and other parameter.

Course Content:
Unit I: Antenna (10 Hrs)
Two elements arrays and their directional characteristics, linear arrays analysis, broadside and end fire arrays pattern multiplication, binomial arrays, design of broadest array for a specific pattern. Basic principles of parabolic reflectors, analysis and power pattern, lens antennas folded dipole turnstile and Yagi antenna, log –periodic antennas horn antennas, traveling wave antennas and case grain antennas. Microstrip antenna – Basic Characteristics, Feeding Methods, Method of analysis. Smart Antenna: Introduction, Benefits of Smart Antennas.

Unit II: Microwave Tubes (10 Hrs)

Unit III: Waveguide Components And Applications (08 Hrs)

Unit IV: Microwave Solid State Devices (06 Hrs)

Unit V: Strip Lines & Monolithic Microwave Integrated Circuits (06 Hrs)
Microstrip lines: Introduction, Hybrid Model Analysis, characteristic impedance, losses, quality factor of Microstrip lines, Slot line and coplanar strip lines, Microstrip circuit design – Impedance transformers, Filters, Isolator and Phase-shifter, parallel strip lines, distributed lines MMIC: Introduction, substrate materials, conductor materials, dielectric materials, resistive materials, MMIC growth, Fabrication technique, examples.

Unit VI: Microwave Measurements (05 Hrs)

Text Books:

**Reference Books:**

**BECP 306**

**MICROWAVE ENGINEERING**

**Total Hrs:** 20

**LIST OF EXPERIMENTS:**

1. Study of different microwave guide components.
2. Study of characteristics of Klystron tube and to determine its electronic turning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE10 mode.
4. To determine the standing wave ratio and reflection coefficient.
5. To measure an unknown impedance with smith chart.
6. To study VI characteristic of Gunn diode.
7. To study the following characteristic of Gunn diode.
8. Output power and frequency as a function of voltage.
9. Square wave modulation through PIN diode.
10. Measure the polar pattern and gain of a waveguide horn antenna.
11. To study the function of multi-hole directional coupler by measuring the parameters.
13. To study the Attenuators.
14. To verify characteristics of Microstrip Components.
15. Open ended experiments.

**BECL 410**

**EMBEDDED SYSTEMS**

[3-0-0-3]  **Total Hr.:[ 45 Hrs.]**

**Course Prerequisite:**
Microprocessor Based Systems (BECL 303)

**Course Objectives:**
1. To study and understand various embedded systems.
2. To understand the design parameters of embedded systems applications.
3. To study and impart different tools for embedded system design.

**Course Outcomes:**
At the end of the course the student shall be able to:

**CO1:** Select Appropriate Microcontroller, Techniques & understand the Architecture of 8051.

**CO2:** Design 8051 Programs For Embedded Applications.

**CO3:** Design and Interface memory for Real Time applications using LED & LCD.

**CO4:** Understand & design Programs for ARM base applications.

**CO5:** Make Use Of ARM7 Controller For Designing Of Embedded Applications.

**CO6:** Select And Make Use of Appropriate Bus Standard for Design application of Embedded systems.

**Course Content:**

**Unit I:** (8 Hrs)

Microcontrollers: Microprocessors and Microcontrollers, Types of Microcontrollers, External memory, Processor Architecture – Harvard v/s Van Neumann; CISC v/s RISC, Microcontroller, Memory types, Software development tools like assembler, cross- compiler, emulator, and simulator, 8051 controller, Block Diagram & Architecture.

**Unit II:** (8 Hrs)

8051 Instruction Set, Addressing modes & programming. 8051 Timers, Serial I/O

**Unit III:** (8 Hrs)

Memory Interfacing. Programming, Real time interfacing with LED, LED display, LCD display

**Unit IV:** (8 Hrs)

RISC Controller: PIC Microcontrollers – overview; features, PIC 16c6x/7x – architecture, file selection Registers.

**Unit V:** (7 Hrs)

RISC Controller :PIC Microcontrollers(PIC 16c6x/7x)- Memory organization, Addressing modes, Instruction set, Timer Modes and Serial I/O, Programming.

**Unit VI:** (6 Hrs)

Industrial Interfacing Buses: PCI, ESA, EISA, I2C, USB, RS232, recent trends in embedded systems.

**Text Books:**

**Reference Books:**
BECL 413
WIRELESS COMMUNICATION
[3-0-0-3] Total Hr.: [45 Hrs.]

Course Prerequisite:
Computer Networks (BITL302),
Communication Protocol Design (BECL427),
Wireless Sensor Networks (BECL 428)

Course Objectives:
1. To understand the concept of wireless communication
2. To study the design and implementation of wireless system
3. To understand and explain protocol design issues and protocol designs for wireless communication.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Apply the basic concept of wireless communication and distinguish the major cellular communication standards (1G/2G/3G/4G systems)
CO2: Use the knowledge of cellular system components in designing of protocol for call identification & establishment.
CO3: Apply knowledge of cellular concept, backbone networks, capacity expansion techniques in managing Wireless network.
CO4: Analyze the GSM /TDMA system architecture, protocol, techniques.
CO5: Apply the knowledge of modulation & diversity techniques to improve performance for mobile radio channels in wireless communication.
CO6: Analyse LAN, PAN, MAN & Bluetooth technology in wireless communication system.

Course Content:
Unit I: (07 Hrs)

Unit II: (07 Hrs)
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, OFDM, UWB radio techniques Cellular component identification Call establishment.

Unit III: (08 Hrs)
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security

Unit IV: (08 Hrs)
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers. GSM system operation, Traffic cases, Call handoff, Roaming, GSM protocol architecture. TDMA system, GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems.

Unit V: (08 Hrs)
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Diversity Combining Techniques, Typical GSM Hardware.

Unit VI: (07 Hrs)
Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.20X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies, emerging trends in wireless communication.

Text Books:

Reference Books:

BECL 414
OPTICAL COMMUNICATION
[3-0-2-4] Total Hrs.[45 hrs]

Course-Prerequisite:
Digital Communication (BECL 403),
Communication Electronics (BECL 202)

Course Objectives
To understand the basic concepts of fiber optical Communication.
To understand photonic systems, modulation formats and multiplexing technologies for OFC
To study and understand optical switching and fiber optical measurement.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Demonstrate an understanding of optical fibre propagation characteristics and transmission properties.
CO2: Demonstrate basic fiber handling skills, including connectors and splicing

CO3: Calculate the attenuation and signal degradation due to intermodal and intermodal distortion.

CO4: Understand the principle and characteristics of different optical light sources and switching techniques

CO5: Describe the principles of photo detection and optical receiver

CO6: Apply relevant scientific and engineering principles to solve real world optical engineering problems.

Course Content:

Unit I: (8Hrs)
Overview of Optical fiber Communications, Principle of optical communication – Attributes and structures of various fibers such as step index, graded index mode and multi mode fibers. Propagation in fibers – ray mode, Numerical aperture and multi path dispersion in step index and graded index fibers. Material dispersion and frequency response. Self phase modulation, combined effect of dispersion and self phase modulation

Unit II: (7 Hrs)
Electromagnetic wave equation in step index and graded index fibers modes and power flow in fibers. Manufacture of fibers and cables, fiber joints, splices and connectors.

Unit III: (7 Hrs)

Unit IV: (7 Hrs)
Optical sources – LED and laser diode, principles of operation, concepts of line width, phase noise, switching and modulation characteristics – typical LED and LD structures.

Unit V: (8 Hrs)
Optical sources – LED and laser diode, principles of operation, concepts of line width, phase noise, switching and modulation characteristics – typical LED and LD structures. Optical switching Fiber Optical Measurements.

Unit VI: (08 Hrs)
Advanced topics on Optical Communications

Text Books:

Reference Books:

BECP 414
OPTICAL COMMUNICATION Total Hrs: 20

List of Experiments
1. To Set up Fiber optic analog link & Measure power in optical fiber.
   To study of pulse amplitude modulation.
   Study of Time division multiplexing [Analog ]
   Study of losses in Optical fiber.
   Measurement of Numerical aperture in optical fiber.
   Study of Time division multiplexing
   Study of framing in Time division multiplexing.
   Study of Marker in Time division multiplexing.
   Study of Manchester coding & decoding.
   Study of Voice coding & coder chip.
   Setting up a Fiber optic digital link.
   Study of pulse position modulation.
   RS 232 interface using optical fiber.
   Study of pulse width modulation.
   To study characteristics of fiber optic LED & photo-detector.
   Study of OTDR.
   Study of attenuation loss using OTDR.
   Detect location of Fault in Optical Fiber.
   Set up optical video link & measure power.
   Design an optical Communication link.
   Open ended experiments.

ELECTIVE – II
BECL 409
DIGITAL IMAGE PROCESSING [3-0-0-3] Total Hr.:[45 Hrs.]

Course-Prerequisite:
Signals and Systems , Digital Signal Processing (BECL 405)

Course Objectives
1. To study the basic theory & algorithms used in digital image processing
2. To expose students to current technologies and issues those are specific to image processing systems.
3. To understand and study the issues like segmentation, transforms etc used for the image processing.
   To understand MATLAB tool boxes and their uses for applications of image processing

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Understand the fundamentals of the human visual system and perception with knowledge of imaging systems and processing units.

CO2: Demonstrated understanding of spatial filtering techniques, including linear and nonlinear methods, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

CO3: Demonstrated understanding of 2D Fourier transform concepts, including the 2D DFT and FFT, and other transforms (DCT, Haar, WHT) and their use in frequency domain filtering.

CO4: To recognise degradation problem in digital image processing, and to decide upon appropriate methodologies in their solution and to understand the principles of image compression.

CO5: Able to employ morphological filtering techniques to clean up and cluster image for further analysis.

CO6: Detect/Extract regions of interest from an image using various thresholding and segmentation techniques and apply these techniques to solve real-world image processing problems.

Course Content:

Unit I: (08 Hrs) Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit II: (08 Hrs) Basic intensity transformation and spatial filtering, Image negatives, log transforms, power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions.

Unit III: (08 Hrs) Two-dimensional orthogonal and Unitary Transforms, properties of Unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit IV: Model of image Degradation/Restorations process, Noise models, Restoration in the presence of noise only, periodic noise reduction by Frequency domain filtering, Image reconstruction from Projections, Image compression models, Huffman coding, LZW coding, Run length coding, Bit-plane coding.

Unit V: (07 Hrs) Some basic morphological algorithms, Boundary extraction, convex hull, thinning, skeletons, morphological Reconstruction. Color image processing, color models, RGB color models, CMY and CMYK color models the HSI color models.

Unit VI: (07 Hrs) Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Region-based segmentation, watershed segmentation algorithm Applications of segmentation, Hyperspectral image processing, latest development in digital image processing.

Text Books:

Reference Books:

BECL 424 APPLICATION SPECIFIC INTEGRATED CIRCUITS DESIGN [3-0-0-3] Total Hr.: [45 Hrs]

Course-Prerequisite:
CMOS VLSI DESIGN (BECL406)

Course Objectives
1. To distinguish Different techniques of application specific integrated circuits
2. To evaluate the need for application specific integrated circuits
3. To provide students with a thorough understanding of the principles behind the structure application specific integrated circuits.
4. To provide the knowledge about Identify the functions application specific integrated circuits.
5. To improve research skills, analytical skills and problem solving skills.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Analyze the application specific integrated circuits with their design constraints and distinguish different designing tools, compilers, standard cell, cell libraries etc.

CO2: Ability to use modern hardware and software design tools to develop digital systems.

CO3: Differentiate between VHDL, Verilog and ASIC Design techniques and their designing constraints.
**Course Objectives:**

1. To impart and demonstrate how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products.
2. To understand continuous-time control design using software, for the manipulation, transmission, and recording of data.
3. To study parameters of actuators and sensors their suitability for applications.

**Course Outcomes:**

At the end of the course the student shall be able to:

**CO1:** Understand the concept of mechanical, electronics, control and computer engineering in the design of mechatronics systems.

**CO2:** Identify the basic element used in an electrical actuation system and explain their underlying principles of operation.

**CO3:** Apply knowledge about the working principle of hydraulic pumps and actuators.

**CO4:** Integrate the various sensor and actuation systems using Adon cards and various communication mode for development of mechatronic system.

**CO5:** Use techniques, skills, and modern engineering tools necessary for engineering practice.

**CO6:** Use neural network to integrate and develop various applications of mechatronics system.

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**Course Content:**

**Unit I:** (12 Hrs)

**TYPES OF ASICS:** Design flow – Economics of ASICs – ASIC cell libraries – CMOS logic cell data path logic cells – I/O cells – cell compilers.

**Unit II:** (12 Hrs)

**ASIC LIBRARY DESIGN:** Transistors as resistors – parasitic capacitance – logical effort programmable ASIC design software: Design system – logic synthesis.

**Unit III:** (11 Hrs)

Half gate ASIC, Low level design entry: Schematic entry – low level design languages – PLA tools – EDIF – An overview of VHDL and Verilog.

**Unit IV:** (10 Hrs)

Logic synthesis in Verilog and VHDL simulation. ASIC Construction – Floor planning & placement – Routing, latest development in ASIC design technology.

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**Text Books:**


**Reference Books:**


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**BMEL 403**

**MECHATRONICS**

[3-0-0-3] Total Hr.:[45 Hrs]

**Course Prerequisite:**

Engineering Mechanics (BCEL106)

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**Course Objectives:**

1. To impart and demonstrate how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products.
2. To understand continuous-time control design using software, for the manipulation, transmission, and recording of data.
3. To study parameters of actuators and sensors their suitability for applications.

**Course Outcomes:**

At the end of the course the student shall be able to:

**CO1:** Understand the concept of mechanical, electronics, control and computer engineering in the design of mechatronics systems.

**CO2:** Identify the basic element used in an electrical actuation system and explain their underlying principles of operation.

**CO3:** Apply knowledge about the working principle of hydraulic pumps and actuators.

**CO4:** Integrate the various sensor and actuation systems using Adon cards and various communication mode for development of mechatronic system.

**CO5:** Use techniques, skills, and modern engineering tools necessary for engineering practice.

**CO6:** Use neural network to integrate and develop various applications of mechatronics system.

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**Course Content:**

**Unit I:** (08 Hrs)

**Introduction To Mechatronics:** Definition of Mechatronics, Basic Characteristics of measuring device like Static & Dynamic Characteristics as Accuracy Precision, Resolution, Repeatability, Reproducibility, Drift, Hysteresis, Linearity, Sensitivity, Threshold, Speed of response, Measuring Lag, Fidelity Static Error & Dynamic error calculations. Scope & Its importance with respect to inter disciplinary approach, Role of electronics in mechatronics, Mechatronics system design approach with reference to robotics & Automation Printer & Elevator systems [overview]

**Unit II:** (09 Hrs)


**Unit III:** (08 Hrs)

**Signal Conditioning & Data Acquisition & Controller:** Use of Wien Bridge, Wheatstone bridge, Instrumentation amplifier [IC based AD 633,AD 522/524] for above sensors & Transducers, Specifications of A/D & D/A converter related to mechatronics applications, Interfacing of inputs & Outputs with Micro controller with [89C series & PIC Micro controller], Interfacing of Sensors with PLC, PLC’s selection criterion & their specifications

**Unit IV:** (07 Hrs)

**Data Presentation & Data Logging System:** Magnetic recorder, Strip-Chart recorder in mechatronics. Block Diagram of typical interface IEEE 488 standard bus, Rs232 slandered, Multichannel data logger[Block Diagram], Lp2C bus,
HART Protocols, Computer based data acquisition system.

**Unit V:** (08 Hrs)

**ACTUATORS:** Concept of Actuators, Classification of Actuators Pneumatic Hydraulic & Electrical Actuators, Selection criterion of Control valve, & Motors, Single Acting & Double Acting Cylinders

Electro _Pneumatic: Pneumatic Motor, Valves

Electro _Hydraulic: 3/2valves, 4/2 valves, 5/3 Valves


**Unit VI:** (5 Hrs)

Study Different Applications Of Mechatronics As Case Study

CASE STUDY 1: Mechatronics Design of a Coin Counter.

CASE STUDY 2: Mechatronics Design of a Robotic walking Machine.

CASE STUDY 3 : Strain Gauge /LVDT based Weighing machine.

CASE STUDY 4: Rotary optical Encoder

CASE STUDY 5: Skip control of CD player.

Text Books:


Reference Books:


**BECL 428**

**WIRELESS SENSOR NETWORKS**

[3-0-0-3]  Total Hr:[45 Hrs]

**Course-Prerequisite:**

Sensors & Transducers (BECL417)

**Course Objectives:**

1. To learn the basics of wireless sensor network
2. To understand the concepts of ad-hoc and sensor networks, their applications and typical node and network architectures
3. To study protocol design issues (especially energy-efficiency) and protocol designs for wireless sensor networks
4. To understand the applications of WSN

**Course Outcomes:**

At the end of the course the student shall be able to:

CO1: Understand different ad-hoc and sensor network in terms of application and architecture.

CO2: Design and customize MAC and routing protocols for various applications of wireless sensor networks.

CO3: Understand importance of clock synchronization in wireless sensor networks

CO4: Understand and analyze wireless sensor networks with proper power management for node and system.

CO5: Design set up and evaluate measurements of protocol performance in wireless sensor networks.

CO6: Design wireless sensor networks applications.

**Course Content:**

**Unit I:** (08 Hrs)

Introduction – motivation, applications, sensors, architectures, platforms for WSN, Actual Systems - Berkeley motes, TinyOS and nesC.

**Unit II:** (08 Hrs)

How to program actual WSN. Wireless Radio Realities – radio irregularities and impact on protocols, MAC protocols – B-MAC, multi-channel MAC, Routing.

**Unit III:** (07 Hrs)

Directed Diffusion, Clock Synchronization, Localization – TDOA, Walking GPS, range free solutions

**Unit IV:** (07 Hrs)

Power Management – per node, system-wide, sentry services, sensing coverage, Data Services and Databases – architectures, queries [SQL].

**Unit V:** (08 Hrs)

Data dissemination, Programming Abstractions – programming models, Enviro Track, new APIs Security and Privacy – problems, attacks, solutions.

**Unit VI:** (07 Hrs)


**Text Books:**


**Reference Books:**


**BECL 415**
RADAR & SATELLITE COMMUNICATION  
[3-0-0-3]  Total Hr.: [45 Hrs]

Course-Prerequisite:
Digital Communication (BECL 403), Communication Electronics (BECL 202), Microwave Engineering (BECP 306)

Course Objectives
1. To impart working principles and concepts of radar and satellite communication system.
2. To impart knowledge of different components in Radar and satellite communication.
3. To understand the orbital aspects and components of a satellite communication system.
4. To study the link budget of a satellite communication system and study of satellite orbits and launching.

Course Outcomes:
At the end of the course the student shall be able to:
CO-1: Understand the basic concept operation and application of modern radar system and able to specify the subsystem performance requirements in radar system.
CO-2: Comprehend radar measurements and fundamentals of radar tracking
CO-3: Evaluate overall performance and operation under the environment effects and techniques to confront it and top level measure of performance.
CO-4: Develop specialized insight in the field of satellite communication
CO-5: Use relevant methods to understand and reduce atmospheric effects on satellite communication.
CO-6: Understand and Use Satellite navigation system for day to day applications.

Course Content:
Unit I: (06 Hrs)
RADAR Range Equation, CW and FM modulated RADAR, MTI and Pulse Doppler RADAR, Tracking RADAR.

Unit II: (07 Hrs)
RADAR antennas, parabolic reflector, Scanning field reflector, Lens antennas RADAR Receivers, Displays and Duplexer, Detection of RADAR; signals in noise.

Unit III: (07 Hrs)
RADAR clutter, Effects of weather on RADAR, Detection of targets in Precipitation, Synthetic Aperture RADAR, HF over the Horizon RADAR.

Unit IV: (10 Hrs)
Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem. Satellite link design: System noise temperature and T / T ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified [C/N].

Unit V: (08 Hrs)
Propagation on satellite: Earth’s path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature.

Unit VI: (07 Hrs)
Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station, recent trends in radar and satellite communication.

Text Books:

Reference Books:

BCSL 415
CLOUD COMPUTING  
[3-0-0-2]  Total Hours: 45

Course Objectives:
1. Understand the current technologies in Internet world
2. Explain Public and Private Cloud
3. Discuss Cloud and (new) Service Level Management
4. Discuss how to approach and evaluate a Cloud business case
5. Describe Cloud and Risk Management

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Understand the importance of Virtualization, components and characteristics of cloud computing.
CO2: Use Cloud as the infrastructure for existing and new services.
CO3: Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
**CO4:** Design and develop various applications using cloud platforms

**CO5:** Understand non-trivial issues in the Cloud, such as load balancing, identity and authorization management.

**CO6:** Design the business models that underlie Cloud Computing.

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**Course Content:**

**Unit – I:** (8 Hrs)


**Unit – II:** (7 Hrs)

**Cloud Computing Architectural Framework:** Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

**Unit – III:** (8 Hrs)

**Exploiting Cloud Services:** Software as a Service(SaaS), Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service(IaaS): Introduction to IaaS, Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.

**Unit – IV:** (7 Hrs)

**Cloud Application Development:** Role of business analyst, Technical architecture considerations, Service creation environments to develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

**Unit – V:** (8 Hrs)

**Cloud Security and Risk Management:** Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.

**Unit – VI:** (7 Hrs)


**Text Books:**


**References:**


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**ELECTIVE – III BMEL420 ROBOTICS [3-0-0-3] Total Hr.:[45 Hrs.]**

**Course-Prerequisite:**

Control System Engineering (BEEL 312)

**Course Objectives**

To understand various advanced microcontrollers.

To understand basic electronic components used in robotics

To study motion actuators and with sensors.

To understand electric ladder diagrams and their design methods.

**Course Outcomes**

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<th>At the end of the course the student shall be able to:</th>
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**Course Content:**
Unit I: (08 Hrs)
Automation and Robotics, Robot anatomy, configuration of robots, joint notation schemes, work volume, introduction to manipulator kinematics, position representation, forward and reverse transformations of a 2- DOF arm, a 3- DOF arm in 1. two dimension, a 4 – DOF arm in three dimension, homogeneous transformations in robot kinematics, 2. D-H notations, solving kinematics equations, 3. introduction to robot arm dynamics.

Unit II: (08 Hrs)
Basic control system models, slew motion, joint – interpolated motion and straight line motion, controllers like on/off, proportional, integral, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative.

Unit III: (07 Hrs)
Robot actuation and feedback components position and velocity sensors, actuators and power transmission devices, mechanical grippers, vacuum cups, magnetic grippers, pneumatic, electric, hydraulic and mechanical methods of power and control signals to end effectors.

Unit IV: (08 Hrs)
General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and related operations, machine loading and unloading, die casting, plastic molding, forging, machining operations, stamping press operations using robots.

Unit V: (07 Hrs)
Use of robot in spot welding continuous are welding, spray coatings, Robots in Assembly Operations.

Unit VI: (07 Hrs)
Robot cell layouts, multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis, latest trends in ROBOTICS.

Text Books:

Reference Books:

BECL 422 MICROELECTROMECHANICAL SYSTEMS (MEMS)
[3-0-0-3] Total Hr.:[ 45 Hrs]

BECL 425
REAL TIME OPERATING SYSTEMS
[3-0-0-3] Total Hr.: [45 hrs]

Course Objectives
1. To understand the characteristics and issues in real time operating systems
2. To study the timing requirements of real-time systems
3. To understand the different architectures and design specifications of real time operating systems and real time applications.
4. To impart hard and soft real-time systems
5. To describe scheduling algorithms for hard real-time systems

Course Outcomes:
At the end of the course the student shall be able to:

CO 1: Orientation in the area of design cycle of real-time applications

CO2: Design applications based on real-time operating systems.

CO3: Distinguish a real-time system from other systems And identify the functions of operating system

CO4: Evaluate the need for real-time operating system and implement the real-time operating system principles

CO5: Analyse real time systems with regard to keeping time and resource restrictions.

CO6: Approp use of architectures and behaviors of embedded systems.

Course Content:
Unit I: (10 Hrs)

Unit II: (08 Hrs)

Unit III: (08 Hrs)

Unit IV: (08 Hrs)

Unit V: (06 Hrs)

Unit VI: (05 Hrs)
Operating Systems: Real Time Functions and Services, OS Architectures-Real Time UNIX and POSIX, Issues in Task management- Processes and Threads, Scheduling, Synchronization and communication, Emerging trends in real time operating systems.

Text Books:

Reference Books:

BECL 416
MOBILE COMMUNICATION
[3-0-0-3] Total Hr.: [45 Hrs.]

Course-Prerequisite:
Computer Graphics & Visualization (BCSL312), Communication Protocol Design (BECL427), Telematics (BECL 315)

Course Objectives
To understand the radio wave propagation and interference in mobile communications.
To understand the basic knowledge about the generations of mobile communication.
3. To study different architectures of mobile communication and its related parameters.
4. To impart the knowledge about applications of mobile communication

Course Outcomes:

At the end of the course the student shall be able to:

CO1: Understand the importance of Virtualization, components and characteristics of cloud computing.

CO2: Use Cloud as the infrastructure for existing and new services.

CO3: Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS

CO4: Design and develop various applications using cloud platforms

CO5: Understand non trivial issues in the Cloud, such as load balancing, identity and authorization management.

CO6: Design the business models that underlie Cloud Computing.

Course Content:

Unit I: (08 Hrs)
The cellular concept, Evolution of mobile radio communication, Cellular telephone system, frequency reuse concept, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system.

Unit II: (08 Hrs)
The mobile radio environment, causes of propagation path loss, causes of fading – long term 3. and short term, definition of sample average, probability density function, cumulative probability distribution, level crossing rate and average duration of fade, delay spread, coherence bandwidth, inter symbol interference.

Unit III: (08 Hrs)
Modulation techniques and multiple access technique for mobile communication: BPSK, QPSK. Transmission and detection techniques in mobile, 4 QPSK transmission and detection techniques. QAM, GMSK Technique. Multiple access Techniques: Introduction to multiple access, FDMA, TDMA, spread Spectrum Multiple Access, Frequency Hope Multiple access [FHMA], Code Division multiple access [CDMA], Space Division Multiple access [SDMA].

Unit IV: (08 Hrs)
Equalization, diversity and channel coding: fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity, fundamentals of channel coding.

Unit V: (07 Hrs)
GSM – Global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing GSM, introduction to CDMA, digital cellular standard. GPS Technology, GPS Receiver.

Unit VI: (06 Hrs)
Introduction to 3G: UMTS, CDMA [IS-95] Frequency and channel specification, forward CDMA channel, Reverse CDMA channel, recent advancements in mobile communication.

Text Books:


Reference Books:


BEEL 420
PLC & SCADA
[3-0-0-3] Total Hr.:[ 45 Hrs]

Course Prerequisite:
Control System Engineering (BEEL 312)

Course Objectives

1. To develop understanding and application skills for the programming of PLCs.
2. Demonstrate knowledge of systems associated with PLCs

Demonstrate and apply knowledge of PLC hardware/software concepts

Course Outcomes:

At the end of the course the student shall be able to:

CO 1: Understand the basics of PLC Controllers and SCADA system

CO2: Learn the monitoring and supervisory function of SCADA and Data acquisition in the Industry

CO3: Learn SCADA system components

CO4: Study of Architecture of IEC 61850

CO5: Learn communication technology of SCADA

CO6: Learn application of SCADA
Course Content:
Unit I: (08 Hrs)
Introduction: Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC.

Unit II: (08 Hrs)
Data acquisition systems, Evolution of SCADA, Communication technologies, Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries

Unit III: (07 Hrs)
SCADA System Components: Schemes- Remote Terminal Unit [RTU], Intelligent Electronic Devices [IED], Programmable Logic Controller [PLC], Communication Network, SCADA Server, SCADA/HMI Systems

Unit IV: (08 Hrs)
SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture - IEC 61850

Unit V: (07 Hrs)
SCADA Communication: various industrial communication technologies - wired and wireless methods and fiber optics. open standard communication protocols

Unit VI: (07 Hrs)
SCADA Applications: Utility applications- Transmission and Distribution sector -operations, monitoring, analysis and improvement. Industries - oil, gas and water. Case studies, Implementation, Simulation Exercises, latest developments in PLC & SCADA,

Text Books:

Reference Books:

BIITL417
INTERNET OF THINGS (IoT)
[3:0:0:0] Total Hr.:[ 52 Hrs]
No. of Credits: 
Exam Duration :3 hours
Lecture Hrs per week: 4
Exam Marks : 100

Course Objectives:
The objective of the course is to:
1. Understand IoT Market perspective.
3. Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes:
At the end of the course the student shall be able to:
CO1: Understand the evolution of IOT from M2M & Market perspective of IoT.

CO2: Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

CO3: Apply IoT design constraints to hardware for device integration.

CO4: Building IoT architecture with standard considerations.

CO5: Building the Web of Things from the Cloud of Things for industrial automation.

Course Content:
Unit I: (10 Hrs)
M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

Unit II: (10 Hrs)

Unit III: (11 Hrs)
M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit IV: (10 Hrs)

Unit V: (11 Hrs)
from the Web of Things to the Cloud of Things, Commercial Building Automation- Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Textbook:


Reference Books:


BECP 408
Project Phase-I : Project Seminar
[0-0-4-2]

Course Objectives
1. To understand and study the process of literature review and to put forward the findings.
2. To get the detailed practical knowledge about latest technology by designing any system or prototypes by using acquired technical knowledge and skills.

Course Outcomes:
At the end of the course the student shall be able to:

CO1: Use the acquired technical knowledge to solve any problem related engineering, environmental, social.

CO2: Propose and convince design method through effective presentation

CO3: Search and study literatures from conference, journals in concern area

CO4: Deliver Progress seminars and execute project as group member

CO5: Make proper documentation of project via project report.

CO6: Implement propose design through prototype or software
EIGHTH SEMESTER
BECP 411
INDUSTRY PROJECT INTERNSHIP
[0-0-30-20]

Course Objectives
1. To expose and explore students to potential employers
2. To gain on job experience in an industry/ research environment so as to help students to meet requirements of career prospects
3. To satisfy curiosity and sharpen up research potential at research organization for research minded students
4. To develop personality and soft skills
5. Provide opportunity to undertake real time, innovative and research based project in industry
6. To gain knowledge of managerial aspect such as finance, team work, team leading, testing etc followed by industry while conducting project
7. To facilitate students Interaction in product development process in industries and organization

Course Outcomes
At the end of the course the student shall be able to:
CO1: Apply the knowledge gained in theory and to integrate theory with practice followed in industry
CO2: Realize sense of responsibilities in view of project implementation
CO3: To understand the functional behavior of organization
CO4: Work as a member of diverse technical team and to develop project/product
CO5: Interpret the literature and data for project execution
CO6: Use software, hardware, testing and simulation tools and platforms used in industry for project/product design and development
CO7: Understand cost effectiveness while designing and implementing project / product
CO8: Present, prepare and deliver seminar as a member of project team and interpret results to present conclusions
## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### SEMESTER-III

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<th>Sub. Code</th>
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**ELECTIVE I:**
- BIT L301 - Java Programming
- BCSL312 - Computer Graphics And Visualisation
- BITL408 - Distributed Databases & Object
- BCSL414 - Data Mining & Warehousing Oriented Databases

### SEMESTER-VI

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**ELECTIVE II:**
- BECL413 - Wireless Communication
- BCSL403 - Artificial Intelligence & Expert Systems
- BECL423 - Pattern Recognition
- BCSL407 - Advanced Computer Architecture
- BECL405 - Digital Signal Processing
- BCSL419 - Digital Marketing

**ELECTIVE III:**
- BCSL416 - Machine Learning
- BCSL410 - Soft Computing
- BECL428 - Wireless Sensor Network
- BCSL412 - Software Architecture
- BITL307 - Scripting Languages
- BCSL420 - Entrepreneurship
- BCSL421 - Block Chain Technology

**ELECTIVE IV:**
- BECL425 - Real Time Operating System
- BECL409 - Digital Image Processing
- BITL407 - Advanced Web Technologies
- BITL410 - Software Testing
- BCSL310 - Mobile Computing
- BCSL418 - Enterprise Storage Technologies
- BCSL422 - Bigdata & Hadoop
- BCSL427 - Data Analytics

**ELECTIVE V:**
- BITL309 - Cyber Laws
- BCSL311 - E-Commerce
- BITL411 - Enterprise Resource Planning
- BCSL415 - Cloud Computing
- BCSL417 - Bio Informatics
- BCSL423 - Artificial Intelligence & Machine Learning

### SEMESTER-VIII

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230
THIRD SEMESTER

BAML204: APPLIED MATHEMATICS – III [3-1-0-4]

Total Hrs: 45

Pre-requisite: MATHEMATICS- I, MATHEMATICS-II
Co-requisite: NA

Course Objectives:
1. This course introduces a general mathematical concepts and objects.
2. It skill the students to understand important mathematical models used in computer science branch.
3. This course also aims to formulate and solve the problems in daily applications of computer science.

Unit -I: Laplace Transforms (7 Hrs)


Unit -II: Z-Transforms (8 Hrs)

The Z transform- definition & properties, inverse & relation with Laplace Transform. Application to z-transform to solve difference equations with constant coefficients.

Unit -III: Fourier Series (7 Hrs)

Periodic function & their Fourier expansion, even & odd function, change of interval, half range expansion. Fourier Transforms: Fourier Integral theorem, Fourier transforms and their simple properties

Unit -IV: Partial Differential Equations and its application (8 Hrs)

Partial differential equations of first order & first degree (i.e. Lagrange’s form), linear homogeneous partial differential equation of nth order with constant coefficients, method of separation of variable. Simple applications.

Unit -V Random Variables (7 Hrs)

Random Variables, Distribution functions of continuous & discrete random variables, Joint distributions, mathematical expectations, moment, Moment generating function & characteristic function.

Unit -VI: Special probability distribution (8 Hrs)

Geometric, Binomial, Poisson’s, normal, Exponential, Uniform, Weibul probability distribution. Random processes resemble average & temporal average, Auto correlation & cross correlation, stationary random process, power spectrum stationary processes & ergodic Random process. Advanced topics on Applied Mathematics

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recall & use the Laplace transform to solve constant-coefficient differential equations with initial conditions
2. Compute the Z-transform of a sequence and use to solve constant-coefficient difference equations with initial conditions
3. Calculate Fourier Transforms for the variety of simple functions.
4. Shall be competent in solving linear PDEs using classical solution methods
5. Shall be able to model and calculate random variables.
6. Be able to differentiate between common type of data and use distributions.

TEXT BOOKS:

REFERENCES
1. Mathematics for Engineer, Chandrika Prasad
2. Advanced Mathematics for Engineer, Chandrika Prasad
7. Applied Mathematics Volume 1: J. N. Wartikar & P. N. Wartikar

BCSL201 DATA STRUCTURES USING C [3-1-0-4]

Total Hrs: 45

Pre-requisite: Basics of Computing
Co-requisite: NA

Course Objectives:
1. This course introduces basic idea of data structures, organization methods and structures used to organize large amount of data.
2. It also aims at developing skills to implement methods to solve specific problems using basic data structures.
3. The course also provides opportunities to design and implement techniques to sort and search the data.

Unit I: Arrays and Pointers (7 Hrs)

Introduction, Linear Arrays, Arrays as ADT, Representation of Linear array in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays,
Pointers; Pointer Arrays, Dynamic Memory Management.

**Unit II: Linked List (9 Hrs)**
Introduction, Linked Lists, Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists).

**Unit III: Stacks, Queue and Recursion (9 Hrs)**
Introduction, Stacks, Array Representation of Stacks, Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular Queues, Deques, Priority Queues, Applications of Queues.

**Unit IV: Trees (10 Hrs)**

**Unit V: Graphs and their Applications (6 Hrs)**
Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall’s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, Traversing a Graph, Posets; Topological Sorting, Spanning Trees.

**Unit VI: Sorting and Searching (4 Hrs)**
Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing, Advanced topic on Data Structures.

**Course Outcomes:**
Upon successful completion of the course, students will be able to -
1. Identify essential data structures and understand when it is appropriate to use.
2. Explain use of Abstract data types & ways in which ADTs can be stored, accessed and manipulated
3. Apply linear and nonlinear data structures to solve various real world computing problems using C-programming language.
4. Analyze standard algorithms for searching and sorting.
5. Design the hierarchical data structure with minimum complexity for real world problem.
6. Evaluate critical, independent and quantitative problems using various data structures using C.

**TEXT BOOKS:**
1. Data Structures with C, Seymour Lipschutz, Schaum Outlines, Tata Mc Graw Hill

**REFERENCE BOOKS:**
1. S. Sahani, Data Structures in C.D. Samantha, Classic Data Structures, PHI Publications.

**BCSP201 DATA STRUCTURES USING C (0-0-2-1)**
Total Hrs: 20

**List of practical:**
17. Write and execute a program in C to implement an array and find out greatest and smallest number from the array.
18. Write and execute a program in C to implement the Bubble Sort and Selection sort
19. Write and execute a program in C to implement Insertion sort
20. Write and execute a program in C to implement the Binary search algorithm
21. Write and execute a program in C to implement Merge sort
22. Write and execute a program in C to implement Quick sort
23. Write and execute a program in C to implement stack using arrays.
24. Write and execute a program in C to implement queue using arrays
25. Write and execute a program in C to implement single linked list
26. Write and execute a program in C to implement circular linked list
27. Write and execute a program in C to find number of leaf node in a tree
28. Write and execute a program in C to Implement two stack using an array
29. Write and execute a program in C to implement BFS and DFS
30. Open ended practical

**BECL303: MICROPROCESSOR BASED SYSTEMS (3-1-0-4)**
Total Hrs: 45 hours
Pre-requisite: Basics of Electronics
Co-requisite: NA

**Course Objectives:**
1. This course introduces a general idea and basic digital circuits used for designing a microprocessor.
2. It is aimed at developing skills to develop assembly language programming.
3. They learn making interfacing with peripheral devices.
4. The course provides career opportunities in the subject areas of design and programming of microprocessors.

**Unit I: Introduction to 8086 Microprocessor (7 Hrs)**
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086/8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on Clock Speed, Concurrent operation of EU and BIU, Memory Organization & Interfacing.

**Unit II: 8086 Programming (8 Hrs)**
Addressing modes, Instruction set, Programming examples, Pseudo Opcodes, Assembler Directives. Introduction to Software and Hardware tools. [Cross assemblers, Logic analyzers, Emulators, Simulators], Architecture.

**Unit III: Co-processor Interfacing (7 Hrs)**
8086/88 Maximum Mode, Architecture and Programming of 8087 and its Interfacing with 8086/8088.

**Unit IV: 8255 Interfacing (8 Hrs)**
Interfacing and programming of Peripheral 8255, Interfacing of ADC, DAC & applications. Interfacing and programming of Peripheral 8253.

**Unit V: Special Peripheral Interfacing (7 Hrs)**
Architecture, Interfacing and programming of Peripherals, 8251 & DMA Controllers 8237.

**Unit VI: Advanced Microprocessor study (8 Hrs)**
80386 Architecture, Real and Protected Mode, Register Model, Memory Management Unit, Latest trends in microprocessors systems.

**Course Outcomes:**
Upon successful completion of the course, students will be able to
1. Demonstrate an understanding of the microprocessor architecture, its instructions and addressing mode
2. Analyze a microprocessor program and develop an assembly language programs for applications
3. Implement floating point operations using coprocessors
4. Identify and explain the operations of peripherals typically used interfacing microprocessors such as A/D, D/A Converter.

**Develop and interface complete microprocessor based systems to peripheral devices.**
5. Apply advanced techniques and tools for microprocessor based system development for real world applications.

**BOOKS:**
1. Advanced Microprocessor s & Peripherals by A.K. Ray & K.M. Bhurchandi, TMH
2. Programming & Interfacing of 8086 / 8088, D.V. Hall, TMH.

**REFERENCE BOOKS:**
1. Intel Reference Manuals, Microprocessor & Microcontrollers: Intel
3. Microprocessors 8086 / 88 Family Prog. Interfacing: Liu, Gibson

**BECP303MICROPROCESSOR BASED SYSTEM (0-0-2-1)**
**Experiment List:**
**Total Hrs: 20**
1. To study the architecture of µc 8086 microprocessor & do some examples program

(i) Addition of two 8-bit numbers

(ii) Multiplication of two 16-bit numbers

WAP to perform to develop following equation: \( y = mx + c \) & stored result for 20 data inputs from offset 2000H to offset 2014H

To write program to generate Fibonacci series.

To write program to convert a 16 bit binary number into equivalent BCD numbers.

Write an ALP to compute factorial of a given 8 bit integer at a byte location.

Write an ALP to multiply two 3x3 matrices of signed 8 bit integers. Display result using DEBUG or CODEVIEW

To write a program to find out the largest number from a given unordered array of 8-bit numbers stored in the locations from a known address

Display the message “Study of up is interesting" on CRT screen

To write a program to Interface Relay by using DOS functions

An Open ended project-Implement sensor interfacing on Dynalog 8086 Trainer Board

**BCCSL202 COMPUTER ARCHITECTURE & ORGANIZATION (4-0-0-4)**
**Total Hrs: 45**

**Pre-requisite:** Basics of Electronics
**Co-requisite:** NA
**Course Objectives:**
1. This course introduces basic fundamental units of a computer system and its operation and flow of information between these units.
2. It is aimed at developing skills to implement control unit performing operations such as Addition, Subtraction, Multiplication and Division.
3. The course provides career opportunities in the subject areas of designing an advanced computer system.

Unit I: Basic Structure of Computers (7 Hrs)
Functional units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.

Unit II: Basic Processing Unit (8 Hrs)
Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Microprogrammed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit (7 Hrs)
Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth's Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System (8 Hrs)
Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input/Output Organization (7 Hrs)
I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access, Computer Peripherals: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC Philosophy (8 Hrs)

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recognize the central ideas underlying the discipline of computer system.
2. Explain and Compare the representation of data, addressing modes, instructions sets for a computer system.
3. Apply the knowledge of Cache memory to increase the performance of Computer System.
4. Discuss the issues and design tradeoffs in designing computer architecture and components.
5. Justify the knowledge of parallel, pipelined, superscalar, and RISC/CISC architectures.
6. Choose recent technologies in computer architecture.

TEXT BOOKS:

REFERENCES BOOKS:

BHUL201 PRINCIPLES OF MANAGEMENT (4-0-0-4)
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces idea of management issues viz. Marketing, Financial, Human Resource and its planning.
2. It also indicates skills about the past structure of organization and its Behavior and future improvements.
3. It also provide detailed study of information management systems related with policy, implementation, and other applications related to all areas of the organization /s) enabling decision making smooth and faster.

Unit I: Introduction (7 Hrs)
Nature and Functions of Management, Management yesterday and today, Planning and Decision making.

Unit II: Management Information System (8 Hrs)

Unit III: Marketing Management and Planning (7 Hrs)

Unit IV: Financial Management (8 Hrs)

Unit V: Human Resource Management (7 Hrs)

Unit VI: Organization Structure and Behavior
(8 Hrs)
Organization Behavior: Organization Structure and design. Designing Effective Organization, Managing Job Stress, Organization Development

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Learn the basic concepts of management and relate them to real life situations
2. Apply the concepts to real business situations
3. Integrate the core functions of marketing, finance and HR to achieve the common objectives
4. Distinguish ways in which organizational structure impacts strategy, performance, and operations and analyze the significance of properly planning and executing change in an organization
5. Determine ways in which technology can be used to advance an organization and recognize and apply the skills necessary for carrying out effective.
6. Participate, summarize and/or lead class discussions, case problems and situations from both the text and material

TEXT BOOKS:
1. Principles of management, P C Tripathi and P N Reddy
3. Human Resources and Personal Management, William Werther and Keith Davis
4. Marketing Management, V S Ramaswamy and S Namakumari
6. Financial Management, Khanna

BECP209 HARDWARE MAINTENANCE AND TROUBLESHOOTING (0-0-2-2)
Total Hrs: 20
Pre-requisite: NA
Co-requisite: NA

MBL102: GENERAL PROFICIENCY:-II:
GERMAN / FRENCH/ SPANISH LANGUAGE

AIM: -To introduce foreign Language course for strengthening student's profile.

Course Objectives:
1. To learn foreign languages to improve inter personal skills.
2. To enable improving business communications and having access to literature in globally recognized languages.

Course Objectives:
1. This course introduces study of different hardware units of system and its assembly.
2. It also skills the students about the installation of system and application software.
3. It also skills the students to identify problems occurring in the system and its Trouble Shooting.
4. It also skills to identify methods to protect System from Virus, Spyware and Malware.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify the central ideas underlying the discipline of computer system.
2. Explain and interpret the existing configuration and system peripherals.
3. Illustrate the performance of routine maintenance to upgrade hardware and software tools.
4. Plan the topology Local Area Networks (LANs) by using personal computers (PCs).
5. Justify to manage data backup and restore operations on server set schedules

List of Practical:
Configuration of BIOS.
1. Storage devices To demonstrate Partitioning of Hard disk
2. To demonstrate Installation of Operating System.
3. To demonstrate assemblng of computer
4. To Demonstrate Networking Basics
5. To Demonstrate Structured Cabling
6. To Demonstrate configuration of WI-FI and Personal Network
7. To Demonstrate basic networking Commands
8. To demonstrate Trouble shooting in windows
9. To demonstrate installation of Linux
10. To demonstrate system protection from virus, spyware, malware etc
11. open ended experiment

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**Course Outcomes:**
Upon successful completion of the course, students will be able to
1. Communicate effectively in more than one globally recognized language like French, Spanish, German, Japanese, etc.
2. Interact with technical and business communities at international forums.
FOURTH SEMESTER
BAML208 GRAPH THEORY AND COMBINATORICS (4-0-0-4)  Total Hrs: 45

Course Objectives:
1. This course introduces size and kind of objects.
2. It also skills to analyze objects meeting the criteria, finding "largest", "smallest", or "optimal" objects.
3. It also introduces combinatorial structures and apply algebraic techniques to combinatorial problems.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Know grouping of objects and operation, relation, ordering of objects.
2. Application of set theory.
3. Know Groups and Rings, their types and Applications.
4. Know Data structure used to represent different kinds of objects viz Graph, Trees.
5. Know the basics of combinatorial structure and develop algebraic technique to solve combinatorial problems
6. Programming application of group, ring and number theory.

Unit I: Set Theory  (7 Hrs)

Unit II: Group  (8 Hrs)
Algebra or Algebraic systems like semigroup, monoid and examples. Homomorphism, Isomorphism of semigroup & monoid. Groups, properties of algebraic groups. Permutations groups, Subgroups, Cosets, Lagrange’s theorem, properties of cyclic groups, generator of group, kernel of Homomorphism, quotient group, fundamental theorems & Homomorphism of groups. Residue classes & Fermats theorem.

Unit III: Rings  (7 Hrs)

Unit IV: Graph Theory  (8 Hrs)
Graphs and its types, Sub graph, Quotient graph, Euler path, complete path, indegree, outdegree, reachability, cycle, matrix representation of graph. Transitive closure of graph, Adjacency matrix, Trees, Venn diagram, Representation of trees, binary trees, spanning trees, Prim’s algorithm.

Unit V: Combinatorics  (7 Hrs)
Definition of generating functions and examples, proof of simple combinatorial identities, Probab. G.F. $p(t) = \sum p_n t^n$, $E(x) = p(t)$, examples. Recursive relations: definitions & examples, explicitly formula for sequence, back tracking to find explicit formula of sequence, solving recurrence relations. Counting Theorem and application, Equivalent sets, cardinal numbers, denumerable sets. Multiplication principle of counting. Permutation & Combination with examples. The pigeon hole principle & extended pigeon hole principle and application of pigeon hole principle in solving simple problems.

Unit VI: Number Theory  (8 Hrs)
Examples of continued fractions. The study of continued fractions. Alpha has Infinite continued fraction if alpha is irrational. Alpha has periodic continued fractions if alpha is quadratic irrational. Application to approximation of irrationals by rationals. Hurwitz’s theorem, Advanced topic on Combinatorial Theory.

Text Books:
1. Discrete Mathematical structure with application to computer science by Trembley & Manohar (Mc. Graw Hill)
2. Discrete Mathematical Structure by Kolmann , Busby & Ross (PHI)

References:
1. Discrete Mathematics by Liu

BCSL301 THEORY OF COMPUTATION (3-1-0-4)  Total Hrs: 45

Course Objectives:
1. This course introduces to students general idea of finite state and automata theory.
2. Making students aware of regular languages, context free languages. And its usefulness in finite state machines.
3. It is aimed at developing skills to provide solutions to variety of real life applications which involve finite automata.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Define the basics of relational algebra, formal languages and grammar
2. Demonstrate designing of finite automata and generation of regular expression
3. Illustrate regular and context-free grammar and solve related problems
4. Analyze various properties of CFL and design push down automata
5. Design Turing machine and identify decidable and undesirable problems
6. Choose the advance automata modeling techniques for computation.

**Unit I: Mathematical preliminaries (7 Hrs)**
Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods - pigeon-hole principle and simple applications - concept of language - grammars and production rules - Chomsky hierarchy.

**Unit II: Finite automata & regular expressions (8 Hrs)**
Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures - regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

**Unit III: Regular grammar & context free grammar (7 Hrs)**
- Pumping lemma for regular sets - closure properties of regular sets - decision properties for regular sets, equivalence between regular language and regular grammar. Context – free languages – parse trees and ambiguity, reduction of CFGS, Chomsky and Greibach normal forms.

**Unit IV: Push – down Automata (PDA) (7 Hrs)**
Non-Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs - closure and decision properties of CFLs.

**Unit V: Turing machines (12 Hrs)**
Variants – recursively enumerable (r.e.) set – recursive sets ,TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and unsolvability of ambiguity problem of CFGs, Church’s hypothesis, Introduction to recursive function theory – primitive recursive and partial recursive functions.

**Unit VI: Trends and Applications of Automata (4 Hrs)**
Recent trends in Theory of computation, advanced topics & its Application.

**Text Books**
1. Introduction Of Automata Theory, Languages and computation - J.E. Hopcroft, J.D.Ulman, Pearson education.

**Reference Books**
1. Introduction Of Automata Theory, Languages and computation, John Martin
3. Theory of Computer Science – Mishra and Chandrashekharan, PHI.

**BCSL302 SYSTEM PROGRAMMING (4-0-0-4)**
Total Hrs: 45

**Course Objectives:**
Upon successful completion of the course, students will be able to:
1. Identify the basic elements of hardware and apply their functions to form architecture.
2. Summarize the basic loading, linking and macro features in assembly level programming.
3. Illustrate program compilation, linking, and loading process.
4. Analyze the operating system by making system calls for Common object file format.
5. Design UNIX device drivers.
6. Choose UNIX and Linux file systems for system environments and tools.

**Unit I: (7 Hrs)**
Assembler Concept of assembler, design of single pass and two pass assembler.

**Unit II: Macroprocessor (8 Hrs)**
Macroprocessor- Concept of macro, macro call within macro, macro definition within macro, recursive macro calls, designs of macro processor.

**Unit III: Linker and Loader (7 Hrs)**
Linker and Loader- Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.

**Unit IV: Common Object file format & System Utilities (8 Hrs)**
Common Object file format & System Utilities- Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures. Source code control system, make, link editor, symbolic debugger.
Unit V: UNIX Device Drivers (7 Hrs)
Unix Device Drivers - Definition, Anatomy and Types, Device programming, Installation, Incorporation of driver routines, Basic device driver operation, Implementation with Line Printer & Disk. Comparative study between device drivers for UNIX & Windows.

Unit VI: Linux System programming (8 Hrs)
Basics, Concepts, Writing, implementation of virtual machines.

Text Books:
2. UNIX Device Drivers - George Pajari, Pearson Education.

Reference Books:
1. System Programming and Operating systems - D. M. Dhamdhere
2. UNIX system Utilities manual.
3. Unix programming Environment - Keringham and Pike, Pearson Education.

BITL202 OBJECT ORIENTED PROGRAMMING THROUGH C++ (3-1-0-4)
Total Hrs: 45

Course Objectives:
1. This course introduces student’s general idea and concepts of object oriented programming.
2. It is also aimed at developing skills to implement these concepts.
3. The course provide carrier opportunities in design of some applications as object oriented concepts plays dominant role in software development.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify the principles of object oriented programming using C++
2. Demonstrate the concept of function overloading, constructor overloading & operator overloading in programming
3. Apply inheritance and polymorphism concepts for application development
4. Distinguish the concept of static and dynamic memory allocation for software development
5. Design generic programming applications using templates
6. Choose advanced technique in application development for real life problems.

Unit-I: Principles of Object Oriented Programming (8 Hrs)

Unit-II: Overloading (10 Hrs)
Constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading, overriding, Applying operator overloading.

Unit-III: Inheritance, Virtual Functions and polymorphism (6 Hrs)
Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.

Unit-IV: Static & Dynamic memory allocation (8 Hrs)
Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the asm keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, typename and export.

Unit-V: Templates (5 Hrs)
Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Unit-VI: Exceptions Handling (8 Hrs)
Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++, Advanced topics & its Application.

Text Books:

Reference Books:
1. Let’s C++ by Y. Kanetkar, BPB publications
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH

BITP202 OBJECT ORIENTED PROGRAMMING THROUGH C++ [0-0-2-1]
Total Hrs: 20

List of Practical’s
Sr. No. | Title of Practical
--- | ---
1 | Write a Program to perform various operations on complex numbers.
2 | Prepare salary chart of an employee using Structures.
3 | Write code to demonstrate the creation of class & object.
4 | Programs to define Class using constructor & destructor.(Default constructor, Multiple constructor, Copy constructor, Overloaded constructor)
5 | Write a Program to maintain employee record using Classes.
6 | Write a Program to illustrate Multiple Inheritance.
7 | Demonstrate the concept of overloading unary & binary operators.
8 | Write a program to show the concept of function overloading.
9 | Write A Program to illustrate Dynamic Memory Allocation using Pointers.
10 | Write code to show compile time polymorphism.(static binding)
11 | Write code to show run time polymorphism(dynamic binding)
12 | Create a class code & illustrate the use of THIS pointer.
13 | Demonstrate the formatting of output using manipulators.
14 | Create templates & demonstrate their use.
15 | Write code to demonstrate exception handling.
16 | Open ended practical.

BCSL402 DATA COMMUNICATION [3-1-0-4]
Total Hrs: 45

Course Objectives:
1. This course introduces students basics of data communication and basic technique used to transfer data.
2. To identify various communication media and multiplexing techniques.
3. To understand advanced technique such as Data encoding and Compression.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify the basics requirements of data communication system.
2. Compare data Encoding And Modulation techniques used in data communication system
3. Illustrate different transmission media & Interfaces for various networks.
4. Analyze various Analog & Digital Services for communication networks.
5. Report conflicting issues and resolution techniques in data transmission
6. Choose an advance Data Compression techniques.

Unit I: Signals (8 Hrs)
**Analog and digital:** Analog And Digital Data, Analog and Digital Signals; Periodic and Aperiodic Signals, Analog Signals: Simple Analog Signals; Time and Frequency Domains; Composite Signals: Frequency Spectrum and Bandwidth; Digital Signals: Decomposition of Digital Signal; Transmission Modes: Serial and Parallel Transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex Communication.

Unit II: Encoding and Modulation (8 Hrs)
Digital-to-Digital Conversion: Unipolar, Polar, Bipolar; Analog-to-Digital Conversion: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), Sampling Rate, Bit Rate; Digital-To-Analog Conversion: Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Quadrature Amplitude Modulation (QAM), Bit / Baud Comparison; Analog-to-Analog Conversion: Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM);

Unit III: Interfaces and Modems (8 Hrs)

Unit IV: Communication Media (7 Hrs)

Unit V: Multiplexing (7 Hrs)
Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM): Inverse Multiplexing, Wave-Division Multiplexing, Multiplexing Applications: The Telephone System: Common Carrier Services and Hierarchies, Analog Services, Digital Services, FTTC: FTTC in the Telephone Network, FTTC in the Cable TV Network.

Unit VI: Data Compression (7 Hrs)

Text Books:
2. Understanding Data Communications and

Reference Books:
1. Electronic communication Systems by Kennedy.
2. Communication systems by Singh and Sapre.
3. Data communication by Fred Halsall, Pearson Education.

BCSP402 DATA COMMUNICATION [0-0-2-1] 
Total Hrs: 20

Sr. No  Title of Practical
1  To Design & Analyze of basic data communication system for computing
2  Write a MATLAB Program to generate & Analyze various waveforms
3  Sketch & Write a MATLAB Program to convert analog signal to digital signal for the given values
4  Write a MATLAB Program to calculate nyquist sample rat for a given sinusoidal signal
5  To study and demonstrate basics of serial communication ports and protocol
6  To study and demonstrate parallel communication and transmission
7  Design & Implementation of Amplitude Modulation and perform simulation in MATLAB.
8  Design & Implementation of pulse Amplitude Modulation and perform simulation in MATLAB.
9  Implementation of Time Division Multiplexing(TDM) for 1:0.5 interval and perform simulation in MATLAB
10  Implementation of Frequency Division Multiplexing and perform simulation in MATLAB
11  Implementation of ASK and perform simulation in MATLAB
12  To demonstrate transmission media and various interface standard
13  Design and Implementation of phase modulation and perform simulation in MATLAB
14  Design and Implementation of frequency modulation and perform simulation in MATLAB
15  Open ended design of Practical.

Open ended design of Practical.

BCSP202 SHELL PROGRAMMING [0-0-2-2] 
TOTAL HRS: 20

Sr. No  Title of Practical
2  Write a shell script to implement simple calculator.
3  Write a shell script which whenever gets executed displays the message “Good Morning/Good afternoon /Good Evening “depending on the time at which the script is executed.
4  Write a shell script that will print, message “Hello World, in Bold and Blink effect, and in different colors like red, brown etc using echo commands.
5  Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
6  Write a shell script using for loop to print the various patterns on screen.
7  Write shell Script to demonstrate Switch Statement.
8  Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file)
9  Write a shell script to see a total memory (including the swap), & check how many GB of RAM your system has used.
10  Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)
11  Write a Shell Script to delete the zero sized file using if and for in Unix / Linux / Ubuntu.
12  Open ended practical: Write a Script to implement Finite Automata.

Practical Beyond Syllabus:
1. Design shell script for lexical analyzer
2. Design shell script for YAC

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Define and use the fundamental UNIX command and utilities.
2. Explain and summarize shell scripts effectively.
3. Solve and Illustrate shell scripts in order to perform basic shell programming.

MBL103: GENERAL PROFICIENCY-III : SOFT SKILLS

Course Objectives:
1. To enhance the inherent qualities of oneself and provide a platform to show hidden talent.
2. To nurture one’s special capability and interest in activities like sports, drama, singing.
3. To help express oneself and be more compatible with outer world in the hobby domain.

Course Outcome:
1. Explore and demonstrate the inherent talents within.
2. Fruitfully engage themselves in creative activities during spare time.
2. Provide logical solution as a result of hobby activity exhibited.

FIFTH SEMESTER
BCSL303 DATABASE MANAGEMENT SYSTEMS
(3-1-0-4) Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces general idea of database management system.
2. It is aimed at developing skills to design databases using data modeling and design techniques.
3. It is also aimed to developing skills to implement real life applications which involve database handling.
4. This course also provides carrier opportunities in subject areas of designing, storage techniques and data handling and managing techniques.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Define SQL queries to perform CRUD operations on database (Create, Retrieve, Update, and Delete) and Design Entity-Relationship (E-R) model from specifications and to transform it to the relational model.
2. Demonstrate data models and design techniques involved in the database design process.
3. Illustrate the various techniques of data storage in physical database and learn indexing.
4. Discuss various skills to manage transaction processing in database system.
5. Design and implement various query optimization techniques in database.
6. Choose the available recent trends in DBMS such as NO SQL and it’s in real time application.

Unit -I: Database system concepts and Architecture (8 Hrs)
Concept of relational database, Relational data model, Relational algebra, SQL-the relational database standard, introduction to PL/SQL.

Unit-II: Database Design Theory (8 Hrs)
Functional dependencies and normalization, relational database design algorithms, practical database design and demoralization, Relational constants, programmatic ways for implementing constraints, triggers.

Unit -III: Physical Database Design and Memory Management in database (9 Hrs)
Concept of physical and logical hierarchy, storage, concepts of index, B trees, hash index, function index, bitmap index, database buffer management, log buffer management code reuse, concept of two tier and N-tier architecture. Database recovery techniques. Aries Algorithm for recovery.

Unit -IV: Query Optimization and Performance Tuning (8 Hrs)
Various techniques for query optimization, strong and weak equivalence, cost base optimization, Use of different storage structures in query optimization.

Unit-V: Transaction Management (10 Hrs)
Transaction Processing -Transaction and system concepts, Desirable properties of transaction, Schedules and recoverability, serializability of schedules, concurrency control, lock based protocols and time stamp based protocols, read consistency.

Unit -VI: Trends in Database Management (2 Hrs)
What is NoSql, History of NoSQL, Important characteristics of NoSQL categories of NoSQL. Google Database, Twitter and Social networking databases

Text BOOKS:
2. Database System Concepts by Henry Korth

Reference BOOKS:
3. Database Systems by Connolly, 3rd edition, Pearson Education

BCSP303 DATABASE MANAGEMENT SYSTEMS (0-0-2-1)
Total Hrs: 20

List of Practicals:
1. Configure and Install PostgrSQL followed by Connect to PostgreSQL GUI.
2. Create a Railway Scheme using DDL Commands and Insert Data into It.
3. Execution of basic SQL: Assignment 1 (Railway schema).
4. Create the University schema using the commands in the DDL.
5. Insert Data into University Schema (Constraint Check).
6. Execution of basic SQL: Assignment 2
7. Execution of Joins in SQL.
10. Schema creation and constraints: Assignment 5.
11. SQL Implementation of Concurrency and Transactions.
12. Write a SQL script to implement Triggers.
13. Write a SQL script to create VIEWS in SQL.
14. Write a SQL script to demonstrate use of LOCKS in database.
15. Open ended practical/ Virtual lab.

BCSL304 OPERATING SYSTEMS (4-0-0-4)
Pre-requisite: Computer Architecture & Organization
Co-requisite: NA

Course Objectives:
1. This course introduces general idea, structure and functions of operating system
2. Making students aware of basic mechanisms used handle processes, manages memory, manages storage devices and files.
3. The course provide career opportunities in subject areas of designing operating systems

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify basic structure and purpose of operating system
2. Interpret the concepts of process & Memory management.
3. Illustrate various CPU scheduling algorithms.
4. Analyze different memory management techniques with advantages and disadvantages.
5. Schematize Deadlock & security mechanisms in operating systems.
6. Choose various advances in OS and its applications

Unit-I: Introduction (06 Hrs)
Evolution of OS, Types of OS, Basic hardware support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit-II: File Systems (10 Hrs)

Unit-III: Process and Its Scheduling (10 Hrs)
Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

Unit-IV: Memory Management (10 Hrs)

Unit-V: Process management and synchronization (10 Hrs)
Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems.

Unit-VI: Deadlocks detection & avoidance (10 Hrs)
Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation.

Content beyond the syllabus (04 Hrs)
Recent trends in Operating System, Introduction to Advanced OS & its Application.

Text BOOKS:

Reference BOOKS:

BCSL305 PRINCIPLES OF PROGRAMMING LANGUAGE (4-0-0-4) Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces the general ideas of programming concepts.
2. Making students aware of basic programming paradigms, the principles and techniques involved in design and implementation of it.
3. It is aimed at developing skills to provide frameworks specifying and reasoning about programming languages.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recognize programming paradigm and design principles.
2. Demonstrate different data types and their specification.
3. Illustrate the generic subprograms and its structure.
4. Analyze memory allocation, inheritance and management.
5. Design of sequence control in programming language.
6. Evaluate recent trends in programming language and its implementation in real time applications.

Unit I: Introduction (12 Hrs)
Definition of Programming language, Implementation of high-level languages, Data elements, binding time, binding identifiers to names, binding of attributes, Binding time. Concept of r-value and l-value and their implementation. Effect of Environment on a language, Language paradigms. Language translation issues.

Unit II: Data Types (10 Hrs)
Data type, Type checking and type conversion, elements of specification and implementation of data type. Implementation of elementary data types: integer, real, character, Boolean Pointer, enumerated type Implementation of structured data types. Vectors & arrays, Sets.

Unit III: Implementation and Subprogram (12 Hrs)
Abstract data type, encapsulation. Implementation of new data types, Subprogram definition and activation, their Implementation, parameter passing methods, generic subprograms, Scope rules.

Unit IV: Inheritance and Memory Management (12 Hrs)
Type equivalence, type definitions with parameters. Implementation of Inheritance. Storage management issues like static and dynamic allocation stack based allocation and management, Heap based allocation and management.

Unit V: Sequence Control (12 Hrs)
Sequence control, Implicit and explicit sequence control, Sequencing with arithmetic expression, Sequence control between statements, prime programs, implementation of case statement, Subprogram sequence control, recursive and non recursive subprogram. Data control, referring environment, dynamic and static scope, static chain implementation and display implementation.

Unit VI: Trends in Programming (02 Hrs)
Recent trends in Principle in Programming Languages, Advanced topics & its Application.

BOOKS:
2. Programming Languages, Ravi Sethi, Addison Wesley.

Reference Book
1. Principles of programming languages by Gilles Dowek @ Springer-verlag london Limited 2009
2. Concepts in programming languages by John C. Mitchell copyright @ cambridge university press 2003
4. Programming Languages: Application and Interpretation, Copyright © 2003-07, Shriram Krishnamurthi, United States License

BITL302 COMPUTER NETWORKS (3-1-0-4) Total Hrs: 45
Pre-requisite: Data Communication Co-requisite: NA

Course Objectives:
1. This course introduces basic concepts of networking and its architecture while making them aware of functions of each layer in architecture.
2. It is also developed skills to understand standards employed in computer networking.
3. The course also provides carrier opportunities in subject areas of protocols design and network components contributing the design.

Course Outcomes:
1. Recognize the need for OSI reference model in computer networking.
2. Differentiate various transmission medium used in physical layer.
3. Use different elementary protocols for communication and Identify IEEE standards employed in computer networking.
4. Compare various Routing Algorithms and Protocols to evaluate performance of network
5. Design techniques involved in developing transport and application layer of computer networking.
6. Choose latest technology used for transmission in computer networking.

Unit-I:Introduction (9Hrs)
The use of computer networks, Network hardware, LAN’s, Man’s, WAN’s, internet works, Network software, protocol hierarchies, design issues for layers, interfaces and services, Connection
oriented and connectionless services, service primitives, relationship of Services to protocols, the OSI reference model, TCP/IP reference model, comparison of OSI and TCP/IP reference model.

Unit-II: Physical Layer (8 Hrs)
The theoretical basis for data communication-Fourier analysis, bandwidth-limited signals, Maximum data rate of a channel, transmission media-magnetic media, and twisted pair coaxial Cable, fiber optics. Wireless transmission, microwave transmission. Multiplexing, switching, narrow and ISDN - services, architecture, interface, perspective on N-ISDN, broadband ISDN & ATM-virtual circuits versus circuit switching, transmission in ATM networks, ATM Switches.

Unit-III: Data Link Layer (8 Hrs)
Design issues - services provided to the network Layer, framing, error control, flow control, Error correcting & detecting codes, elementary data link protocols, simplex stop and wait Simplex protocols for noisy channel, sliding window protocols-one bit protocol, go back Protocol, selective repeat protocol. The medium access sub layer - static and dynamic channel Allocation in LANs and MANs, Multiple access protocols - ALOHA, CSMA, collision free Protocols, limited contention protocols, IEEE 802.11 wireless LAN protocols, IEEE Standards 802 for LAN and MANs-802.3 & Ethernet, token bus. Token ring.

Unit-IV: The Network Layer (9 Hrs)
Design issues, services provided to the transport layer, internal organization, comparison of Virtual circuit and datagram subnets, routing algorithms. Optimality principle, shortest path routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical routing, broadcast & multicast routing, congestion control algorithms, general principles, prevention policies, traffic shaping, flow specifications, congestion control in virtual circuit subnets, Choke packets, load shedding, jitter control, IP protocol, IP address. Subnets, internet Control protocols, OSPF, BGP.

Unit V: Transport and Application Layer (8 Hrs)
Transport and Application Layer - services provided to the upper layer, Quality of Service, Transport service primitives, elements of transport protocols, addressing, establishing a Connection, releasing a connection, flow control & buffering, multiplexing, crash recovery.

Unit VI: Trends and Applications (3Hrs)
Bluetooth protocol stack, Bluetooth connections, piconets and scatternets, WiFi and WiMAX Standard Recent trends and advance topics.

TEXT BOOKS:

REFERENCE BOOKS:

BITP302 COMPUTER NETWORKS (0-0-2-1) Total Hrs: 20
List of Practical:
1. To test and Study the basic network and Network configuration Network commands.
2. To configure One Network (with Two PC) One Hub.
3. To Configure Two Network Two Switch One Router
4. To Configure Two Network(two PC each) One Switch
5. To implement CRC of data link layer
6. To implement Dijkstra's Routing algorithm
7. To Work and understand protocol structure (IP, TCP, UDP, ICMP header format)
8. To study sub netting; calculate subnet mask and to identify subnet addresses
9. Implementation of Client Server Communication Using TCP.
10. To Understand IP Addressing: Classless Addressing

BCSL306 SOFTWARE ENGINEERING AND PROJECT MANAGEMENT (3-1-0-4) Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces basic idea of software engineering while making them aware of basic mechanism of software engineering.
2. It is aimed at developing skills to provide development solutions to variety of real life situations which involve software engineering.
3. They learn appropriate cost estimations for developed software.
4. This course provides career opportunities in subject area of software requirement, software design, and software testing quality management. Configuration management.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify and adopt the life cycle of software development process.
2. Demonstrate, evaluate and interpret the information sources for the development of software systems.
3. Interpret and be familiar with the role and responsibilities of the professional software’s & ethics to adopt and solve software engineering product development related problems.
4. Design and analyze the skills to solve problems and provide their solutions using appropriate methods of analysis and design.
5. Design different testing mechanisms for achieving quality control and quality assurance for large scale software systems.
6. Evaluate and apply appropriate cost estimations techniques for development of software.

Unit-I: Introduction (8 Hrs)

Unit-II: Software Planning (8 Hrs)

Unit-III: Software Analysis and Design (9 Hrs)

Unit-IV: Software Testing (9 Hrs)

Unit-V: Software Metrics and Software Quality Management (8 Hrs)

Unit-VI: Trends in Software Engineering and Project Management (3 Hrs)
Software project management (PERT/CPM):Developing a network plan, overview of PERT /CPM, basic rules for developing network, basic rules for developing project network.

Recent trends in Software Engineering and Project Management, Advanced topics & its Application

BOOKS.
1. Software Engineering- A Practitioner’s Approach (Sixth Edition) - Roger Pressman (TMH)

Reference Books:
2. Software Engineering Theory and Practice by Pfleeger, Pearson Education.

BCSP306 SOFTWARE TOOLS LAB-1 (0-0-2-1)
Total Hrs: 20

Course Objective:
This course introduces basics of Rational Rose Suite while making aware of designing and development processes involved in application development.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recognize basics concept of java programming
2. Demonstrate object oriented programming using java
3. Apply Exception Handling to make programs robust and secure
4. Analyze concept of multithreading using Java
5. Design programs that can communicate over network
6. Evaluate performance of applets design for real world application

List of Practicals:
1. Write a java program that implement the concepts of classes and objects
2. Write a java program that implement the concepts of constructor
3. Write a java program that implements the concepts of Package
4. Write a java program that implements the concepts of interface
5. Write a java program that implements the concepts of Exception Handling
6. Write a java program that implements the concepts of Multithreading
7. Write a java program that implements the concepts of I/O Handling
8. Write a java program that implements the concepts of Applet
9. Write a java program that implements the concepts of String Handling.
10. Write a java program that implements the concepts of networking.

**MBL104: General Proficiency-IV**  
(Advanced Communication Skill)  
**Pre-requisite:** NA  
**Co-requisite:** NA

**Course Objective:**
1. To make them aware of advanced techniques of public speaking, one to one interaction and social ethics.
2. To communicate and express efficiently and assertively.

**Course Outcomes:**
At the end of the course the student shall be able to:
1. Apply the knowledge of phonetics and phonology to articulate speech.
2. Demonstrate ability to analyze, evaluate and summarize charts, graphs and presentations.
3. Circumvent ideas and views assertively for effective public speaking.

**ELECTIVE-I**  
BITL301 JAVA PROGRAMMING  
**Total Hrs:** 45  
**Pre-requisite:** Data Structure using C  
**Co-requisite:** NA

**Course Objectives:**
1. This course introduces student's basic programming concepts of Java.  
2. It is aimed at developing skills to built real life applications.
3. This course provides carrier opportunities in network programming and socket programming.

**Course Outcomes:**
Upon successful completion of the course, students will be able to:
1. Recognize the basic principles of the object oriented development process for the analysis and design of solutions for small scale problems.
2. Demonstrate & interpret the concepts of packages and interface amongst classes during application development.
3. Apply the concepts of multithreading and exception handling to design computer based applications.
4. Analyze & demonstrate an introductory understanding of event-driven programming and graphical user interfaces using applet to provide solutions for real-world problems.
5. Write Socket communication program to establish connection between client and server.
6. Evaluate the different small to medium sized application programs based on the Java core and advanced concepts and IDE.

**Unit I: Introduction to JAVA, Class and Object**  
(3 Hrs)
Introduction to data types, operators and control statements, Classes: fundamentals of classes, declaring objects, Assigning objects, reference variables, methods, constructor, variable handling and garbage collection. Methods and classes: Overloading methods, using objects as parameters, arguments passing, returning objects, recursion, access control, understanding static, introducing final, nested inner classes, storage classes, command line arguments.

**Unit II: JAVA Packages, Interface and Exception Handling**  
(6 Hrs)
Introduction to Array, Vectors, Wrapper Class & Inheritance. Packages and interface: Packages, access protection, importing packages, interfaces. Exception handling: Fundamentals exception types, uncaught exception, try-catch, displaying description of an exception, multiple catch clauses, nested try statements, throw, finally, built in exceptions, creating own exception subclasses.

**Unit III: Multithreaded Programming**  
(9 Hrs)
JAVA thread model, thread priorities, synchronization, messaging, the thread class, runnable interface, creating thread, creating multiple thread, using isAlive( ), join( ), thread priority, synchronization, interthread communication, suspending, resuming, stopping threads using multithreading.

**Unit IV: I/O, Applet and String Handling**  
(12 Hrs)
I/O stream, bytes stream,, character stream, pre-defined streams, reading console input reading character, reading string, writing console output, the PrintWriter class, reading and writing files, applets fundamentals, transient and volatile modifiers, using instance of strictfp, native method. String Handling: string constructor, special string operator, character extraction, string comparison, searching string, modifying a string, data conversion using valueOf( ), changing case of Characters within a string, string buffer.

**Unit V: Networking and Generics**  
(12 Hrs)
Networking: networking basics & socket overview, client/server, reserved socket, proxy server, internet addressing, networking classes and interfaces, factory methods and instance method TCP/IP client socket, URL, URL connections, TCP/IP server socket, datagram. Generics: General form of generic class and examples, creating generic method, generic interfaces, class hierarchies, erasure, generic restrictions.

**Unit VI: Recent Trends**  
(3 Hrs)
Recent trends and advance topics.

**Text Books:**
1. The Complete Reference by Herbert Schild, TMH Publication

**Reference Books:**

BCSL312 COMPUTER GRAPHICS & VISUALIZATION (4-0-0-4)
Total Hrs: 45
Pre-requisite: Applied Mathematics
Co-requisite: NA

**Course Objectives:**
1. This course introduces basic fundamentals of computer graphics while making them aware of basic principles of computer graphics.
2. It is also aimed at developing fundamental data structure and algorithm for modeling.
3. This course also provide career opportunities in developing Video Games, Virtual Reality applications, computer simulation, computer aided design and web design.

**Course Outcomes:**
Upon successful completion of the course, students will be able to:
1. Identify the fundamentals of computer graphics, various display devices and able to perform basic object generation.
2. Demonstrate various filling and clipping algorithms for objects.
3. Apply various transformation techniques for animation.
4. Analyze various projection and hidden surface removal techniques.
5. Design curve generation techniques and visualization techniques.
6. Evaluate advanced modeling techniques and tools in the area of computer graphics.

**Unit-I: Introduction** (7 Hrs)
Introduction to Computer Graphics and Image Processing, Basic fundamentals of random scan, raster scan devices, Stereoscopic and Virtual Reality Systems, line and circle drawing algorithms.

**Unit-II: Polygon Filling Methods** (8 Hrs)
Seed fill, fence fill, edge flag algorithm, and scan conversion techniques, aliasing and antialiasing techniques, clipping algorithms.

**Unit-III: Transformations** (9 Hrs)
Basic 2D transformation, composite transformations- translation, rotation, scaling, reflection, and shear views, windowing, Introduction to 3D transformation.

**Unit-IV: Projections and Elimination** (8 Hrs)
Three dimensional display methods, parallel, perspective projections and types, hidden line and surface elimination techniques, shading and rendering.

**Unit-V: Curve Generation** (10 Hrs)
Curve Generation: Cubic Spine, Bezier, B-Spline, blending of curves and other interpolation techniques, Introduction to Visualization, Applications, Visualization Techniques- parallel coordinates – a, charts (pie chart, bar chart, histogram, function graph, scatter plot, etc., graphs (tree diagram, network diagram, flowchart, existential graph, etc.) Venn diagram Euler diagram etc.

**Unit-VI: Trends and Applications** (3 Hrs)
Recent trends in Computer Graphics and Visualization, Advanced topics & its Application

BITL408 DISTRIBUTED DATABASES & OBJECT ORIENTED DATABASES (4-0-0-4)
Total Hrs: 45
Pre-requisite: Database management System
Co-requisite: NA

**Course Objective:**
1. This course introduces student the fundamental concept of distributed and object oriented databases making them aware of techniques of designing and managing data in distributed environment.
2. It is also aimed developing skills to provide solutions to real life applications which involve distributed databases.
3. This course provides carrier opportunities in subject areas of design of distributed and object oriented databases modeling and analysis.

**Course Outcomes:**
At the end of the course the student shall be able to:
1. Apply the basics of distributed and object oriented databases.
2. Identify methods and techniques to design the distributed and object oriented.
3. Develop mathematical formulation for optimization.
4. Apply techniques in manipulation and handling of data in distributed and object oriented environment.
5. Apply OODBMS concepts in real life problems.
6. Apply advanced technique and tools in area of distributed and object oriented databases.
Unit-I: Distributed Databases Features (8 Hrs)
Distributed database management systems - review of databases and computer networks, levels of distribution transparency, reference architecture, type of data fragmentation, distribution transparency for read only applications and update applications, distributed database access primitives and integrity constraints.

Unit-II: Distributed database Design (9 Hrs)
A framework for distributed database design, the design of database fragmentation, the allocation of fragments, translation global queries to fragment queries, equivalence transformation for queries, transforming global queries into fragment queries, distributed grouping and aggregate function evaluation, parametric queries.

Unit-III: Query Optimization (9 Hrs)
Query optimization, problems in query Optimization, and objectives in query process optimization, simpler representation of queries, model for query optimization, join query, general queries, concept of two phase commit, resolving distributed transaction. Concept of replication, snapshot on replication and multimaster replication, conflict resolution in MultiMate replication, concurrency control and database recovery in distributed databases.

Unit-IV: Concepts of Object Oriented Data Model (9 Hrs)
The evolution of object oriented concepts. Object-oriented concepts, characteristics of an object-oriented data model, object schemas, class-subclass relationships. Inter object relationships, late and early binding, and support for versioning. Similarities & differences between OODM and other data models, features of air object-oriented databases management system, OODBMS architectural approaches-extended relational model approach, semantic database approach, object oriented database programming language extension approach, DBMS generator approach, Object definition language and object query language.

Unit-V: Object Oriented Databases (8 Hrs)
OODBMS architectures, performance issues in OODBMS, application selection for OODBMS, database design for an object relational database management system (ORDBMS), Structured types & ADTs, object identity, extending ER model using nested collections, storage and access methods, query processing, query optimization, design and architecture of POSTGRES, Distributed computing in CORBA and EJB.

Unit VI: Trends of Distributed databases (2 Hrs)
Recent trends/ advance topic.
1. Distributed data bases principles and systems by Ceri & Pelagatti (McGraw Hill Pub.)
2. Fundamentals of Database System by Eliniskv & Navathe (3TEd. Addison W.,elsey)

Reference Book:-
1. Database System - Design Implementation & Management by Peter Rob & Carlos Coronel. (Course Tech.)

BCSL414 DATA MINING & WAREHOUSING (3-0-0-3) Total Hrs: 45
Pre-requisite: Database management System Co-requisite: NA

Course Objectives:
1. This course introduces principles, concepts, functions and uses of data warehouses, data modeling and data mining in business.
2. A DW and DM technique is usually business driven and will work to improve the direction of the company by aligning the data warehouse technology with Business strategy.
3. This course also provides carrier opportunities in data warehouse design, query processing, data mining tools and technique.

Course Outcomes:
1. Identify the features and applications of data warehouses.
2. Describe and Identify data processing methods used to efficiently design and manage data storage in data
3. Apply knowledge discovery process and associated algorithms to solve real-life applications
4. Analyze & plan a conceptual framework with popular data mining software.
5. Design data mining algorithms using classification and clustering concepts
6. Evaluate usability and functionality of designed algorithm in the field of research and development Know advanced technique and tools in the area of data warehouse and data mining.

Unit I- Introduction to Data Warehousing (7 Hrs)
Introduction to Decision Support System: DSS Defined, History of DSS, Ingredients of DSS, Data and Model Management, DSS Knowledge base, User Interfaces, The DSS Users, Categories and Classes of DSSs Need for data warehousing, Operational & informational data, Data Warehouse definition and characteristics, Operational Data Stores.

Unit II- Data warehouse architecture (7 Hrs)
Data warehouse Components, Architectural components, Data Preprocessing: Why
Preprocess Data? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization and Concept Hierarchy Generation for numeric and categorical data, significant role of metadata, Building a Data warehouse, Benefits of Data Warehousing.

**Unit III- Multidimensional data Models (8 Hrs)**


**Unit IV- Introduction to data Mining (10 Hrs)**


**Unit V- Knowledge Discovery in Large Data Sets (10 Hrs)**

Classification, Knowledge Discovery Classification Based on Association Rule Mining, Other Classification Methods Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods. Introduction to Knowledge Discovery, innovative techniques for knowledge discovery, application of those techniques to practical tasks in areas such as fraud detection, scientific data analysis, web mining, Introduction to huge data sets such as Web, telecommunications networks, relational databases, object-oriented databases, and other sources of structured and semi-structured data, Problem of Large Data sets 20.

**Unit VI: Recent Trends in Data Mining and warehousing (3 Hrs)**

Recent trends in Data Mining and Warehousing, Advanced topics & its Application.

**Text Book**

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

**REFERENCE Books**

1. Paul Punnnian, "Data Warehousing Fundamentals", John Wiley Pub

2. Alex Berson, S.J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw Hill
SIXTH SEMESTER

BCSL308: Language Processors [3-1-0-4]
Total Hrs: 45
Pre-requisite: Theory of Computation
Co-requisite: NA

Course Objectives:
1. This course introduces student’s general idea of language processors.
2. This course also introduces designing structure and implementation of it.
3. They are also aimed to develop skills to understand optimization technique.

Course Outcomes:
1. Upon successful completion of the course, students will be able to
2. List basic concepts of language processors.
3. Explain different parsing techniques.
4. Apply knowledge of semantic analysis and construct three address codes.
5. Discuss concept of storage Management. Schematize various optimization techniques.
6. Evaluate code generator, discuss the different issues of code generation.

Unit-I: Introduction (8 Hrs)
Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer, LEX.

Unit-II: Syntax Analysis (8 Hrs)
Specification of syntax of programming languages using CFG, Top-down parser, design of LL(1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers, Study of YACC.

Unit-III: Syntax Directed Translation (9 Hrs)
Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations: postfix, syntax tree, TAC, translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit-IV: Storage Allocation and Error Handling (8 Hrs)
Run time storage administration, stack allocation, symbol table management, Error detection and recovery: lexical, syntactic, and semantic.

Unit-V: Code Optimization (9 Hrs)
Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression, Code generation – Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Unit-VI: Trends in Language Processor (3 Hrs)
Recent trends in Language Processor, Compiler tools, advanced topics & its Application.

Text Books:

BCSP308: Language Processors [0-0-2-1]
Total Hrs: 20

List of Practical:
1. Study the syntax of LEX specifications built-in functions and variables. And write a LEX program to convert a number in words to integer.
2. Write a LEX Program to Count no. of lines, blanks, words & characters supplied at a command prompt.
3. Write a LEX program to count the words starting with ‘a’.
4. Write a LEX program to calculate the average of given numbers.
5. Implement Finite Automata in LEX for Odd numbers of a’s
6. Write a LEX Program to convert lower case to upper case and upper case to lower case.
7. Implement a LEX program to recognize whether a given sentence is a simple or compound.
8. Write a LEX program to find the number of vowels and consonants.
9. Write a LEX program to convert an octal number to decimal number.
10. Write A LEX Program To Convert Decimal Number To Hexadecimal Number.
11. Write a LEX program for basic desktop calculator using YACC.
12. Open Ended Practical

BCSL404: DESIGN AND ANALYSIS OF ALGORITHMS (3-1-0-4)
Total Hrs: 45

Course Objectives:
1. This course introduces students the general idea of analysis and design of algorithms while making them aware of basic methods of algorithm analysis and design.
2. It is also aimed at developing skills to solve real life applications which involve algorithm development.
3. The course also provides career opportunities in analysis, design and optimization technique in algorithms.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify methods to solve recurrences describing the performance correctness of algorithms
2. Compare worst-case running times of different algorithms using asymptotic analysis
3. Use different designing methods for development of algorithm for realistic problem
4. Demonstrate the understanding and estimate the performance of algorithm
5. Analyze & Compare major tree & graph traversal algorithms
6. Choose and identify different NP complete problem

Unit – I: Mathematical foundations (7 Hrs)
Summation of arithmetic and geometric series, n, n^2, Bounding summations using integration, Recurrence relations, Solutions of recurrence relations using technique of characteristic equation and generating functions, Complexity calculation of various standard functions, Principles of designing algorithms.

Unit – II: Asymptotic notations (8 Hrs)
Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis.

Unit – III: Advanced data structures (6 Hrs)
Advanced data structures like Fibonacci heap, Binomial heap, disjoint set representation, red and black trees and their applications. Divide and conquer basic strategy, matrix operation, binary search, quick sort, merge sort.

Unit – IV: Greedy Method & Dynamic Programming (10 Hrs)
Greedy method – basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc. Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

Unit V: Traversal and Search Techniques (7 Hrs)
Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen’s problem, graph coloring, Hamiltonian cycles etc.

Unit VI: Completeness Problems and Applications (7 Hrs)
NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete. Recent trends in Design and analysis of algorithms, Advanced topics & its Application.

Recent trends in Design and analysis of algorithms, advanced topics & its Application.

BOOKS:

Reference Books:-

BCSP404: DESIGN AND ANALYSIS OF ALGORITHMS (0-0-2-1)
Total Hrs: 20

List of Practical
Write a program to reverse the elements of an array using pointers.
Implement the Quick sort algorithm.
Implement the merge sort algorithm using divide & conquer technique.
Write a program to implement Matrix-chain multiplication.
Write a program to implement Longest common subsequence.
Write a program in C/C++ to solve Travelling Salesman Problem.
Implement the minimum cost spanning tree algorithm using Prim’s / Kruskal’s algorithm.
Write a program to implement Dijkstra’s / Bellman Ford algorithm for single source shortest path.
Write a program to implement Depth First Search (DFS) / Breath First Search (BFS) Algorithm.
Write a program to implement topological sorting algorithm.
Open Ended Practical.
(i) Write a program in C/C++ to solve fractional knapsack problem.
(ii) Write a program to implement Rabin-carp string matching algorithm.
(iii) Execution on Virtual Lab.

BCSL314: Parallel and Distributed Computing [4-0-0-4]
Total Hrs: 45

Course Objectives
This subject aims to help students to get the most out of parallel and distributed computer systems, i.e. to understand the interaction between hardware and software parts of the system, to understand the power and limitations
of parallel and distributed systems and to understand the beneficial and challenging aspects of parallelism. Upon completion of this subject the student should be able to:
1. Understand the fundamental aspects of parallel and distributed processing.
2. Be familiar with taxonomies of parallel systems.
3. Be familiar with Open Specifications for Multi-Processing and message passing interface.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Identify the parallel & distributed processing models and its applications in computer science
   Explain shared memory architecture and message passing interface.
2. Apply methods of distributed and parallel systems for process modelling.
3. Analyse program partitioning and scheduling mechanisms
4. Design and implement programs using Open Specifications for Multi-Processing
5. Estimate the performance of Parallel and Distributed Systems

Text Book

Reference Books

BECL410: EMBEDDED SYSTEMS [4-0-0-4]
Total Hrs: 60

Course Objectives:
1. This course introduces student’s fundamental concepts of embedded systems and its design.
2. It is aimed at developing skills to real time applications of embedded systems which consist of hardware and software.
3. This course provides carrier opportunities as embedded system engineer, software and hardware engineer.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Identify and adopt knowledge of the terminology, applications, requirements and constraints for embedded systems development.
2. Explain development of software and hardware in real time environment via advanced automated designing and testing tools.
3. Identification and application of various technology & methods for embedded system design and implementation.
4. Design & implementation of embedded systems with advanced microcontroller and interfaces.
5. Testing of complex and critical real world embedded systems, interfaced to digital hardware in real world situations.
6. Evaluate a real-time, embedded industrial control system using an embedded microcontroller with associated interface and communication devices

Unit I: Microcontrollers (10 Hrs)
Microprocessors and Micro-controllers, Types of Micro-controllers, External memory, Processor Architecture – Harvard v/s Van Neumann, CISC v/s RISC, Micro-controller, Memory types, Software development tools like assembler, cross-compiler, emulator, and simulator, 8051 controller, Block diagram & architecture.

Unit II: 8051 (10 Hrs)
8051 Instruction Set, Addressing modes & programming, 8051 Timers, Serial I/O.

Unit III: Memory Interfacing (10 Hrs)
Memory Interfacing, Programming, Real time interfacing with LED, LED display, LCD display.

Unit IV: PIC Micro-Controllers (10 Hrs)
Overview, features, PIC 16c6x/7x –architecture, File selection register, Memory organization, Addressing modes, Instruction set, Programming.

Unit V: ARM Micro-Controllers (10 Hrs)

Unit VI: Industrial Interfacing Buses (10 Hrs)
PCI, ESA, EISA, I2C, USB, RS232. Advance topics on embedded system.

Text Books:

Reference Book :
1. Embedded System: Architecture, programming and design by Rajkamal, TMH
2. ARM Assembly Language: Fundamentals and Techniques, William Hohl, CRC Press/

BECP410: EMBEDDED SYSTEMS [0-0-2-1]
Total Hrs: 20

List of Practical
1. Getting familiar with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code.
2. To write C source code for blinking of LED with Intel Galileo Gen 2.
3. To write C source code to Fade LED using Intel Galileo Gen 2.
4. To write C source code to vary Blinking Rate of LED using Intel Galileo Gen 2.
5. To write C source code for Seven Segment Display using Intel Galileo Gen 2.
7. To write C source code to control LED lightning via Array.
8. Perform SD card testing using Intel Galileo Gen2.
9. To write C source code to Interface LCD with Intel Galileo Gen 2 and display GHRCE on LCD Display.
10. To write C source code to Interface Temperature Sensor (LM35) with Intel Galileo Gen 2 and display the temperature on LCD.
12. To write C source code to Interface Temperature Sensor & I2V DC fan with Intel Galileo Gen 2.

BCSP313: OPEN SOURCE TOOL LAB [0-0-2-1]
Total Hrs: 20

Course Objective:
1. This course introduces the basic constructs available in software tools for application development.
2. This course also aimed to develop skills to identify components available in tools.

Course Outcome:
1. Recognize the role of languages like HTML, DHTML, CSS, JavaScript and PHP.
2. Classify the elements and attributes of web page.
4. Analyze dynamic web pages using JavaScript, XML.
5. Design web applications using PHP.
6. Choose the advance open source tools to develop web application.
Course Objectives:

1. To make students communicate their knowledge and feelings with a purpose.
2. To perform effectively in one to one and group discussion meetings and in public.
3. To make students more focused for enhancing employability prospects.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Write more accurate and effective technical reports.
2. Create favorable environment for better recruitment.
3. Perform better in group discussion and interview.

Course Objectives:

1. To orient the students for research in the area of interest.
2. To provide step wise procedure for carrying out research.
3. To introduce various mathematical, analytical and simulation tools useful for research.
4. To learn methods for safeguarding the intellectual property rights.

Course Outcomes:

1. Identify types of modern molecular biology and model biological information.
2. Summnerize and Predict output of alignment method.
3. Illustrate various approaches and tools related to bioinformatics problem
4. Distinguish different machine learning techniques in bioinformatics and how the relative merits of different approaches can be evaluated by correct benchmarking techniques.
5. Justify theoretical approaches to model and analyze complex biological systems.
6. Estimate relationships among living things and solve biological problems.
7. Carry out research in a scientific manner.
8. Prepare research report and publish research findings.

*OPEN ELECTIVES*
SEVENTH SEMESTER

BITL304 COMPUTER SYSTEM AND SECURITY
(4-0-0-4)  Total Hrs: 60

Pre-requisite: Computer Network
Co-requisite: NA

Course Objectives:
1. This course covers the fundamentals of computer systems security.
2. It introduces many different areas of security such as encryption, malicious code, authentication and access control, trusted computer systems, operating system and network security.
3. The objective of this course is to provide students with a comprehensive overview of the threats to computer security, technologies for security assurance, and engineering approaches to security solutions.

Course Outcomes:
1. Upon successful completion of the course, students will be able to Understand and learn how to use encryption.
2. Visualize and differentiate the application of cryptographic techniques.
3. Compare various cryptographic algorithms for the appropriate protection measures against malicious code.
4. Apply the modern principles of network security threats and determine efforts to counter them.
5. Analyze the local and global impact of computing and engineering solutions on individuals, organizations and society.
6. Design & implement and maintain security requirements and mechanisms in various computer systems and networks.
7. Evaluate the principles of trusted system to achieve the degree of assurance.

Unit-I: Introduction (10 Hrs)

Attacks, services, mechanisms, security attacks, security services, a model for internet work security, encryption model, steganography, classical encryption techniques, modern techniques - simplified DES, block cipher principles, data encryption standard, strength of DES, differential & linear cryptanalysis, block cipher design principles, block cipher modes of operation, Algorithm - triple DES, international data encryption algorithm, blowfish, RCS, CAST, RC2, characteristics of advanced symmetric block ciphers.

Unit-II: Confidentiality and Key Management (12 Hrs)

Confidentiality using conventional encryption: placement of encryption function, traffic confidentiality, key distribution, random number generation. Public key cryptography: principles, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve remainder theorem, discrete logarithms.

Unit-III: Message Authentication and Hash Functions (12 Hrs)


Unit-IV: Network Security Issues (12 Hrs)

Authentication applications – Kerberos, X.509 directory authentication service, Kerberos encryption techniques, E-mail security: pretty Good privacy, S/MIME, data compression using ZIP Radix-64 conversion. PGP random number generation. IP security: overview, architecture, authentication header, encapsulating security payload, combining security associations, key management.

Unit-V: Web and System Security (10 Hrs)


Unit-VI: Trends and Applications of Network Security (4 Hrs)


Text Books:

Reference Books:
2. Introduction to Data Compression 2/c by Khalid Sayood (Morgan kaufmann/Harcourt India).

BITP304 COMPUTER SYSTEM AND SECURITY
(4-0-0-4)

List of Practicals:
1. Write a C program: Consider a plain text message I AM A HACKER. Encrypt it with the help of the following algorithm:
   a) Replace each alphabet with its equivalent 7-bit ASCII code.
   b) Add a 0 bit as the leftmost bit to make each of the above bit patterns 8 positions long.
   c) Swap the first four bits with the last four bits for each alphabet.
   d) Write the hexadecimal equivalent of every four bits.
2. Write a C program to perform encryption and decryption using the following algorithms:
Caesar Cipher
Rail Fence Technique
Simple Transposition Technique.
3 Write a C program that can encrypt and decrypt using DES.
4 Write a program to implement RSA Algorithm.
5 Write a program to implement Diffie –Hellman Key Exchange.
6 Write a Program to Implement Elliptic curve based Arithmetic.
7 Write a program to implement extended Euclidean Algorithm.
8 Write a program to implement Message Digest -5
9 Write a program to implement SHA-1(Secure Hash algorithm)
10 To Study and analyze SHTTP
11 To Study and analyze Firewall
12 *Open Ended Experiment:-Wireshark

BITL401 HUMAN COMPUTER INTERACTION
(4-0-0-4)
Total Hours: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces students the concept of Human-Computer Interaction. It is also aimed to skill Interaction design methodologies.
2. This course also introduces how to apply the Human-Computer Interaction concepts to the current interaction designs.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Define fundamental concepts in HCI in real life.
2. Describe different types of user study and usability study.
3. Illustrate different types of low-fidelity and mid-fidelity prototypes;
4. Discuss lifecycle of a complete user-centered design process including user studies.
5. Justify the various Model View Control Architecture as per the software requirement.
6. Evaluate various approach to, user centered design processes for a range of real-world scenarios.

Unit-I: Introduction (6 Hrs)
Introduction, A badly designed interactive system, who designs interactive systems, Engineering, What is useful or usable. Making interactive systems feel natural for users Introduction, Natural computing, Natural computing and user-centered system design, Six principles of natural computing, Core concepts, Interactive design, Strengths and weaknesses of interactive systems.

Unit-II: User modeling (10 Hrs)
User modeling in user-centered system design (UCSD): Introduction, Types of user model, User models and evaluation, Heuristic evaluation. The user-centered system design process introduction,


Unit-III: Design process: (8Hrs)
Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Unit-IV: Screen Designing (10 Hrs)

Unit-V: Interface Design Tools (10 Hrs)

Unit-VI: Recent trends/ advance topic.

Text Book:

Reference Books:
1. Human –Computer Interaction By Dan R.Olsen, CENGAGE Learning
2. Interaction Design beyond human-computer interaction Authors: Preece, Rogers, and Sharp

ELECTIVE II

BECL413 WIRELESS COMMUNICATION
[3-0-0-3]
Total Hours: 45
Pre-requisite: Computer network
Co-requisite: NA

Course Objectives:
1. This course introduces students the basic and operational principles of the various components of wireless networks while making them aware of how the connections are setup and maintained.
2. It also skill the students with the regulatory environment in which the Wireless industry operates.
3. The course also provides the carrier opportunities in the field of wireless network.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recognize basic and operational concept of wireless communication & Networks.
2. Interpret & analyze various cellular System components & wireless communication Technologies.
3. Apply the cellular concept to evaluate the performance of cellular network.
4. Analyze & compare different multiplexing & modulation techniques.
5. Justify the applications of different techniques while designing wireless communication system.
6. Choose wireless LAN 802.11X technologies & standards for wireless communication systems.

**UNIT – 1 Introduction**
(7 Hrs)

**UNIT – 2 Common Cellular Components**
(7 Hrs)
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment.

**UNIT – 3 Wireless Network Architecture**
(8 Hrs)
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security.

**UNIT – 4 GSM And TDM Techniques**
(8 Hrs)
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers. GSM system operation, Traffic cases, Call handoff, Roaming, GSM protocol architecture. TDMA system, GSM system operation, Traffic cases, Call handoff, Roaming, GSM protocol architecture. TDMA systems.

**UNIT – 5 Modulation Techniques**
(8 Hrs)
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware.

**UNIT – 6 Wireless Lans**
(7 Hrs)
Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies.

**Text Books:**

**Reference Books:**

**BCSL403 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM [3-0-0-3]**
Total Hours: 45
Pre-requisite: NA
Co-requisite: NA

**Course Objectives:**
1. The goal of this course is to have students develop concepts and skills associated with problems that are classified as requiring intelligence for their solution.
2. It also develops skills to identify solution strategies and ability to implement and evaluate intelligent agents for representative AI problems – e.g., constraint satisfaction, automated theorem proving, etc.
3. Ability to communicate effectively about AI problems, algorithms, implementations, and their experimental evaluation.

**Course Outcomes:**
Upon successful completion of the course, students will be able to:
1. Recognize basic problem solving methods based on AI-based search, knowledge representation, reasoning, planning, and learning algorithms.
2. Demonstrate simple intelligent / expert system using available tools and techniques.
3. Illustrate problem solving techniques to include spatial, temporal, qualitative, and common sense Reasoning.
4. Analyze search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) to solve critical and complex problems in AI.
5. Design knowledge representation, reasoning, and machine learning techniques to develop intelligent systems in real-world problems.

**Course Objectives:**

**Unit-I:**
(8Hrs)

**Unit-II:**
(8 Hrs)
Unit-III: (9 Hrs) Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance.

Unit-IV: (9Hrs) Structured Knowledge Representation: Semantic Nets, Frames, and Scripts. Learning: Block architecture of learning system, Types of learning, performance Measures First order logic, Unification, and Resolution in Predicate Logic Uncertainty Treatment: formal and empirical approaches including Exact and Approximate inference in Bayesian Networks, Bayesian theory, belief functions, certainty factors.

Unit-V: (8 Hrs) Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, inference using full joint distributions, fuzzy logic.

Unit-VI: (3 Hrs) Recent advances in Artificial Intelligence, Algorithms for artificial intelligence, Genetic algorithms. Tools for development of Artificial Intelligence: Open Neural network library. Applications of artificial Intelligence.

Text Books:
1. Artificial Intelligence a Modern Approach: Russell and Norvig , Pearson Education, 2nd
2. Artificial Intelligence – A Practical Approach: Patterson, Tata McGraw Hill, 3rd

Reference Books:
2. Robert Levine, “A comprehensive guide to artificial intelligence and expert systems”,
3. Elain Rich, ”Artificial Intelligence”, PHI Publication
4. Introduction to Artificial Intelligence by E.Charniack and D. Mcdermott, Pearson Education.

BECL423 PATTERN RECOGNITION [3-0-0-3]
Total Hrs: 45
Pre-requisite: Graphtheory & Combinotrics
Co-requisite: NA

Course Objectives:
1. This course introduces the Fundamentals of Pattern recognition.
2. The students skilled to choose an Appropriate feature and pattern classification algorithm for a pattern recognition problem.
3. The course also skill the students to properly implement the algorithm using modern computing tools such As Matlab, OpenCV, C, C++ and correctly.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Understand the nature and inherent difficulties of the pattern recognition problems.
2. Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood.
3. Identify and Select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
4. Interpret and communicate the results clearly and concisely using pattern recognition terminology classification, Clustering.
5. Implement algorithm using available resources and to properly.

Unit I: Statistical Decision Theory (8 Hrs) Statistical Decision Theory, Probability-probabilities of events, random variables, joint distribution & densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

Unit II: Statistical Decision Making (9 Hrs) Bay’s theorem, multiple features, conditionally independent features, decision boundaries, unequal cast of error, estimation of error rates, the leaving-one-out technique. Characteristics curve, estimating the composition of population.

Unit III: Nonparametric Decision Making (9 Hrs) Histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate functions, minimum squared error estimation functions, choosing a decision making technique.

Unit IV: Clustering (8 Hrs) Introduction, hierarchical clustering, partitioned clustering.

Unit V: Processing Of Waveforms and Images (9 Hrs) Processing of waveforms and images- Gray level scaling transformations, equalization geometric image scaling and interpolation, smoothing transformation, edge detection, line detection and template matching, logarithmic gray level scaling, statistical significance of image features.

Unit VI: Trends and Applications (2Hrs) Recent trends/ advance topic.

Text Book:
1. Pattern recognition and image processing by Earl Gose, Richard Johnsonbaugh & Steve Jost (PHI Pub.)

BCSL407 ADVANCE COMPUTER ARCHITECTURE: (3-0-0-3)
Total Hrs: 45
Pre-requisite: Computer Architecture & Organization
Co-requisite: NA
Course Objective:
1. This course aimed to emphasize on the concept of a complete system consisting of asynchronous interactions between concurrently executing hardware components and device driver software.
2. This course aimed to illustrate the behavior of a computer system as a whole.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify different processor architectures and system-level design processes.
2. Describe the performance enhancements using pipelines, dynamic scheduling, branch prediction, caches, and vector processors.
3. Interpret the performance of advanced I/O devices and hardware.
5. Implement the design aspects and categorize various issues, causes and hazards due to parallelisms.
6. Choose the latest technology for modern architectures such as Multi-Core and Multi-CPU systems.

Unit I: Overview of Advanced Computer Architecture (9 Hrs)

Unit II: Pipelining and Multiple Issues Processors (9 Hrs)
Linear Pipeline, Classification of Pipeline Processors, Construction Pipeline, Arithmetic Pipeline, Instruction Prefetch, Branch Handling, Data Buffering, Internal Forwarding and Register Tagging. Concepts of instruction-level parallelism (ILP), Techniques for increasing ILP; Superscalar, super pipelined and VLIW processor architectures.

Unit III: Memory and I/O (9 Hrs)
Hierarchical Memory Technology, Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

Unit IV: Multiprocessor and Thread Level Parallelism (9 Hrs)
Multiprocessor Architecture: Taxonomy of parallel architectures; Centralized shared-memory architecture, synchronization, memory consistency; Cluster computers, Non von Neumann Architectures: Data flow Computers, Reduction computer architectures. Symmetric and distributed shared memory architectures.

Unit V: Multi Core Architectures (9 Hrs)

Text Books:

Reference Book:
4. Superscalar Processors: Mike Johnson.
5. Processor Architecture From Dataflow to Superscalar and Beyond Kurij Silc Borut Robic Theo Ungerer
6. MODERN PROCESSOR DESIGN: Fundamentals of Superscalar Processors, John Shen & Mikko Lipasti

BECL405: DIGITAL SIGNAL PROCESSING [3-0-0-3]
Total Hrs: 45
Pre-requisite: Data Communication
Co-requisite: NA

Course Objectives:
1. This course introduces basics of digital signal processing.
2. The course also aimed to skill the students concepts of discrete time signal processing and systems necessary for the design.
3. The course also aimed to skill the student’s concepts of analysis of advanced signal processing technologies.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. List and compare different signal processing strategies and advanced signal processing technologies.
2. Explain the concept of frequency in continuous-time and discrete-time signals.
3. Compare digital and analog signals and systems; encode & decode information from signals.
4. Identify and formulate basic operations that are involved in analog-to-digital and digital-to-analog converters.
5. Design DT system in linear, time-invariant, causal, and memoryless, asymptotic, marginal and BIBO stability of systems given in frequency domain.
6. Evaluate various digital filters by hand and by using Matlab.

Unit-I: Discrete Time Signals  (7 Hrs)
Discrete time signals and systems, classification of discrete time systems and its properties, Linear convolution, Cross Correlation, Autocorrelation of discrete signals, sampling theorem & sampling process.

Unit-II: Frequency Domain Representation (8 Hrs)
Frequency domain representation of discrete time signals and systems, Fourier transform of discrete time signals, properties of discrete time, Fourier transform.
The Z-transform, Definition, properties of ROC for the Z-transform, Properties of Z-transform, Inverse Z-transform using contour integration, complex convolution theorem, Unilateral Z – transform.

Unit-III: Transform Analysis  (8 Hrs)
Transform analysis of LTI system & structure for discrete – time system. Frequency response of LTI system, Relationship between magnitude & phase response, Block diagram representation & signal flow graph representation of IIR and FIR systems. Linear constant coefficient difference equations, Basic structures for IIR systems, transposed forms, basic network structures for FIR systems, lattice structures.

Unit-IV: Filter design Techniques  (7 Hrs)
Design of discrete time IIR filters from continuous time filters, Frequency transformation of low pass IIR filters, Design of FIR filters by windowing, FIR filter design by Kaiser and Hamming window method.

Unit-V: Discrete Fourier Transform  (8 Hrs)

Unit-VI: Digital Signal processors  (7 Hrs)

Text Books:

Reference Books:
1. Digital signal Processing Theory and application by Proakis and Manolakis, 3rd edition PHI Ltd.

ELECTIVE III

BCSL416 MACHINE LEARNING  [3-0-0-3]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. To study principles, advantages, limitations and possible applications of machine learning.
2. To study models for supervised and unsupervised machine learning.
3. To study reinforcement machine learning and probabilistic graphical models

Course Outcomes:
Upon successful completion of the course students should be:
1. Have a good understanding of the fundamental issues and challenges of machine learning: data model.
2. To study and develop applications based on Genetic Algorithms.
3. Creatively deal with data related issues that need to be addressed for successful data mining to be carried out.
4. After analysis of data student be able to select appropriate feature set on which the algorithm efficiently work.
5. Be able to design and implement various machine learning algorithms in a range of real-world applications.
6. Have an understanding of the strengths and weaknesses of many popular machine learning approaches.

Unit-I: Introduction  (9 Hrs)
Machine Learning, Machine Learning Foundations, Overview, Applications, Types of Machine Learning, Basic Concepts in Machine Learning,
Examples of Machine Learning, Applications, Linear Models for Regression, Linear Basis Function Models, The Bias, Variance Decomposition, Bayesian Linear Regression - Bayesian Model Comparison.

Unit-II: Supervised Learning (9 Hrs)
Linear Models for Classification, Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models, Bayesian Logistic Regression, Decision Trees Classification Trees, Regression Trees, Pruning, Neural Networks, Feed-Forward Network, Functions, Error Back-Propagation, Regularization, Mixture Density and Bayesian Neural Networks.

Unit-III: Unsupervised Learning (9 Hrs)

Unit-IV: Probabilistic Graphical Models (9 Hrs)
Directed Graphical Models, Bayesian Networks, Exploiting Independence Properties, From Distributions to Graphs, Examples, Markov Random Fields, Inference in Graphical Models, Learning, Naïve Bayes Classifiers.

Unit-V: Probabilistic Graphical Models (9 Hrs)
Markov Models, Hidden Markov Models, Inference, Learning, Generalization, Undirected graphical models, Markov Random Fields, Conditional Independence Properties, Parameterization of MRFs, Examples, Learning, Conditional Random Fields (CRFs) - Structural SVMs.

Text Books:

Reference Books:

BCSL410 SOFT COMPUTING [3-0-0-3]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces the basics of Soft computing and its application areas particularly to Intelligent systems.
2. The course also aimed to skill the students Soft Computing and hybrid intelligent systems, Neurofuzzy systems and adaptive control systems.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify and describe soft computing techniques and their roles in building intelligent systems.
2. Provide mathematical background for carrying out systematic computations associated with soft computing approaches.
3. Apply fuzzy logic and reasoning concept to handle uncertainty and solve engineering problems.
4. To analyze the performance of genetic algorithm and other random search procedures useful while seeking global optimum in search space.
5. Ability to design the concept of neural networks to solve pattern classification, clustering and regression problems.
6. Estimate and evaluate the feasibility of applying a soft computing methodology to handle uncertainty & solve engineering problems.

Unit I: Comparison of Soft Computing Methods (6 Hrs)

Unit II: Neural Networks (8 Hrs)

Unit III: Fuzzy Theory (8 Hrs)

Unit IV: Neuro-Fuzzy Modelling (7 Hrs)

Unit V: Neuro-Fuzzy Controller in Engineering Applications (9 Hrs)
Fuzzy Logic in Control Engineering- Mamdani and Sugeno Architecture for Fuzzy Control, Analytical Issues in Fuzzy Logic Control, Fuzzy Logic in Intelligent Agents, Fuzzy Logic in Mobile Robot
Upon successful completion of the course, students will be able to
1. Recognize the existing applications to identify the various issues in wireless sensor networks.
2. Demonstrate the elements of distributed computing and network protocol design to show and summarize the principles in the context of wireless sensor networks.
3. Apply the knowledge of wireless sensor networks to solve the various localization problems.
4. Analyze and inspect the basic requirement to simplify the power management issues in wireless sensor networks.
5. Design and develop the various hardware concepts, software platforms that exist and modify for sensor networks in developing various security issues.
6. Evaluate and determine the various network level protocols for MAC, routing and distributed tracking.

Unit I: Introduction
(8 Hrs)
Introduction – motivation, applications, sensors, architectures, platforms for WSN, Actual Systems - Berkeley motes, TinyOS and nesC.

Unit II: Programming Wireless Sensor Network
(9 Hrs)
How to program actual WSN. Wireless Radio Realities – radio irregularities and impact on protocols, MAC protocols, B-MAC, multi-channel MAC, Routing.

Unit III: GPS
(8 Hrs)
Directed Diffusion, Clock Synchronization, Localization – TDOA, Walking GPS, range free solutions

Unit IV: Power Management
(8 Hrs)
Power Management – per node, system-wide, sentry services, sensing coverage, Data Services and Databases – architectures, queries (SQL),

Unit V: Security And Privacy
(8 Hrs)
Data dissemination, Programming Abstractions – programming models, EnviroTrack, new APIs Security and Privacy problems, attacks, solutions.

Unit VI: Case Study
(4 Hrs)
A Complete System – surveillance and tracking application.

Text Book:

Reference Book:

BCSI412 SOFTWARE ARCHITECTURE
(3-0-0-3)
Total Hrs: 45
Pre-requisite: Software Engineering & Project Management
Co-requisite: NA

Course Objectives:
1. This course introduces basics of software testing at the function, class and application level. His course is also aimed to develop concepts of black-box (functional and boundary) and white-box (coverage-based) testing, and apply these concepts to small programs and components (functions and classes).
2. This course introduces the software engineering discipline of software quality engineering and to The legal and societal issues of software quality.
3. This course also provides the carrier opportunities in the field of software testing.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Identify different software architectures and their relation with design patterns.
2. Describe major software architectural styles, design patterns, and framework alternatives for a problem and selection among them.
3. Illustrate Software Quality and Assurance practices and various software testing techniques through case studies.
4. Analyze software architecture using various documentation approaches and architectural description languages.
5. Report the architectural concerns for designing and evaluating a system's architecture.
6. Evaluate the current trends and technologies such as model-driven and service-oriented architectures.

Unit – I INTRODUCTION: (7 Hrs)
The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; what makes a “good” architecture? What software architecture is and what it is not; other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

Unit - II ARCHITECTURAL STYLES AND CASE STUDIES: (6 Hrs)
Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.

Unit – III QUALITY: (7 Hrs)
Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.

Unit – IV ARCHITECTURAL PATTERNS – I: (8 Hrs)

Unit-V DESIGNING AND DOCUMENTING SOFTWARE ARCHITECTURE: (7 Hrs)
Architecture in the life cycle; designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; choosing the relevant views; Documenting a view; Documentation across views.

Text Books:

Reference Book:
1. Design Patterns- Elements of Reusable Object-Oriented Software – E. Gamma, R. Helm, R. Johnson, J. Vlissides; Addison-Wesley, 1995.
2. Web site for Patterns: http://www.hillside.net/patterns/

BITL307 SCRIPTING LANGUAGES (3-0-0-3)
Total Hrs: 45

Pre-requisite: NA
Co-requisite: Advanced webtechnology

Course Objectives:
1. This course enables students to understand web page site planning, management and Maintenance.
2. The course explains the concept of developing advanced HTML pages With the help of frames, scripting languages, and evolving technology like DHTML.
3. The main objective behind introduction of this course is also to develop web sites which are Secure and dynamic in nature and writing scripts which get executed on server as well.

**Course Outcomes:**
Upon successful completion of the course, students will be able to
1. Design website using the concepts of HTML.
2. Apply the concept of markup languages for web development.
3. Design website using the concepts of WML.
4. Analyze ASP and its implementation
5. Design dynamic and interactive web pages by the JSP and its implementation
6. Apply advanced techniques of ASP and JSP in Web Designing

**Unit-I: HTML/ DHTML** (8 Hrs)
HTML & DHTML basics: Introduction, basic tags, tables, forms, frames.

**Unit-II: XML** (7 Hrs)
XML basics, understanding markup languages. Structures and syntax, valid. Well formed XML, DTD (document type Definition) classes. XSL: XML with style sheet basics.

**Unit-III: WML** (9 Hrs)
WML basics, Writing WML code, some examples, Graphics, Templates. Forms and User input: The Options Menu, Events, Variables, and Input Tags.

**Unit-IV: ASP** (9 Hrs)
ASP basics, ASP Overview, Variables, Forms & Query strings, Server Variables, Sessions, Conditions/Control Flow Constructing Code: Arrays, Looping For/Loop and While/Next, Functions and Sub Procedures, VB Built In Functions, VB Script, Coding Standards: Comments, Naming Conventions, Indenting, Modular, Debugging, Error Handling, Includes Organizing Code. Object Types, Automated Tasks Working with Databases: MS Access/Database Concepts, SQL, ADO, and Reading from a table.

**Unit-V: JSP** (9 Hrs)
JSP basics, Course Introduction, Creating a Common Navigation Bar: Plan a Common Navigation Bar, Create Common Elements, Dynamically Change the Display of Common Navigation Elements, Building a Login System: Plan the Login System’s Logic, Create a Registration Form, Java script, Validate Form Data, Store and Retrieve Session Data, Update a Database with User Data, Personalizing a Site: Plan a Personalization System, Store Data in a Cookie, Retrieve and Use Cookie Data Test for Live Session Data, Destroy a Session.

**Unit-VI: Recent Trends and Applications** (3Hrs)
Recent trends and applications of scripting languages.

**Text Books:**
1. XML in action web technology by William J. Pardi (P1-LI Pub.)
2. Complete reference for HTML & DHTML.

**Reference Books:**
1. WAP ‘A beginners Guide’-------- Dale Bulbrook
2. WAP Development with WML and WML Script------- Ben Forta And Keith
ELECTIVE-IV

BECL425 REAL TIME OPERATING SYSTEMS
[3-0-0-3]
Total Hrs: 45
Pre-requisite: Operating system
Co-requisite: NA

Course Objectives:
1. This course aims to explore the programming language and operating systems facilities essential to the implementation of real-time, reactive, and embedded systems.
2. This course also explores the limitations of industry-standard operating systems, and introduces new approaches to operating systems design that address the challenges of security, robustness, and concurrency.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Apply the knowledge Real Time Operating Systems and its applications in real scenarios.
2. Apply different used approaches for real time systems.
3. Gain knowledge Working and implementation of real time applications.
4. Design scheduling algorithms related to real time applications.
5. Apply concepts of real vs ideal clocks and their synchronization.
6. Identify and use recent trends in RTOS of development.

Unit I: Introduction (9 Hrs)

Unit II: Requirements and Design Specifications (8 Hrs)

Unit III: Declarative Specifications And Deterministic Scheduling (8 Hrs)

Unit IV: Execution Time Specification (8 Hrs)
Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimization, System Interference and Architectural Complexities Timer Application, Prosperities of Real and ideal clocks, Clock Servers – Lamport’s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization, Centralized Synchronization, Distributed Synchronization.

Unit V: Programming Languages (9 Hrs)

Unit VI: Trends And Applications (3 Hrs)
Recent trends in Real time operating System, Advanced topics & its Application

Text Book:

BECL409: DIGITAL IMAGE PROCESSING
[3-0-0-3]
Total Hours: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. The course introduces the fundamentals of digital image processing and algorithms that are used.
2. This course also explores complex methods for a wide range of tasks such as noise reduction, Restoration, compression, feature extraction and pattern recognition.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Identify the fundamentals of the human visual system and perception with knowledge of imaging systems and processing units.
2. Summarize understanding of spatial filtering techniques, including linear and nonlinear methods, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
3. Illustrate the use of 2D Fourier transform concepts, including the 2D DFT and FFT, and other transforms (DCT, Haar, WHT) and their use in frequency domain filtering.
4. To discuss degradation problem in digital image processing and to decide upon appropriate
methodologies in their solution and to understand the principles of image compression.

5. Justify morphological filtering techniques to clean up and cluster image for further analysis.

6. Estimate regions of interest from an image using various thresholding and apply these techniques to solve real-world image processing problems.

Unit I: Introduction (8 Hrs)
Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit II: Filtering (8 Hrs)
Basic intensity transformation and spatial filtering, Image negatives, log transforms, power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit III: Transformation (8 Hrs)
Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit IV: Image Degradation /Restoration Process (7 Hrs)
Model of image Degradation/Restorations process, Noise models, Restoration in the presence of noise only, periodic noise reduction by Frequency domain filtering, Image reconstruction from Projections, Image compression models, Huffman coding, LZW coding, Run length coding, Bit-plane coding.

Unit V: Image Morphology (7 Hrs)
Some basic morphological algorithms, Boundary extraction, convex hull, thinning, skeletons, morphological Reconstruction. Color image processing, color models, RGB color models, CMY and CMYK color models the HSI color models.

Unit VI: Image Segmentation (7 Hrs)
Image segmentation, Fundamentals, Point, Line and edge detection of segmentation, Thresholding, Region-based segmentation, watershed segmentation algorithm Applications of segmentation.

Text Book:

Reference Books:

Course Objectives:
1. This course introduces the basic concepts and general principles associated with web application development, illustrating specific technologies.
2. It is also aimed to provide an understanding of different concepts, architectures, techniques, and infrastructures for service oriented computing in web development.
3. This course provides career opportunities in the subject area of design of web development, web maintenance and deployment.

Course Outcomes:
Upon successful completion of the course, students will be able to:
2. Demonstrate use of Perl scripting language in web based application.
3. Apply PHP and DREAM WEAVER to develop web application.
4. Analyze dynamic and interactive application using J2ME.
5. Design a code for web application using scripting languages.
6. Choose advanced tools in the area of web application development.

Unit-I: Common Gateway Interface (10 Hrs)

Unit-II: Perl (10 Hrs)
Variables and Data Types, Expressions, Operators, and Control Structures, Functions, Arrays, Object-Oriented PHP, Strings and Regular Expressions, File I/O and the File System, Databases, PHP and Dynamic Site Development.

Unit-III: PHP (12 Hrs)

Unit-IV: Dream Weaver (12 Hrs)
Internet Access and HTML, Planning Web Sites, The Dream weaver Environment, Viewing and Managing HTML Code, Creating a Web Site,
Defining a Web Site, Creating a Basic Web Page and Page Properties, Building a Web Site, The Site Panel and Templates, Adding Content to Web Pages, List Formats and Graphic File Types, Inserting a Table and Adjusting Table Properties, Using Graphics in Table Cells and, Nested Tables, Using Table Layout View, Creating and Using a Repeating Region Template, Working with Links, Creating Internal and External Hyperlinks, Creating an Image Map and Anchors, Enhancing Navigation in a Site, Framesets Reusable Navigation Bars, Managing and Uploading a Web Site.

Unit-V : J2ME (12 Hrs)
J2ME specifics ME components: KVM, J2ME, CLDC, MIDP, Overview of profile system, Architecture, Differences between J2ME environments, Comparisons between J2ME and Personal Java. MIDP: Mobile information device profile, Creating MIDP applications, Midlet suites and deployment MIDP GUI: Graphical User Interfaces with MIDP Displays, Commands, Pointers, Screens Animations and drawing.

Unit VI: Recent Trends (4 Hrs)
Recent trends/ advance topic.

Text Books:
2. Beginning PHP 5 and MySQL. W.Jason Gilmore.

Reference Books:
2. CGI programming in C & Perl by Thomas Boutell Addison-Wesley Publication.

BITL410 SOFTWARE TESTING (3-0-0-3)
Total Hrs: 45
Pre-requisite: Software Engineering
Co-requisite: NA

Course Objectives:
1. This course introduces various non-functional requirements that lead to good Architecture and good Design.
2. It also skill the students to explore various design patterns and learn to implement them.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Define various testing techniques and testing performed at each phase of software life cycle.
2. Describe the principles of system and component testing considering quality assurance and quality control
3. Illustrate Software Quality Assurance practices and various software testing techniques through case studies.
4. Discuss test strategies for generating system test case
5. Justify how testing tools are used in various testing techniques.
6. Evaluate advanced computing techniques and tools in software testing

Unit I: Software Testing Principles (6 Hrs)
Need for testing, Psychology of testing, Testing economics, SDLC and Testing, Verification & Validation, QA and QC.

Unit II: Testing Strategies (7 Hrs)
White box testing techniques: Statement coverage, Branch Coverage, Condition coverage, Decision/Condition coverage, Multiple condition coverage, Dataflow coverage, Automated code coverage analysis, Inspections, Walkthroughs and Code Review. Black box testing techniques: Boundary value analysis, Robustness testing, Equivalence partitioning, Syntax testing, Finite state testing, Levels of testing, Unit, Integration and System Testing, Compatibility Testing, Domain Testing, Adhoc Testing, Use of Requirements Traceability Matrix.

Unit III: Types of Testing (10 Hrs)
Integration Testing: Top-down, Bottom up, Big bang, Sandwich, Scenario Testing, Defect Bash, System and Performance Testing: Types of system testing – Functional and non-functional testing, Acceptance Testing, Setting entry and exit criteria for phases and typical product release scenarios, Basic factors governing performance testing, methodology for performance testing, tools for performance testing, Localization testing: preliminary concepts, Adhoc testing, pair testing, extreme testing, agile testing, exploratory testing, defect seeding Usability Testing: Factors in usability testing, aesthetics testing, accessibility testing, tools for usability testing.

Unit IV: Test Management (10 Hrs)

Unit V: Product and Process Metrics (10 Hrs)
People and organizational issues: Common people issues and myths in testing, providing career paths in testing, Organizational structures for testing teams, geographically distributed testing teams and success factors. Test Metrics Product
Metrics, Process Metrics, Progress Metrics, and Use of metrics in ascertaining product release.

Unit VI: Recent Trends in Software Testing (2 Hrs)
Recent trends/ advance topic.

Text Books:

Reference Books:

BCSL310 MOBILE COMPUTING
(3-0-0-3) Total Hrs: 60
Pre-requisite: Computer Network
Co-requisite: Wireless communication

Course Objectives:
1. This course introduces students a general idea of wireless communication while making them aware of system architecture and protocols used for wireless communication.
2. It is also aimed at developing skills for wireless application protocol environment.
3. This course also provides career opportunities in this field.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Recognize basic and operational concept of wireless communication & Networks.
2. Classify components and protocols used for Medium Access Control in wireless communication.
3. Interpret & Illustrate security issues in mobile communication.
5. Design applications for mobile communication using application protocol environment.
6. Choose advanced computing technique and tools in mobile communication.

Unit-I: Introduction (14 Hrs)
Introduction to wireless communication, wireless transmission, frequencies for radio transmission, signal propagation, multiplexing, modulation, spread spectrum, introduction to cellular system. GSM: System architecture, protocols, localization and calling, handover. GPRS, CDMA Mobile IP.

Unit-II: Medium Access Control (10 Hrs)
Medium access control: Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, Wireless LAN, Bluetooth.

Unit-III: Mobile Transport Layer (12Hrs)
Dynamic host configuration protocol, Mobile transport layer: Traditional TCP, Indirect TCP, Snoopy TCP, mobile TCP, Transaction oriented TCP.

Unit-IV: Issues in Wireless Communication (08 Hrs)

Unit-V: Wireless Application Protocol (WAP)/WML/WML Script (12Hrs)

Unit-VI: Upcoming Technologies in Mobile Computing (4 Hrs)
Advanced topics & its Application in iphone and Android

Text Books:

Reference Books:
1. Wireless and Mobile Networks Architecture By Yi Bing Lin, , John Wiley
2. The Beginning WML and WML Script", Wrox Publication

BCSL418 Enterprise Storage Technologies
(3-0-0-3)
Total Hrs: 39
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces basic idea of data storage, storage networking, Business Continuity and Storage Security.
2. It also aims at developing skills to implement methods for solve specific problems using basic storage technologies.
3. The course also provides opportunities to design and implement techniques for storage management.

**Course Outcomes:**
Upon successful completion of the course, students will be able to:

1. Identify essential storage technology and understand when it is appropriate to use.
2. Explain use of basic storage fundamentals, Storage Networking and storage security.
3. Apply the concept of business continuity.
5. Design the hierarchical storage system with minimum complexity for real world problem.
6. Evaluate critical, independent and quantitative problems using various storage systems.

**UNIT I: Data Storage Fundamentals (7 Hrs)**

Enterprise data center environment: Data center components, Enterprise storage environment: Enterprise storage requirements Types of data storage devices: overview of magnetic disk drive, solid state drive, optical disc drive, and magnetic tape drive, Overview of storage system: storage drives and storage controller, Introduction to virtualization: Compute virtualization: drivers, overview, hypervisor, virtual machine, and benefits Network virtualization: drivers, overview, types (VLAN, VM network etc.), and benefits Storage virtualization: drivers, overview, and benefits.

**UNIT II: Storage Systems (7 Hrs)**

Storage System Components and Architecture: Generic components and architecture Front end: front-end ports, processors, and cache, Cache management techniques, Back end: back-end ports, processors, and storage media, RAID: RAID benefits, RAID levels: RAID 0, RAID 1, RAID 1+0, RAID 3, RAID 4, RAID 5, and RAID 6 RAID techniques: Stripping, Mirroring, and Parity, Block Storage, File Storage, Object Storage, Unified Storage, File Storage, Unified Storage.

**UNIT III: Storage Networking (7 Hrs)**

SAN Fundamentals on Data ONTAP, FC SAN, FC SAN components and architecture: FC protocol, FC addressing, FC SAN topologies, Zoning, IP SAN IP SAN benefits, Types of IP SAN: iSCSI SAN and FCIP SAN, iSCSI SAN components and architecture, iSCSI protocol, FCIP SAN components and architecture FCIP protocol.

**UNIT IV: Business Continuity (7 Hrs)**


**UNIT V: Storage Security and Storage Infrastructure Management (7 Hrs)**

Introduction to Storage Security: Overview of storage security, Importance of security, CIA and AAA, Types of threats and attacks, Storage Security Mechanisms, Application level: Identity and access management, malware protection software, mobile device management, Network level: firewall, DMZ, intrusion detection, VPN, VLAN, VSAN etc., Storage level: Encryption (data at rest and in flight), zoning, LUN masking etc.

**UNIT VI: Recent trends and technologies (4 Hrs)**

**ELECTIVE-V**

BITL309 CYBER LAWS (3-0-0-2)
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

**Course Objectives:**
Upon successful completion of the course, students will be able to:

1. This course introduces students a critical understanding of Cyber Law.
2. This course also aimed to develop skill for dealing with frauds, deceptions (confidence tricks, scams) and other cyber crimes such as child pornography, that are taking place via Internet.
3. This course also explores the legal and policy development in various countries to regulate Cyberspace.

**Course Outcomes:**
Upon successful completion of the course, students will be able to:

1. Developing legal issues in a digital networked environment including Cyber Crimes & Legal Framework.
2. Analyze various cybercrimes in specific areas of law arising in cyberspace containing intellectual property, regulation of content /censorship, privacy and E-commerce.
3. Evaluate how these developing concepts affect the flow of information in society and the work of information professionals.
4. Identify critical Cyber Law that in what way these emerging concepts disturb the flow of information in the culture and the work of IT professionals.
5. Identify and analyze the Cyber Law Issues in E-Business Management.
6. Develop and design different techniques for Forensic Examination of Computer-based electronic and digital evidence.

**Unit I:** (9 Hrs)


**Unit II: Law of Digital Contracts (8 Hrs)**


**Unit III: Intellectual Property Issues in Cyber Space (8 Hrs)**

Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World.

**Unit IV: International Scenario in Cyber Law (10 Hrs)**
Data Protection Laws in EU and USA, Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.

**Unit V: Cyber law Issues For Management (7 Hrs)**

**Unit VI: Recent Trends (3 Hrs)**
Recent trends and advance topics.

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**Text Book:**

**Reference Books:**
2. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi

**BCSL311 E-COMMERCE (3-0-0-2) Total Hrs: 45**
Pre-requisite: NA  
Co-requisite: NA

**Course Objectives:**
1. This course introduces student’s fundamental concepts of Ecommerce.
2. It is aimed at developing skills to consumer e applications and organizational applications of e-commerce.
3. This course provides carrier opportunities as web applications development and application engine design.

**Course Outcomes:**
Upon successful completion of the course, students will be able to
1. Identify Analyze the technique and issues related to application development in E-commerce
2. Analyze e-commerce global nature and issues associated with implementation of e-commerce in various business processes
3. Identify advantages and disadvantages of technology choices available for e-commerce implementation
4. Practice ethical, social and legal aspects in e-commerce
5. Implement E-Commerce in various business models
6. Identify and implement advanced technology tools in and recent trends in the area of e-commerce.

**Unit I:** (8 Hrs)

**Unit II:** (8 Hrs)

**Unit III:** (6 Hrs)
Business to consumer electronic commerce: consumer trade transactions, the elements of e-commerce – elements, e-visibility, the e-shop, online payment, delivering the goods, after sales service, internet e-com security, a website evolution mode. e-business: Internet book shops, grocery supplier, software supplies and support, electronic newspaper, internet banking, virtual auctions, on-line share-dealing, e-diversity.

**Unit IV:** (6 Hrs)

**Unit V:** (5 Hrs)

**Unit VI:** (2 Hrs)
Recent trends in electronics-commerce, Advanced topics & its Application.

**Text Books:**
1. e-Commerce by David Whiteley (McGrew Hill Pub.)
2. Electronics-Commerce by Gary P. Schneider & James T. Perry. (COURSE TECHNOLOGY Thomson Learning)

**Reference Book:**
BITL411 ENTERPRISE RESOURCE PLANNING (3-0-0-2)
Total Hrs: 45
Pre-requisite: Software Engineering & Project Management
Co-requisite: NA

Course Objective:
1. This course introduces student the general idea of enterprise resource planning making them aware of analyze the factors and forces which facilitate ERP systems.
2. It is also aimed at developing skills to implement ERP systems.
3. This course provides carrier opportunities in subject areas of design of ERP system used for decision making process.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Identify the business need on ERP architecture
2. Identify factors and forces which facilitate development of ERP systems.
3. Identify how organizational factors such as management’s role and organizational culture contribute to successful ERP
4. Identify ERP Implementations for Business Processes
5. Apply ERP In Various Industries
6. Apply the advanced technique and tools for ERP system implementation

Unit-I: Introduction (10 Hrs)
Introduction business needs and ERP, ERP as an overview, entries as an overview, benefits of ERP, ERP and related technologies, ERP architecture, business process reengineering, data warehousing, data mining, on line analytical processing supply choice management.

Unit-II: ERP Implementation (10 Hrs)
Client server architecture and ERP, ERP implementation life cycle, implementation methodologies of Implementation - the hidden cost, organizing implementing vendors, consultants and users, contracts with vendors, consultants and employees, project management and monitoring after ERP implementation.

Unit-III: The Business Module (9 Hrs)

Unit-IV: ERP Products (7 Hrs)
Selection of ERP, SWOT analysis of various ERP products supply chain enabled ERP.

Unit-V: Use Of ERP in Manufacturing/Nonmanufacturing Industry (6 Hrs)
ERP and Electronic Data Interchange (EDI) integration, ERP in manufacturing and non-manufacturing industries

Unit VI: Recent Trends in ERP (3 Hrs)
Recent trends/ advance topic.

Text Book:
1. ERP Demystified by Aleris Leon (TMH Pub.).

Reference Book:
1. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentageon Pren.)

BCSL 415 CLOUD COMPUTING (3-0-0-2)
Total Hrs: 45
Pre-requisite: Parallel & Distributed Computing
Co-requisite: NA

Course Objectives:
1. Understand the current technologies in Internet world
2. Explain Public and Private Cloud
3. Discuss Cloud and (new) Service Level Management
4. Discuss how to approach and evaluate a Cloud business case
5. Describe Cloud and Risk Management

Course Outcomes:
Upon successful completion of the course, students will be able to
1. State the basics of distributed computing and cloud computing
2. Summarize and compare the technical capabilities and business benefits of virtualization and cloud computing.
3. Illustrate & Discuss cloud computing concepts to analyze business issues and requirements for designing effective solutions.
4. Analyze the financial, technological, and organizational capacity for designing cloud environment.
5. Justify and write cloud computing security challenges and related risk management issues
6. Evaluate the recent tools used in cloud computing.

Unit- I: Introduction to Cloud Computing (8 Hrs)

Unit – II: Cloud Computing Architectural Framework (7 Hrs)
Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors, Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

Unit – III: Exploiting Cloud Services (8 Hrs)
Software as a Service (SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service (IaaS): Introduction to IaaS, Scalable server clusters, Machine Image,

Unit – IV: Cloud Application Development (7 Hrs)
Role of business analyst, Technical architecture considerations, Service creation environments to develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

Unit – V: Salesforce (8 Hrs)
Introduction to Salesforce and overview, Technologies behind Force.com platform, Salesforce CRM concepts, Fields, Objects, Records, Relationships, Formula and Validation, Page layouts, Workflow, Reports, Dashboards, Securing and sharing data.

Unit – VI: Visualforce (7 Hrs)
Visualforce overview, Standard controllers, Standard list controllers, custom controllers, overriding buttons, link and tabs. Creating and using custom components, Dynamic visualforce bindings, Dynamic visualforce components.

Text Books:
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

References Books:

BCSL 417 BIOINFORMATICS (3-0-0-2) Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
This course introduces general bioinformatics concepts

Text Books:
1. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith Addison Wesley Longman

1. Understand the theoretical basis behind bioinformatics
2. Students will be trained in the basic theory and application of programs used for database searching, protein and DNA sequence analysis

Course Outcomes:
Upon successful completion of the course students should be:
1. Identify types of modern molecular biology and model biological information.
2. Predict output of alignment method.
3. Identify various approaches and tools related to bioinformatics problem.
4. Apply advantages and disadvantages of different machine learning techniques in bioinformatics and how the relative merits of different approaches can be evaluated by correct benchmarking techniques.
5. Apply theoretical approaches to model and analyse complex biological systems.
6. Interpret relationships among living things and solve biological problems.

Unit-I: (9 Hrs)
Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy, conversion process in prokaryotes and eukaryotes. Over-view of protein structure Protein Information Resources Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

Unit-II: (9 Hrs)
Genome Information Resources DNA sequence databases, specialized genomic resources DNA Sequence analysis Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.

Unit-III: (9 Hrs)
Pair wise alignment techniques, Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, working with BLAST and FASTA.

Unit-IV: (9 Hrs)
Multiple sequence alignment - Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching Working with DNA microarray, Gene Clustering.

Unit-V: (9 Hrs)
Drug Discovery Technologies, Drug Designing Approaches, Important Parameter in Drug Discovery, And Case Study of Various Tools.

**Reference Books:**
2. Bioinformatice: David Mount
3. Introduction to Bioinformatics by M. Lesk OXFORD publishers (Indian Edition)
BCSL420: ENTREPRENEURSHIP  Total Hrs: 45

Course Objectives:
1. This course introduces the concept of Entrepreneurship, its characteristics
2. It also aims at developing skills to implement successful creative business ideas by providing the knowledge of the barriers in entrepreneurship, its values and attitudes.
3. The course also provides opportunities to learn the recent trends and basics of Woman and Rural Entrepreneurship
4. They learn the significance of the Entrepreneurship Development Programmes. And the competencies required to be a successful entrepreneur.

Unit -I: Entrepreneurship
Entrepreneurship- Definition, Characteristics of Entrepreneurship, Functions and Types of Entrepreneurship, Intrapreneurship, Activities of Intrapreneurship , Concept of Entrepreneurship, Growth in India

Unit -II: Entrepreneurship Values and Attitudes
Entrepreneurial Attitude, Role Demands and requirements of Entrepreneurship, Principles and Essentials of Entrepreneurship, Entrepreneurship as a Team work, Creativity Innovation and Idea Generation- Creativity, Innovation and Idea Generation, Components of Creative Performance, Creative Enterprises, The Business Idea, Project Identification Dynamics

Unit -III: Entrepreneurial Motivation
Entrepreneurial Motivation, Factors for Entrepreneurial Motivation, Internal and External Factors, Types of Entrepreneurs Barriers to Entrepreneurship- Environmental Barriers, Economic Barriers, Non-Economic Barriers, Personal Barriers to Entrepreneurship, Government Actions, Entrepreneurial Barriers for Specific groups.

Unit -IV: Women Entrepreneurs
Profile of Women Entrepreneurs, Three Categories of Women Entrepreneurs, Problem of Woman Entrepreneurs Developing Entrepreneurs, Financial Assistance

Unit –V: Rural Entrepreneurs
Meaning of Rural Entrepreneurship, Need for Rural Entrepreneurship, Rural Industrialization in Retrospect, Problems in Rural Entrepreneurship, NGOs and Rural Entrepreneurship

Unit -VI: Entrepreneurial Competencies and Entrepreneurship Development Programmes (EDPs)
Meaning of Entrepreneurial Competency or trait, Major Entrepreneurial Competencies Developing Competencies, Entrepreneurship Development Programmes, Need for EDPs, Objectives of EDPs, Phases of EDPs and Evaluation of EDPs

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Have the ability to discern distinct entrepreneurial traits
2. Know the parameters to assess opportunities and constraints for new business ideas
3. Understand the systematic process to select and screen a business ideas
4. Design strategies for successful implementation of ideas

TEXT BOOKS:
1. Entrepreneurship Development by S.L.Gupta and Arun Mittal, Publisher: International Book House
2. Entrepreneurial Development, S.S.Khanka, Publication: S.Chand

REFERENCES
1. Entrepreneurial Development, By Abhishek Nirjar, Publication: Word-press
2. Entrepreneurial Development, By Sangeeta Sharma, Publication: PHI Learning Pvt. Ltd.
3. Entrepreneurial Development, By R. Singh, Publication: S K KATARIA & SONS-NEW DELHI
BCSL421: BLOCKCHAIN TECHNOLOGY

Total Hrs: 30

Course Objectives:
1. This course aims to provide conceptual understanding of the function of Blockchains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
2. This course covers the technological underpinnings of blockchain operations as distributed data structures and decision making systems, their functionality and different architecture types.
3. This course provides a critical evaluation of existing “smart contract” capabilities and platforms, and examines their future directions, opportunities, risks and challenges.

Course Outcomes:
1. Understand the structure of a blockchain and why/when it is better than a simple distributed database;
2. Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities;
3. Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations,
4. Understand what constitutes a “smart” contract, what are its legal implications and what it can and cannot do, now and in the near future,
5. Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT),
6. Attain awareness of the new challenges that exist in monetizing businesses around blockchains and smart contracts

Contents:

Unit -I: (5hrs)
Introduction to Blockchain ,Why Blockchain is crucial?, Key vocabulary while discussing Blockchain ,Distinction between databases and blockchain,Explaining distributed ledger,Blockchain ecosystem,Blockchain structure,Working of Blockchain technology,Permissioned and permission-less Blockchain.

Unit –II: (5hrs)
Bitcoin and its history,Why use Bitcoins?,Where and how to buy Bitcoins,How to store Bitcoins?,How and where to spend Bitcoins?,Selling Bitcoins,Bitcoin transactions,How Bitcoin transactions work,What happens in case of invalid transactions,Parameters that invalidate the transactions Scripting language in Bitcoin,Applications of Bitcoin script,Nodes and network of Bitcoin Various roles play in Bitcoin ecosystem

Unit -III: (5hrs)

Unit -IV: (5hrs)
Private and public Blockchain,Various Blockchain setup platforms,Using Ethereum to setup private Blockchain,Steps to build a Blockchain solution,Smart Contracts on Ethereum,Compile, deploy and instantiate contracts,Configuring, running and working with the go-Ethereum client,Account management and mining,Understand the different stages of a contract deployment,How to interact with a contract once deployed

Unit –V: (5hrs)
Introduction to Hyperledger,Hyperledger Architecture,Consensus,Consensus & its interaction with architectural layers, Application programming interface, Application model, Network topology Exploring Hyperledger frameworks

Unit -VI: (5hrs)
Introduction to MultiChain,Privacy & permissions in MultiChain,Mining in MultiChain,Multiple configurable Blockchains using MultiChain,Setting up a private Blockchain,Creating a Blockchain Connecting to a Blockchain,Some commands in interactive mode,Using native assets,Transaction metadata,Streams,Round robin mining

TEXT BOOKS:
1. Blockchain by Melanie Swan

Reference Books:
2. The Book of Satoshi by Phil Champagne
3. Blockchain Revolution by Don and Alex Tapscott
BCSL419: DIGITAL MARKETING

Course Objectives:
1. This course introduces a digital marketing concepts and objects.
2. Identify core concepts of marketing and the role of marketing in business and society.
3. Understand and use of 8 key digital marketing tools

Unit -I: Digital Marketing

Unit –Search Marketing
Basics of Search Marketing: Organic and Paid search results, Overview of Google adwords, Keywords research and Analysis, Tracking the success of SEM, Search Engineering Optimization Techniques, On-page and Off-page Optimization.

Unit -III: Social Media Marketing

Unit -IV: Email Marketing
The basics of Email Marketing, Concept of A/B Testing and its use in Email Marketing

Unit -V Display and Mobile marketing
Different Kinds of Display marketing, The display Marketing Ecosystem, Retargeting and Dynamic Retargeting, Different kinds of Mobile Marketing, The Mobile Marketing Ecosystem.

Unit -VI: Web Analytics
Digital Measurement Landscape, Introduction to Google Analytics, Interpreting the data in Google Analytics.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Knowledge of social, legal, ethical and technological forces on marketing decision-making.
2. Ability to formulate marketing strategies that incorporate psychological and sociological factors which influence consumers.
3. Ability to collect, process, and analyze consumer data to make informed marketing decisions
4. Ability to analyze marketing problems and provide solutions based on a critical examination of marketing information.
5. Ability to apply knowledge and skills to real-world experiences in an internship.

TEXT BOOKS:

REFERENCES
2. Digital Marketing, Prof.Saurabhi Singh
### DEPARTMENT OF INFORMATION TECHNOLOGY

#### SEM-III

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#### Semester IV

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Heads TOTAL : 18 3 8 29 23 100 100 300 75 -- 575

Total Hours: 575

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278
## SEMESTER-V

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### ELECTIVE - I

- BCSL410 - SOFT COMPUTING
- BITL307 - SCRIPTING LANGUAGES
- BITL 308 - MANAGEMENT INFORMATION SYSTEMS
- BITL309 - CYBER LAWS
- BCSL312 - COMPUTER GRAPHICS AND VISUALISATION

## SEMESTER-VI

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- 2
- 6
- 30
- 23
- 120
- 120
- 360
- 100
- 50

**Total:** 650

**Notes:**

- All courses follow a similar teaching scheme with Theory, Practical, and Total marks.
- The Evaluation Scheme includes TAE, CAE, ESE, and Internal. External marks are also provided.

---

**Total:** 750

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ELECTIVE – II
BECL409 - DIGITAL IMAGE PROCESSING
BITL403 - MULTIMEDIA SYSTEMS
BCSL414 - DATA MINING AND WAREHOUSING
BCSL403 - AI AND EXPERT SYSTEM
BCSL311 - E-COMMERCE

*OPEN ELECTIVES

SEMESTER-VII

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ELECTIVE – III
BCSL405 - NATURAL LANGUAGE PROCESSING
BITL407 - ADVANCED WEB TECHNOLOGIES
BITL408 - DISTRIBUTED DATA BASES AND OBJECT ORIENTED DATA BASES
BECL413 - WIRELESS COMMUNICATION
BMEL509 - INDUSTRIAL ROBOTICS

ELECTIVE- IV
BECL423 - PATTERN RECOGNITION
BITL409 - BIO-INFORMATICS
BITL410 - SOFTWARE TESTING
BITL411 - ENTERPRISE RESOURCE PLANNING
BCSL411 - ADVANCED OPERATING SYSTEM DESIGN.

SEMESTER-VIII

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280
THIRD SEMESTER

BCSL201: DATA STRUCTURES USING C
[3-1-2-6]
Total Hrs: 45
Pre-requisite: Basic of Computing
Co-requisite: NA
Course Objectives:
1. This course introduces basic idea of data structure while making aware of methods and structure used to organize large amount of data.
2. It also aimed at developing skills to implement methods to solve specific problems using basic data structures.
3. The course also provides career opportunities in design of data, implementation of data, technique to sort and searching the data.

Course Outcomes:
Upon successful completion of the course, students
1. CO1: Acquire and apply basic concepts of data type and array data structure.
2. CO2: Implement linked list data structure to find solution for given engineering applications.
3. CO3: Implement data structure such as stacks and queues to solve various computing problems using C-programming language.
4. CO4: Design tree data structure to solve various computing problems.
5. CO5: Design graph data structure to solve various computing problems.
6. CO6: Design and analyze standard algorithms for searching and sorting.

Course Syllabus
UNIT I: Arrays, Records And Pointers (7 Hrs)
Introduction, Linear Arrays, Arrays as ADT, Representation of Linear in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices

UNIT II: Linked List (9 Hrs)
Introduction, Linked Lists, Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems

UNIT III: Stacks, Queue and Recursion (9 Hrs)
Introduction, Stacks, Array Representation of Stacks, Linked Representation of Stacks Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues

UNIT IV: Trees (10 Hrs)

UNIT V: Graphs and their Applications (6 Hrs)
Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall’s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, Traversing a Graph, Posets; Topological Sorting; Spanning Trees

UNIT VI: Sorting and Searching (4 Hrs)
Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort Radix Sort, Searching and Data Modification, Hashing, Advanced topic on Data Structure

Text Books:
1. Data Structures with C, Seymour Lipschutz, Schaums Outlines, Tata Mc Graw Hill

Reference Books:
1. S. Sahani, Data Structures in C, PHI Publications
2. D. Samantha, Classic Data Structure, PHI Publications

BCSP201: DATA STRUCTURES USING C
Evaluation Scheme: Practical [2P]
Total Hrs: 30

List of Practical:
1. Write and execute a program in C to implement binary search algorithm
2. Write and execute a program in C to implement stack using arrays
3. Write and execute a program in C to implement queue using arrays
4. Write and execute a program in C to implement simple linked list
5. Write and execute a program in C to implement stack using linked list
6. Write and execute a program in C to implement queue using linked list
7. Write and execute a program in C to implement doubly linked list
8. Write and execute a program in C to implement circular linked list
9. Write and execute a program in C to implement binary tree, finding the depth of a tree
10. Write and execute a program in C to implement inorder, preorder and postorder traversals
11. Write and execute a program in C to implement depth first search algorithm
12. Write and execute a program in C to implement following sorting techniques using menu driven approach.
13. Open Ended Practical
   Design an employ database for a company by using link list
   Design a simple game using data structure.

BCSL202 COMPUTER ARCHITECTURE & ORGANIZATION
(4-0-0-4)
Total Hrs: 45

Pre-requisite: Basics of Electronics
Co-requisite: NA

Course Objectives:
1. This course introduces basic fundamental Units of a computer system and its operation and flow of information between these Units.
2. It is aimed at developing skills to implement control Unit performing operations such as Addition, Subtraction, Multiplication and Division.
3. The course provides career opportunities in the subject areas of designing an advanced computer system.

Course Outcomes:
1. CO1. Understand the impact of instruction set architecture on cost-performance of computer design.
2. CO2: Understand the organisation of a computer system in terms of its main components.
3. CO3: Carry out basic arithmetic on numbers of differing base.
5. CO5. Designing ways for communication with I/O devices and interfaces.
6. CO6. Apply the concept of RISC philosophy for performance improvement of computer design.

Unit I: BASIC STRUCTURE OF COMPUTERS
(7 Hrs)
Functional units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding opcodes method.

Unit II: BASIC PROCESSING UNIT: (8 Hrs)
Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Microprogrammed Control, microinstruction format, Bit slice concept.

Unit III: ARITHMETIC UNIT: (7 Hrs)
Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth’s Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: THE MEMORY SYSTEM:(8 Hrs)
Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: INPUT/OUTPUT ORGANIZATION:(7 Hrs)
I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC Philosophy: (8 Hrs)

Text Books:

References Books:

BAML206: Mathematical Application in Computational Engineering
Evaluation Scheme: Theory [4-1-0-5] Total Hrs: 45
Pre-requisite: Applied Mathematics –I, II
Co-requisite: NA

Course Objectives
1. This course introduces a general mathematical concepts and objects.
2. It skill the students to understand important mathematical models used in information technology branch.
3. This course also aim to formulate and solve the problems in daily applications of computer science.

Course Outcomes
Upon successful completion of the course, students will be able to:
CO1: Understand and use Laplace transform to solve engineering problems
CO2: Understand and use Z-transform to solve engineering problems.
CO3: Obtain Fourier series expansion of periodic functions and calculate Fourier Transforms for the variety of simple functions.
CO4: Understand and solve Partial differential equations in engineering.
CO5: Understand the concepts of Random variables
CO6: Understand and use special probability distributions.

Course Syllabus

Unit -I: Laplace Transforms [12Hrs]

Unit -II: Z-Transforms: [09Hrs]
The Z transform- definition & properties, inverse & relation with Laplace Transform. Application to z-transform to solve difference equations with constant coefficients.

Unit -III: Fourier Series: [10Hrs]
Periodic function & their Fourier expansion, even & odd function, change of interval, half range expansion.

Fourier Transforms: Fourier Integral theorem, Fourier transforms and their simple properties

Unit -IV: Partial Differential Equations and its application: [09Hrs]
Partial differential equations of first order & first degree (i.e. Lagrange’s form), linear homogeneous partial differential equation of nth order with constant coefficients, method of separation of variable. Simple applications.

Unit -V: Random Variables [10Hrs]
Random Variables, Distribution functions of continuous & discrete random variables, Joint distributions, mathematical expectations, moment, Moment generating function & characteristic function.

Unit -VI: Special probability distribution [10Hrs]
Geometric, Binomial, Poisson’s, normal, Exponential, Uniform, Weibul probability distribution. Random processes resemble average & temporal average, Auto correlation & cross correlation, stationary random process, power spectrum stationary processes & ergodic Random process.

Text Books:

References
1. Mathematics for Engineer, Chandrika Prasad
2. Advanced Mathematics for Engineer, Chandrika Prasad
7. Applied Mathematics Volume 1: J. N. Wartikar & P. N. Wartikar

BITL201: INTRODUCTION TO INTERNET PROGRAMMING [3-0-2-5]
Total Hrs: 45
Pre-requisite: Basic of Computing
Co-requisite: Object Oriented Programming through C++

Course Objectives
1. This course introduces student’s basic programming concepts of Java.
2. It is aimed at developing skills to built real life applications.
3. This course provides carrier opportunities in software development.
4. To know about more languages like Perl and J2ee.

Course Outcomes
Upon successful completion of the course, students will be able to:
1. CO1:Apply the basic OSI and TCP/IP model on web.
2. CO2:Design Web pages using different scripting languaues.
3. CO3: Apply the importance of CSS &javascript in web designing
4. CO4: Designing dynamic websites using recent tools used in industries
5. CO5:Implement server side programming using PERL
6. CO6: Apply new trends in web hosting

Unit I: Basic Network (8Hrs)

Unit II: Scripting Languages (8Hrs)
Content Using Block And Inline Tags, Assign Default Css Styles, Hyperlinks And Images.

Unit III: Javascripting (8Hrs)
Javascript In Web Pages, Writing Javascript Into Html, Programming Techniques, Operation And Expression In Javascript And Programming Constructs.

Unit IV: Dynamic Html (7Hrs)

Unit V: Perl Language (7Hrs)

Unit VI: Introducing J2ee (7Hrs)
J2ee Advantages, Enterprise Architecture Types, J2ee Components, Containers, Types Of J2ee Technology

Text books

Reference Books :
3. ”Cyber Laws in India., ITA-2000 and Beyond” by Navvi
4. “Handbook Of Cyber Laws” By Sharma Vakul

BITP201: INTRODUCTION TO INTERNET PROGRAMMING
Evaluation Scheme: Practical [2P]
Total Hrs: 30
List of Practical:
1. Design a simple page and put two text inputs and a Submit button into it. Ask for the user’s name , address, city, state, zip. Arrange things neatly in a borderless table so everything lines up and looks nice and neat.
2. Find an image. Write a description of that image. Building a table from scratch put that image next to its description like put in a table. Then, find a second image, write a description for it and expand your table to fit this second image & description
3. Design a simple page showing name of a shop, and having list of different items along with description button and the description button should provide link of different pages to show description of different items
4. Design a page with a heading. Make the heading large, bold and italic and center it across the top of the page. Write a short paragraph or two telling a little about GHRCE. In your description, highlight something in italics. Using an unordered bulleted list, list the various departments in GHRCE
5. Create a simple page introducing your technical area of interest. Then include a bullet list of What you do in that area and put list of 5 recent developments in that area.
6. Design a page to demonstrate the cascading style sheet in HTML.(Inline, Embedded & External)
7. Design a web page to show Javascript animation.
8. Design a page to demonstrate marquee hyperlinks in HTML
9. Design a web page that will show flash contents.
10. Create a blog of your own information.
11. Open ended: Web hosting

BITL202: OBJECT ORIENTED PROGRAMMING THROUGH C++
Evaluation Scheme: Theory [3-1-2-6]
Total Hrs: 45
Pre-requisite: Basic of Computing
Co-requisite: Data Structure Using C

Course Objectives
1. This course introduces student’s general idea and concepts of object oriented programming.
2. It is also aimed at developing skills to implement these concepts.
3. The course provide carrier opportunities in design of some applications as object oriented concepts plays dominant role in software development.

Course Outcomes
Upon successful completion of the course, students will be able to:
CO1: Articulate the principles of object oriented programming using C++
CO2: Apply function overloading, constructor overloading, operator overloading & its uses in programming
CO3: Implement inheritance and polymorphis concepts and its use for application development
CO4: Implement static and dynamic memory allocation for software development
CO5: Develop generic programming applications using templates
CO6: Apply advanced technique in application development for real life problems

Course Syllabus
Unit-I: Principles Of Object Oriented Programming: (08 Hrs)
Differences between C and C++. A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS: The origins of C++, What is Object Oriented Programming?, Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading:

Unit-II: Overloading (10 Hrs)
constructor functions, Localizing variables, Function overloading & Ambiguity. Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading [ ], overloading ( ), Applying operator overloading.

Unit-III: Inheritance, Virtual Functions and polymorphism (06 Hrs)
Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.

Unit-IV: Static & Dynamic allocation (08 Hrs)
Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the asm keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, typename and export.

Unit-V Templates: (05 Hrs)
Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Unit-VI: Exceptions Handling (08 Hrs)
Exception Handling, fundamentals, options the uncaught exception ( ). Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++, Advanced topics & its Application

Text books:

Reference Books:
1. Let’s C++ by Y. Kanetkar, BPB publications
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH

BITP202: OBJECT ORIENTED PROGRAMMING THROUGH C++
Evaluation Scheme: Practical [Total Hrs: 30]
List of Practicals:-
1. Write a program to compute the area of triangle and circle by overloading the area() function. CO1
2. Define a class to represent a bank account. Include the following members:
3. Data members:- Name of depositor, Account number, Type of account, Balance amount in the account
4. Member functions:- To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display name & balance
5. Write a main program to test program using class and object. CO1, CO2
6. Create two classes DM and DB which stores values of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out addition operation.
7. Create a class MAT of size m * n. Define all possible matrix operations for MAT type objects. CO1, CO2
8. Create Stud class to display student information using constructor and destructor. (Default constructor, Multiple constructor, Copy constructor, Overloaded constructor) CO1, CO2
9. Consider class network of given figure. The class master derives information from both account and admin classes which in turn derive information from the class person. Define all the four classes and write a program to create, update and display the information contained in master objects. CO1, CO2
10. A book shop sells both books and video tapes. Create a class media that stores the title and price of the publication. Create two derived classes, one for storing number of pages in the book and another for storing playing time of tape. A function display() must be defined in all classes to display class contents. Write a program using polymorphism and virtual function. CO1, CO2
11. Write a program to show use of this pointer, new and delete. CO2, CO3
12. Write a function template for finding the minimum value contained in an array. CO3
13. Write a program containing a possible exception. Use a try block to throw it and catch block to handle it properly. CO3
14. Write a program that illustrates the application of multiple catch statements.
15. Write a class template to represent a generic vector. Include member functions to perform the following tasks:
   - To create a vector
   - To modify the value of a given element
   - To multiply by a scalar value.
16. To display vector.
17. Open Ended Practical: Write a C++ program to design a simple calculator.

BITP203: SOFTWARE LAB

Evaluation Scheme: Practical [4P]
Total Hrs: 60

List of Practical:
1. Introduction to shell programming.
2. Implement a program in C to demonstrate variable declaration and displaying the same using shell scripting.
3. Write shell script to demonstrate passing command line arguments.
4. If a five digit number is input through the keyboard, write a program to calculate the sum of its digits using shell script.
5. Write a shell script to reverse a number supplied by a user.
6. Write a shell script which receives two filenames as arguments. It should check whether the two file's contents are same or not. If they are same then second file should be deleted.
7. A shell script can receive an argument 'one', 'two' or 'three'. If the argument supplied is 'one' display it in bold, if it is 'two' display it in reverse video and if it is 'three' make it blink on the screen. If a wrong argument is supplied report it. Use an else if statement.
8. Write a script to find the value of one number raised to the power of another.
9. Write a shell script to sort the given numbers in descending order using Bubble sort.
10. Write a shell script to ask your name, program name and enrollment number and print it on the screen.
11. Write a shell program to search for a given number from the list of numbers provided using binary search method.
12. Write a shell script which whenever gets executed displays the message "Good Morning/Good afternoon / Good Evening" depending on the time at which the script is executed.
13. Write a shell script that take UID as an argument and prints out person name, home directory, shell and other groups that person may belong to.
14. A file called word file consists of several words. Write a shell script which will receive a list of filenames, the first of which should be word file. The shell script should report all occurrence of each word in word file in the rest of the files supplied as arguments.
15. To perform Open End practical
   1. Write a shell script which works similar to the UNIX commands Head Tail.
   2. Write executing a shell script either the LOGNAME or the UID is supplied at the command prompt. Write a shell script to find out how many terminals has this user logged in.

MBL102: GENERAL PROFICIENCY-II : GERMAN/ FRENCH / SPANISH LANGUAGES

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning Goals</th>
<th>Activities</th>
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</thead>
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<tr>
<td>The Alphabets and accents Pronunciations and charts</td>
<td>Worksheet</td>
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<td>Number 1 to 20</td>
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<tr>
<td>Greetings Salutations &amp; Articles , Personal Pronoun</td>
<td>Day timing, Daily routines forms of respects Vocabulary</td>
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<tr>
<td>Family relations and Shapes and colors, Possessive Pronouns, Gender Sentence</td>
<td>Relations, Day of week</td>
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<tr>
<td>Weather and Seasons</td>
<td>Climate, Fabrics &amp; Clothes, sizes, Interrogatives Basic verbs</td>
<td>Group Activities, Paragraph writing including Names of months Seasons Sky Stars</td>
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<tr>
<td>House &amp; Household things</td>
<td>Describing neighborhood, Present Tense</td>
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<tr>
<td>Visit to supermarket</td>
<td>Learning the shopping etiquettes, vocabulary of food vegetables items, conversing with shopkeepers etc., Plurals</td>
<td>Project on vocabulary of vegetables items, food products, Group Activity, Role play</td>
</tr>
<tr>
<td>Timing and Telephonic Conversions</td>
<td>How to Ask time, Timing and clock ( Hours &amp; Minutes )</td>
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<tr>
<td>Visit to city Prominent places and park</td>
<td>Nature, Directions, Self Introductions, Means of transportations, Tenses contd....</td>
<td>Self Introductions, Means of transportations, Tenses contd....</td>
</tr>
<tr>
<td>In Restaurant / Hotel</td>
<td>Ordering eatables, Table manners, Enhancing vocabulary of food Dishes, cutlery</td>
<td>Enhancing vocabulary of food Dishes, cutlery</td>
</tr>
</tbody>
</table>
Visit to Doctor | Health matters, illness. Commonly used verbs contd.
---|---
French / German / Spanish culture | Vocabulary of clothes, accessories, cuisines, beverages, adjectives
French / German / Spanish culture – monuments, delicacies, wines, visa vis Indian culture | Presentations by students, situation based
Diwali festival | Conversations
Receiving Guests / Entertaining people / Good Bye’s | Activities, Role play, Assignments
Customs, Traditions, Manners, welcome & Audieu’s

**Course Outcomes:**
Upon successful completion of the course, students will be able to:
1. Read, write and understand the literature in the foreign language studied by them.
2. Interact with foreigner in his language.
3. Gain confidence in visiting other countries.
FOURTH SEMESTER

BECL303: MICROPROCESSOR BASED SYSTEMS
Evaluation Scheme: Theory [3-1-2-6]
Total Hrs: 45
Pre-requisite: Basic Electronics
Co-requisite: NA
Course Objectives:
1. This course introduces a general idea and basic digital circuits used for designing a microprocessor.
2. It is aimed at developing skills to develop assembly language programming.
3. They learn making interfacing with peripheral devices.
4. The course provides career opportunities in the subject areas of design and programming of microprocessors.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. CO1-Demonstrate an understanding of the microprocessor architecture, its instructions and addressing modes
2. CO2-Analyze a microprocessor program and develop an assembly language programs for applications
3. CO3-Understand the implementation of floating point operations using co-processors.
4. CO4-Identify, and explain the operations of peripherals typically used interfacing microprocessors such as A/D, D/A converter.
5. CO5-Develop and interface complete microprocessor based systems to peripheral devices.
6. CO6- Apply advanced techniques and tools for microprocessor based system development for real world applications

Unit 1: Introduction to 8086 Microprocessor (07 Hrs)
Building Concepts of Microprocessor, Introduction to 16, 32, 64 bit Microprocessor, Comparison of 8086 / 8088 CPU Architecture, Microprocessor Evolution - INTEL 8086 to Pentium with focus on Clock Speed, Concurrent operation of EU and BIU, Memory Organization & Interfacing.

Unit 2: 8086 Programming (07 Hrs)

Unit 3: Co-processor interfacing (07 Hrs)
8086 / 88 Maximum Mode, Architecture and Programming of 8087 and its Interfacing with 8086/8088.

Unit 4: 8255 Interfacing (07 Hrs)
Interfacing and programming of Peripheral 8255, Interfacing of ADC, DAC & applications. Interfacing and programming of Peripheral 8253.

Unit 5: Special Peripheral Interfacing (07 Hrs)

Architecture, Interfacing and programming of Peripherals, 8251 & DMA Controllers 8237.

Unit 6: Advanced Microprocessor study (08 Hrs)
80386 Architecture, Real and Protected Mode, Register Model, Memory Management Unit, Latest trends in microprocessors systems.

Text Books:
1. Advanced Microprocessor s & Peripherals by A.K. Ray & K.M. Bhurchandi, TMH
2. Programming & Interfacing of 8086 / 8088, D.V. Hall, TMH

Reference Books:
1. Intel Reference Manuals, Microprocessor & Microcontrollers: Intel
3. Microprocessors 8086 / 88 Family Prog. Interfacing: Liu, Gibson

BECP303: MICROPROCESSOR BASED SYSTEM
Evaluation Scheme: Practical [2P]
Total Hrs: 30
List:
1. Write an ALP like addition of two 16 bit, 32 bit numbers and series addition. CO1,CO2
2. Write an ALP to compare a string by using string related instructions of 8086. CO1,CO2
3. Write an assembly language program for 8086 to generate Fibonacci series and store it from memory location 0050H. CO2
4. Write an ALP to find the Even or Odd Number in Memory Array. CO1,CO2
5. Write an ALP to arrange a string in Ascending/Descending order. CO1,CO2
6. Write 8086 ALP for the following operations on the string entered by the user. a) Calculate Length of the string b) Reverse the string c) Check whether the string is palindrome CO3
7. Interface 8251 with 8086 microprocessor CO3
8. Open Ended Project cum Practical CO4

BCSL301: THEORY OF COMPUTATION
Evaluation Scheme: Theory [3-1-0-4]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: Graph Theory & Combinatory
Course Objectives:
1. This course introduces to students general idea of finite state and automata theory.
2. Making students aware of regular languages, context free languages. And its usefulness in finite state machines.
3. It is aimed at developing skills to provide solutions to variety of real life applications which involve finite automata.
Course Outcomes:
Upon successful completion of the course, students will be able to:

1. CO1: Solve the basics of finite state and automata theory
2. CO2: Implementing and Develop an appropriate technique for finite state problems design and Regular Expression
3. CO3: Analyze the techniques used to solve various types of Grammar
4. CO4: Solve the problems for Push down Automata.
5. CO5: Design the Turing machine and using it for recognizing valid strings
6. CO6: Identify the advanced machines designed for Finite state theory

Course Syllabus
Unit I:
Mathematical preliminaries – Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods-pigeon-hole principle and simple applications – concept of language – grammars and production rules –Chomsky hierarchy.

Unit II:
Finite automata & regular expressions-Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures – regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

Unit III:
Regular grammar & context free grammar- Pumping lemma for regular sets-closure properties of regular sets decision properties for regular sets, equivalence between regular language and regular grammar. Context – free languages – parse trees and ambiguity , reduction of CFGS, Chomsky and Griebach normal forms

Unit IV:
Push – down Automata (PDA) – non Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs- closure and decision properties of CFLs

Unit V:
Turing machines – variants – recursively enumerable (r.e.) set – recursive sets TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and unsolvability of ambiguity problem of CFGs, Church’s hypothesis, introduction to recursive function theory – primitive recursive and partial recursive functions.

Unit VI:
Recent trends in Theory of computation, Advanced topics & its Application

Text Books
1. Introduction Of Automata Theory, Languages and computation- J.E. Hopcroft, J.D.Ulman, Pearson education.

Reference Books
1. Introduction Of Automata Theory, Languages and computation, John Martin
3. Theory Of Computer Science – Mishra and Chandrashekhara, PHI

BAML208: GRAPH THEORY & COMBINATORICS
Evaluation Scheme: Theory [4-0-0-4]

Total Hrs: 45

Course Objectives
1. This course introduces size and kind of objects.
2. It also skills to analyze objects meeting the criteria, finding "largest", "smallest", or "optimal" objects.
3. It also introduces combinatorial structures and apply algebraic techniques to combinatorial problems.

Course Outcomes
Upon successful completion of the course, students will be able to:

1. CO1: Know grouping of objects and operation, Relation, ordering of objects.
2. CO2: Know Application of Set theory
3. CO3: Know Groups and Rings, their types and Applications of it
4. CO4: Know Data structure used to represent different kinds of objects viz Graph, Trees
5. CO5: Know the basics of combinatorial structure and develop algebraic technique to solve combinatorial problems
6. CO6: Know programming application of group, ring and number theory.

Course Syllabus
Unit I:
Set theory, Representation of sets on computer in terms of ‘0’ & 1’s. Partition & covering of a set, Product set, Relations, Graph of relation, Matrix of relation, Transitive closure & Compatible relation. Functions, Partial ordering & poset, Hasse diagram of Poset, Totally ordered set, Peano axioms & Mathematical Induction.

Unit II:
Semigroup, monoid, and examples. Homomorphism, Isomorphism of semigroup. Groups, properties of groups. Permutations groups, Subgroups, Cosets, Lagranges theorem, properties of cyclic groups, generator of group, kernel of Homomorphism, quotient group, fundamental theorems & Homomorphism of groups, Residue classes & Fermats theorem.

Unit III:
Rings, types of rings, Fields, subring, Integral domain. Simple properties of rings. Lattice as Poset & as algebraic system, Types of lattices, Hasse diagrams, Sublattice, direct product of

Unit IV (8 Hrs)
Graphs and its types, subgraph, Quotient graph, Euler path, Complete path, reach-ability, cycle, matrix representation of graph. Transitive closure of graph, Adjacency matrix, Trees, Venn diagram, Representation of trees, binary trees, spanning trees, Prims algorithm.

Unit V (7 Hrs)
Definition of generating functions and examples, proof of simple combinatorial identities, Probab. G.F. Recursive relations: definitions & examples, explicitly formula for sequence, back tracking to find explicit formula of sequence, solving recurrence relations. Counting Theorem and appl., Equivalent sets, cardinal numbers, denumerable sets. Multiplication principle of counting. Permutation & Combination with examples. The pigeon hole principle & extended pigeon hole principle and application of pigeon hole principle in solving simple problems.

Unit VI (8 Hrs)
Examples of continued fractions. Study of continued fractions. alpha has Infinite continued fraction if alpha is irrational. Alpha has periodic continued fractions if alpha is quadratic irrational. Appl. to approximation of irrationals by rationals, Hurwitz's theorem.

Text books
1. Discrete Mathematical structure with application to computer science by Trembley & Manohar (Mc. Graw Hill)
2. Discrete Mathematical Structure by Kolmann, Busby & Ross (PHI)

Reference Books

BCSL404: DESIGN AND ANALYSIS OF ALGORITHMS
[4-0-2-6] Total Hrs: 45
Pre-requisite: Applied Mathematics-III
Co-requisite: NA
Course Objectives:
1. This course introduces students the general idea of analysis and design of algorithms while making them aware of basic methods of algorithm analysis and design.
2. It is also aimed at developing skills to solve real life applications which involve algorithm development.

3. The course also provide career opportunities in analysis, design and optimization technique in algorithms.

Course Outcomes:
Upon successful completion of the course, students will be able to:

CO1: Apply the basics of recurrence relation in analysis of algorithm
CO2: Compute the complexities of algorithms using asymptotic notations
CO3: Apply advanced data structure and using divide and conquer method to implement various kinds of searching and sorting techniques, and know when to choose which technique
CO4: Identify & implement various greedy method and dynamic programming concepts to solve shortest path problems.
CO5: Design and implement various applications using graph and backtracking methods
CO6: Apply advanced techniques and tools for algorithm analysis and development of different day to day real world applications.

Course Syllabus
Unit – I: Mathematical foundations (7 Hrs)
 summation of arithmetic and geometric series, n, n2, bounding summations using integration, recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions, Complexity calculation of various standard functions, principles of designing algorithms

Unit – II: Asymptotic notations (8 Hrs)
Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, application of amortized analysis, Sorting networks, comparison networks, logistic sorting network.

Unit – III: Advanced data structures (6 Hrs)
Advanced data structures like Fibonacci heap, Binomial heap, disjoint set representation, and red black trees and their applications.
Divide and conquer basic strategy, matrix operation, binary search, quick sort, merge sort, fast fourier transform.

Unit – IV: Greedy Method & Dynamic Programming (10 Hrs)
Greedy method – basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc. Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem, Maximum flow networks.

Unit V: Traversal And Search Techniques (7 Hrs)
Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-
Queen’s problem, graph colouring, Hamiltonian cycles etc

**Unit VI: Completeness Problems And Applications (7 Hrs)**

NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, decision and optimization problems, Computational Geometry, Approximation algorithm algorithm and concepts based on approximation algorithms. Recent trends in Design and analysis of algorithms, Advanced topics & its Application.

**Text Books:**

**Reference Books:-**

**BCSP404: DESIGN AND ANALYSIS OF ALGORITHMS**

**Evaluation Scheme: Practical [2P]**
**Total Hrs: 30**

**List of Practical:-**

1. Write a program to implement master’s method. CO1
2. Write a program to implement divide and conquer method
   a. Binary search
   b. Merge sort
   c. Selection sort
   d. Quick sort
   e. Strassen’s algorithm CO1, CO2
3. Write a program to implement greedy method
   a. Huffman code
   b. Knapsack
   c. Kruskal’s
   d. Prim’s CO2
4. Write a program to implement dynamic programming
   a. Longest common subsequence
   b. Multistage graph
   c. Matrix chain multiplication CO3
5. Write a program to implement shortest path algorithm
   a. Floyd-Warshall
   b. Bellman-Ford
   c. Dijkstra’s CO3
6. Write a program to implement graph traversal and search technique
   a. Breadth-first search
   b. Depth-first search
   c. Ford-Fulkerson method CO2, CO3
7. Write a program to implement backtracking method
   a. Graph coloring
   b. Hamiltonian cycle
   c. 8-queen’s problem CO3, CO4
8. Open ended practical- Design and implement distance vector routing protocol using greedy approach
9. Design and implement distance vector routing protocol using dynamic approach

**BECL210: ANALOG AND DIGITAL COMMUNICATIONT [4-0-2-6]**
**Total Hrs: 45**

**Pre-requisite: Basic Electronics**
**Co-requisite: NA**

**Course Objectives**

1. To link the fundamental concepts and theory of electronic communication practice.
2. To apply methods of mathematical analysis for signal processing and modulation processes.
3. To become well versed in analog and digital modulation methods.

**Course Outcomes**

Upon successful completion of the course, students will be able to:

1. CO1-Apply the basic concepts of communications system
2. CO2-Express the basic concepts of analog modulation and demodulation schemes
3. CO3-Analyzes Frequency modulation and demodulation schemes
4. CO4- Identify different techniques for pulse modulation
5. CO5- Analyse source coding technics for communication
6. CO6- Understand block and convolution codes for data transmission

**Course Syllabus**

**Unit I: Introduction To Communication (07Hrs)**
Block Schematic of Communication System, Base Band Signals and their bandwidth requirements, RF Bands, Types of Communication Channels [Transmission Lines, Parallel wires, Co-axial Cables, Waveguides and Optical Fiber]. Concept of Radiation and Electromagnetic waves, Mechanism of Propagations : Ground Wave, Sky Wave, Space Wave, Duct, Tropospheric Scatter and Extraterrestrial Propagation. Concept of Fading and diversity reception, Noise Figure Calculations.

**Unit II: Amplitude Modulation And Detection (07 Hrs)**
AM Modulators series plate modulated class C amplifiers, efficiency & power calculations, SSB modulation SSB-SC modulation AM demodulators, square law detector, diode peak detector, envelope detector, detectors for SSB and SSB-SC AM signals, AM using transistors, Block Diagram of AM Receiver, AM Detection : Envelope detection, Synchronous detection, Practical diode detection, AGC, SSB and DSB detection methods.
Unit III: Frequency Modulation And Radio Receivers (08Hrs)

Unit 4: Introduction To Pulse Modulation And Waveform Coding (08 Hrs)
Pulse modulation: Pulse amplitude modulation [PAM], pulse width modulation [PWM], Pulse position modulation [PPM], Pulse code modulation [PCM]: PCM systems, Delta modulation, ADPCM, matched filter receiver, Coherent Binary: PSK, FSK, QPSK, MSK, DPSK.

Unit 5: Source Coding And Transmission Methods (06 Hrs)
Data formats - Unipolar and Polar NRZ, RZ, Bipolar [AMI], Manchester, Synchronization - Bit and Frame, Scrambling- Unscrambling, Information theory, Huffman and L – Z encoding algorithm, channel coding Theorem, convolution, encoding and decoding, distance properties, Viterbi algorithm and Fano algorithm. Trellis coded modulation methods.

Unit 6: Block and convolution channel codes (7Hrs)
Linear block codes, generator matrix and parity check matrix, some specific linear block codes, cyclic codes, transfer function of a convolution code, optimum decoding of convolution code- Viterbi algorithm distance properties of binary convolution codes.

Text Books:
1. Communication Electronics: - Kennedy, TMH

Reference Book:
1. Digital Communication: John G. Prokis [TMG]
2. Digital Communication: Simon Haykin [WEP]
3. Communication Electronics: - Forest Barker, IBT
4. Radio Communication: - Miller
5. Principle of communication Systems: Taup & Smilliery TMH
6. Communication Electronics: Roddy & Coolen PHI
7. Modern communication systems [Principles and application]: Leon W. Couch II [PHI]
8. Digital communication: Shanmugh.

BECP210: ANALOG AND DIGITAL COMMUNICATION
Evaluation Scheme: Practical [2P]
Total Hrs: 30
Practical List:
1. Generation of Amplitude Modulation using transistor BC 548 and Calculate modulation index. and also Perform MATLAB simulation.
2. Generate Amplitude Demodulation using Envelope Detector and observe the result on Spectrum Analyzer. and also perform MATLAB simulation
3. Generation of Frequency Modulation and demodulation using MATLAB.
4. Generation of Pre-emphasis circuit on boardbreadboard system & to plot pre-emphasis curve..
5. Generation of De-emphasis circuit on boardboard system & to plot de-emphasis curve..
6. Generation of frequency shift keying and observation of mark and space frequency using MATLAB.
7. Generation of Pulse Width Modulation(PWM) signal using IC 555 on boardboard.
10. Verify pulse Code Modulation (PCM) using simulation in MATLAB
11. Perform Simulation of all types of pulse modulation on Microcap.

MBL103: GENERAL PROFICIENCY-III : HOBBY CLASSES
Course Objective:
1. To identify one’s special capabilities in activities like sports, drama, singing etc.
2. Through this activities the students will grow in a broader sense.
3. Options like Pranayam, Trekking, Guitar, synthesizer dancing, English drama, sketching, kathak, photography, professional ethics, horse riding, volleyball, etc are offered.

Course Outcome:
Upon successful completion of the course, students will be able to:
1. Sharpen their extracurricular skills for overall development.
2. Gain Confidence in Society.
FIFTH SEMESTER

BITL302 COMPUTER NETWORKS (3-0-0-3) (Elective-III) Total Hrs: 45
Pre-requisite: --

Course Objectives:
1. To understand the computer network architectures.
2. To make aware of design and performance perspective of network architectures.
3. To discuss current trends in communication

Course Outcome:
Student shall be able to
1. CO1: Analyze the need for OSI reference model in computer networking
2. CO2: Studying the various transmission medium used in physical layer
3. CO3: Analyzing different Elementary protocols for communication and identify IEEE standards employed in computer networking
4. CO4: solve and apply various Routing Algorithm and Protocols
5. CO5: Use techniques involved in developing transport and application layer of computer networking.
6. CO6: Identifying latest technology used for transmission in computer networking.

Unit-I: Introduction (9 Hrs)
The use of computer networks. Network hardware. LAN's, Man's, WAN's, internet works. Network software, protocol hierarchies, design issues for layers, interfaces and services. Connectionless oriented and connectionless services, service primitives, relationship of Services to protocols, the OSI reference model, TCP/IP reference model, comparison of OSI And TCP/IP reference model.

Unit-II: Physical Layer (8 Hrs)
The theoretical basis for data communication-Fourier analysis, bandwidth-limited signals, Maximum data rate of a channel, transmission media-magnetic media, and twisted pair coaxial Cable, fiber optics. Wireless transmission, microwave transmission. Multiplexing, switching, Narrow and ISDN - services, architecture, interface, perspective on N-ISDN, broadband ISDN & ATM-virtual circuits versus circuit switching, transmission in ATM networks, ATM Switches.

Unit-III: Data Link Layer (8 Hrs)
Design issues - services provided to the network Layer, framing, error control, flow control, Error correcting & detecting codes, elementary data link protocols, simplex stop and wait Simplex protocols for noisy channel, sliding window protocols-one bit protocol, go back Protocol, selective repeat protocol. The medium access sub layer - static and dynamic channel Allocation in LANs and MANs, Multiple access protocols - ALOHA, CSMA, collision free. Protocols, limited contention protocols, IEEE 802.11 wireless LAN protocols, IEEE Standards 802 for LAN and MANs-802.3 & Ethernet, token bus. Token ring.

Unit-IV: The Network Layer (9 Hrs)
Design issues, services provided to the transport layer, internal organization, comparison of Virtual circuit and datagram subnets, routing algorithms. Optimality principle, shortest path Routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical Routing, broadcast & multicast routing, congestion control algorithms, general principles Prevention policies, traffic shaping, flow specifications, congestion control in virtual circuit Subnets. choke packets, load shedding, jitter control. IP protocol, IP address. Subnets, internet Control protocols, OSPF, BGP.

Unit V: Transport and Application Layer (8 Hrs)
Transport and Application Layer - services provided to the upper layer. Quality of Service, Transport service primitives, elements of transport protocols, addressing, establishing a Connection, releasing a connection, flow control & buffering, multiplexing, crash recovery

Unit VI: Trends And Applications (3 Hrs)
Bluetooth protocol stack, Bluetooth connections, piconets and scatternets, WiFi and WiMAX Standard

Recent trends and advanced topics.

Text Books:

Reference Books:

BITL301 JAVA PROGRAMMING [3-0-2-5]
Total Hours: 45
Pre-requisite: Object Oriented programming Through C++
Co-requisite: NA
Course Objectives
1. This course introduces student’s basic programming concepts of Java.

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2. It is aimed at developing skills to build real life applications.
3. This course provides carrier opportunities in network programming and socket programming.

**Course Outcomes**

Upon successful completion of the course, students will be able to:

1. CO1: Use basic concepts of JAVA.
2. CO2: Identify basics of package, interface, exception handling and its use in application development.
3. CO3: Use the concepts of multi-threading and its use in application development.
4. CO4: Solve the concepts of applet, I/O and string handling and its use in networking.
5. CO5: Apply use of networking and generics in application development.
6. CO6: Apply advanced techniques in JAVA and its use in application development.

**Course Syllabus**

**Unit I : Introduction to JAVA, Class and Object (3 hours)**
Introduction to data types, operators and control statements, Classes: fundamentals of classes, declaring objects, assigning objects, reference variables, methods, constructor, variable handling and garbage collection. Methods and classes: Overloading methods, using objects as parameters, arguments passing, returning objects, recursion, access control, understanding static, introducing final, nested inner classes, storage classes, command line arguments.

**Unit II: JAVA Packages, Interface and Exception Handling (6 hours)**
Packages and interface: Packages, access protection, importing packages, interfaces. Exception handling: Fundamentals exception types, uncaught exception, try-catch, displaying description of an exception, multiple catch clauses, nested try statements, throw, throws, finally built in exceptions, creating own exception subclasses.

**Unit III: Multithreaded Programming (9 hours)**
JAVA thread model, thread priorities, synchronization, messaging, the thread class, runnable interface, creating thread, creating multiple threads. using isAlive( ), join( ), thread priority, synchronization, interthread communication, suspending, resuming, stopping threads using multithreading.

**Unit IV: I/O, Applet and String Handling (12 hours)**
I/O stream, bytes stream, character stream, predefined streams, reading console input reading character, reading string, writing console output, the PrintWriter class, reading and writing files, applets fundamentals, transient and volatile modifiers, using instance of strictfp, native method. String Handling: string constructor, special string operator, character extraction, string comparison, searching string, modifying a string, data conversion using valueOf( ), changing case of characters within a string, string buffer.

**Unit V: Networking and Generics (12 hours)**
Networking: networking basics & socket overview, client/server, reserved socket, proxy server, internet addressing, networking classes and interfaces, factory methods and instance method TCP/IP client socket, URL, URL connections, TCP/IP server socket, datagram. Generics: General form of generic class and examples, creating generic method, generic interfaces, class hierarchies, erasure, generic restrictions.

**Unit VI: Recent Trends (3 hours)**
Recent trends and advance topics.

**Text Books:**
1. The Complete Reference by Herbert Schild, TMH Publication

**Reference Books:**
- Java 2 Black Book by Steve Holzner, Paraglyph Press, 2nd Ed.

**BITP301 JAVA PROGRAMMING**

**Total Hours: 20**

**Evaluation Scheme : Practical**

1. Design a java class to perform following operations
   (i) To print Fibonacci Series using recursion in java
   (ii) To check prime number
   (iii) To take input as number from command line and to reverse that number.
   (iv) To check Palindrome number
   (v) To calculate Factorial of entered number
   (vi) To check Armstrong number
   (vii) To sort an array elements using bubble sort algorithm
   (viii) Binary to decimal conversion
   (ix) To generate random number
   (x) Binary to decimal number conversion

2. a) Write a program to implement the concept of package and multilevel inheritance.
b) Define a method factorial to find factorial of given number and throws a user defined exception if a given no. is negative.  CO1
3 Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both by using runnable interface as well as thread class. CO2
4 a) Design Simple Calculator in Java Using Remote Method Invocation
b) Write a program for priorities based Multithreaded File Reading. CO3
5a) Write a Java program to read a file that contains DNA sequences of arbitrary length one per line (note that each DNA sequence is just a String). Your program should sort the sequences in descending order with respect to the number of ‘TATA’ subsequences present. Finally write the sequences in sorted order into another file.
b) Write a program to implement String and StringBuffer class. CO3
6 a) Write a program to implement TCP/IP client socket and TCP/IP server socket.
b) Develop an intranet based chatting and file shearing application in Java for employees in particular company CO2
7 Design a simple form having fields as: Name, Password, Email, Zip Code, Birth Year, Phone number. Your job is to validate that the user has entered his or her information on the basis of following criteria.
• Make a helper method called isAllAlpha(String str). This method should return true if every character in str is a letter, upper or lower case.
• Make a helper method called isNumeric(String str). This method should return true if every character in str is a number. In addition, can contain, at most, 1 '.'
  • Make sure that the name is at least 2 letters and includes no numbers
  • Make sure that the password is at least 4 characters, contains at least 1 number, 1 lower case letter and 1 upper case letter. Also, don’t let the user’s password be the same as his or her name
  • the email must include an @ as well as a "." and the "." must come after the "@"
  • the zip code must be all numbers and be the right length (zip codes have between 3 and 5 digits)
  • make sure that the person was born at reasonable date (not 1820 or this year!)
  • ensure that the phone number is valid (no letters and follows the prescribed format) CO2, CO3
8 Develop a applet based bank customer management system application in Java CO1, CO2, CO2
9 Develop a company employ management system java application to manage employ data for company by performing INSERT, SELECT, UPDATE, DELETE operations on employ database. CO1, CO2, CO3
10 Open Ended: Develop college student management MVC pattern based JSP-Servlet application for college to manage students record. CO1, CO2, CO3

BCSL303 DATABASE MANAGEMENT SYSTEMS [3-0-2-5]
Total Hours: 45 hours
Pre-requisite: Data Stucture Using C
Co-requisite: NA
Course Objectives:
1. This course introduces general idea of database management system.
2. It is aimed at developing skills to design databases using data modeling and design techniques.
3. It is also aimed to developing skills to implement real life applications which involve database handling.
4. This course also provide carrier opportunities in subject areas of designing, storage techniques and data handling and managing techniques.

**Course Outcomes:**

Upon successful completion of the course, students will be able to

1. CO1: Able to know the basic of database system and construct SQL queries.
2. CO2: Identify data models and design techniques involved in the database design process.
3. CO3: Acquire knowledge about basic concepts of physical data storage and recovery of data in DBMS.
4. CO4: Know and identify various query optimization techniques in database.
5. CO5: Develop skills to manage transaction processing in database system.
6. CO6: Acquire knowledge of recent trends in DBMS and its in real time application.

**Course Syllabus**

**Unit-I:** Database system concepts and Architecture (8 Hrs)

- Concept of relational database, Relational data model, Relational algebra, SQL-the relational database standard, introduction to PL/SQL.

**Unit-II:** Database Design Theory (8 Hrs)

- Functional dependencies and normalization, relational database design algorithms, practical database design and demoralization, Relational constants, programmatic ways for implementing constraints, triggers.

**Unit-III:** Physical Database Design and Memory Management in database (9 Hrs)

- Concept of physical and logical hierarchy, storage, concepts of index, B trees, hash index, function index, bitmap index, database buffer management, log buffer management code reuse, concept of two tier and N-tier architecture. Database recovery technique. Aries Algorithm for recovery.

**Unit -IV:** Query Optimization and Performance Tuning (8 Hrs)

- Various techniques for query optimization, strong and weak equivalence, cost base optimization. Use of different storage structures in query optimization.

**Unit -V:** Transaction Management (10 Hrs)

- Transaction processing -Transaction and system concepts, Desirable properties of transaction, Schedules and recoverability, serializability of schedules, concurrency control, lockbased protocols and time stamp based protocols, read consistency.

**Unit -VI:** Trends in Database Management, (2Hrs)

- What is NoSql, History of NoSQL, Important characteristics of NoSQL categories of NoSQL. Google Database, Twitter and Social networking databases.

**Text Books**

1. Database System Concepts by Henry Korth and Others

**Reference Books**

4. Database Systems by Connolly, 3rd edition, Pearson Education

**BCSP303 DATABASE MANAGEMENT SYSTEMS**

**Total Hours: 20 hours**

**Evaluation Scheme : Practical**

**List of Practical:-**

1. To Study Architecture of DBMS. CO1
2. To Execute the DDL commands in SQL. CO1 & CO2
3. To Execute the DML commands in SQL. CO1 & CO2
4. To Execute Primary Key and foreign key concept in SQL.CO1
5. To Execute Retrieving data using SELECT clause in SQL.CO2
6. To Execute GROUP BY & HAVING Clause in SQL.CO2
7. To Execute queries based on Cartesian product.CO1 & CO2
8. To Execute various Join types & Join conditions.CO1 & CO2
9. To Execute the queries based on Aggregate function.CO1 & CO2
10. To Execute queries based on SINGLE ROW functions. CO2
11. To Execute queries based on Set operators.CO2
12. To Execute PL/SQL block. CO3 & CO4
13. To Execute triggers in database.CO2
14. To Execute cursors in database. CO3
15. Open Ended: Execute commit & rollback statements in SQL. CO2 & CO3

*Open ended design of Practical

**BCSL302 SYSTEM PROGRAMMING** [2-1-0-3]

**Total Hours: 45 hours**

**Evaluation Scheme: Theory**

**Pre-requisite: NA**

**Co-requisite: Operating System**

**Course Objectives:**

1. This course introduces students general idea of system programming while making aware of managing linking and loading of programs in memory.
2. It is aimed at developing skills to provide solutions to applications which involve system managing.
3. The course provides career opportunities in design of linker, loader, Assembler and .object file format.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. CO1: Apply and analyse the Basic concepts of system programming
2. CO2: Design and analyse macroprocessor.
3. CO3: Examine Linker, Loader for system design
4. CO4: Implement the concept of common object file format and system utilities
5. CO5: Acquire and apply the basic concepts of device drivers
6. CO6: Aware with recent concepts of virtual machines.

Course Syllabus

**Unit I: Assembler**
(6 Hrs)
Concept of assembler, design of single pass and two pass assembler.

**Unit II: Macroprocessor**
(8 Hrs)
Macroprocessor- Concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.

**Unit III: Linker and Loader**
(7 Hrs)
Linker and Loader- Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.

**Unit IV: Common Object file format & System Utilities**
(8 Hrs)
Common Object file format & System Utilities- Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures. Source code control system, make, link editor, symbolic debugger.

**Unit V: Unix Device Drivers**
(7 Hrs)
Unix Device Drivers- Definition, Anatomy and Types, Device programming, Installation, Incorporation of driver routines, Basic device driver operation, Implementation with Line Printer & Disk, Comparative study between device drivers for UNIX & Windows.

**Unit VI: Linux System programming**
(8 Hrs)
Basics, Concepts, Writing, implementation of virtual machines
Recent trends in System Programming & its Applications

**Text Books:-**
System Programming- Lila & Beg. Unix Device Drivers- George Pajari, Pearson Education.

**Reference Books:-**
System Programming and Operating systems- D. M. Dhamdhere
Unix system Utilities manual.
Unix programming Environment- Keringham and Pike, Pearson Education.

**BCSL304 OPERATING SYSTEMS**

**Total Hours: 45**

**Evaluation Scheme:** Theory
**Pre-requisite:** Computer Architecture & Organization
**Co-requisite:** NA

Course Objectives:

1. This course introduces general idea, structure and functions of operating system
2. Making students aware of basic mechanisms used handle processes, manages memory, manages storage devices and files.
3. The course provide career opportunities in subject areas of designing operating systems

**Course Outcomes**

Upon successful completion of the course, students will be able to:

1. CO1: Know basics structure and functions of operating system
2. CO2: Identify mechanism to handle files and develop an appropriate algorithm for it.
3. CO3: Implement and analyze process scheduling algorithms.
4. CO4: Acquire knowledge of operating systems role in memory and I/O devices management
5. CO5: Identify mechanism to handle processes management and synchronization
6. CO6: Aware of advanced operating systems developed and its features

**Course Syllabus**

**Unit I: Introduction**
(06 Hrs)
Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

**Unit II: File Systems**
(8 Hrs)

**Unit III: Process And Its Scheduling**
(7 Hrs)
Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

**Unit IV: Memory Management**
(8 Hrs)

**Unit V: Process management and synchronization:**
(7 Hrs)
Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems

**Unit VI**: Deadlocks detection & avoidance:
(8 Hrs)
Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation. Recent trends in Operating System, Introduction to Advanced OS & its Application

Text Books:

Reference Books:

MBL104: General Proficiency-IV (Advanced Communication Skill)

Course Objectives:
1. To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking.
2. To enhance one to one interaction and social ethics.

BCSL410 SOFT COMPUTING [3-0-0-3]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces the basics of Soft computing and its application areas particularly to intelligent systems.
2. The course also aimed to skill the students Soft Computing and hybrid intelligent systems, Neurofuzzy systems and adaptive control systems.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. CO1: Identify and describe soft computing techniques and their roles in building intelligent systems.
2. CO2: Provide mathematical background for carrying out systematic computations associated with soft computing approaches.
3. CO3: Apply fuzzy logic and reasoning concept to handle uncertainty and solve engineering problems.
4. CO4: To analyze the performance of genetic algorithm and other random search procedures useful while seeking global optimum in search space.
5. CO5: Ability to design the concept of neural networks to solve pattern classification, clustering and regression problems.
6. CO6: Estimate and evaluate the feasibility of applying a soft computing methodology to handle uncertainty & solve engineering problems.

Unit I: Comparison of Soft Computing Methods (6 Hrs)

Unit II: Neural Networks (8 Hrs)

Unit III: Fuzzy Set Theory (8 Hrs)

Unit IV: Neuro-Fuzzy Modelling (7 Hrs)

Unit V: Neuro-Fuzzy Controller in Engineering Applications (9 Hrs)

Unit VI: Genetic Algorithm (7 Hrs)

Text Books:
1. ‘Fuzzy Sets & Fuzzy Logic: Theory & Applications’ George Klir, Yuan, Prentice-hall Of India Pvt Ltd

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3. ‘Neural Networks’ James A Freeman & David M Skapura, Pearson Education, 2002
5. ‘Fuzzy Logic, Intelligence, control, and Information’, John Yen & Reza Langarl Pearson Education, Delhi, 2003

Reference Books:
3. ‘Introduction to Neural Networks’ Jack N. Zurada, Jaico Publishers

BITL307  SCRIPTING LANGUAGES  ELECTIVE - I  
[4-0-0-4]
Total Hours: 45 hours

Pre-requisite: Introduction to internet programming
Co-requisite: NA

Course Objectives
1. This course enables students to understand web page site planning, management and Maintenance.
2. The course explains the concept of developing advanced HTML pages with the help of frames, scripting languages, and evolving technology like DHTML.
3. The main objective behind introduction of this course is also to develop web sites which are secure and dynamic in nature and writing scripts which get executed on server as well.

Course Outcomes
Upon successful completion of the course, students will be able to :
1. CO1: Use the basic principles of procedural computer programming forms and frames
2. CO2:Apply understanding of programming language in order to embed scripts within HTML
3. CO3:Design documents to manipulate frames, browsers, windows and images and to generate pages dynamically
4. CO3: Apply scripting tools to contribute the development scripting languages.
5. CO5: Apply Techniques of scripting languages in website development.
6. CO6: Apply advanced trends in scripting languages.

Course Syllabus
Unit -I: HTML/ DHTML (Hrs:8)
HTML & DHTML basics: Introduction, basic tags, tables, forms, frames.

Unit -II: XML (Hrs 7)
XML basics, understanding markup languages. Structures and syntax, valid. Well formed XML, DTD (document type Definition) classes. XSL: XML with style sheet basics.

Unit -III: WML (Hrs 9)
WML basics, Writing WML code, some examples, Graphics, Templates. Forms and User input: The Options Menu, Events, Variables, and Input Tags.

Unit -IV :ASP (Hrs 9)
ASP basics, ASP Overview, Variables, Forms & Query strings, Server Variables, Sessions, Conditions/Control Flow Constructing Code: Arrays, Looping For/Loop and While/Next, Functions and Sub Procedures, VB Built In Functions, VB Script, Coding Standards: Comments, Naming Conventions, Indenting, Modular, Debugging, Error Handling, Includes Organizing Code. Object Types, Automated Tasks Working with Databases: MS Access/Database Concepts, SQL, ADO, and Reading from a table.

Unit -V:JSP (Hrs 9)
JSP basics, Course Introduction, Creating a Common Navigation Bar : Plan a Common Navigation Bar, Create Common Elements, Dynamically Change the Display of Common Navigation Elements, Building a Login System: Plan the Login System’s Logic, Create a Registration Form, Java script, Validate Form Data, Store and Retrieve Session Data, Update a Database with User Data, Personalizing a Site: Plan a Personalization System, Store Data in a Cookie, Retrieve and Use Cookie Data Test for Live Session Data, Destroy a Session.

Unit-VI: Recent Trends And Applications(Hrs 3)
Recent trends and applications of scripting languages.

Text Books:
1. XML in action web technology by William J. Pardi (P1-LI Pub.)
2. Complete reference for HTML & DHTML.

Reference Books :
3. WAP ‘A beginners Guide’-------- Dale Bulbrook
4. WAP Development with WML and WML Script----- Ben Forta And Keith

BITL308  MANAGEMENT INFORMATION SYSTEM  ELECTIVE – I  
[4-0-0-4]
Total Hours: 45 hours

Pre-requisite: NA
Co-requisite: NA

Course Objectives
1. To study Meaning, nature and scope of MIS,
2. Planning with MIS, meaning, nature & feature of organization, nature of conceptual design of an MIS,
3. Organization for implementation of MIS.

Course Outcome
Upon successful completion of the course, students will be able to :

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1. CO1: Understand how to manage large amount of information in organization
2. CO2: Designing of strategic planning of information
3. CO3: Understand to apply information system for design making
4. CO4: Conceptually design and implement databases for organization
5. CO5: Understand planning, testing, organizing and implementation for organization
6. CO6: Identify latest technology and recent trends in MIS

Course Syllabus

Unit I: (Hrs: 8)
Meaning, nature and scope of MIS, decision support, systems approach, the system view of business, MIS organization with in industrial and business unit, managers views of information system, development of management organizational theory, management and organization, behavior, information, data.

Unit II: (Hrs: 7)
Planning with MIS, need for planning, characteristic of plan, strategy & development of plan, role of MIS in strategy development & strategy planning decision, from strategic plans to short range plans.

Unit III: (Hrs: 9)
Meaning, nature & feature of organization, organization and information system structure, management & decision making and MIS, MIS as a technique for mailing programmed decision & non-programmed decision assisting information system.

Unit IV: (Hrs: 9)
Nature of conceptual design of an MIS. Preparing member of the organization for change, studying, managerial and functional process systems, determining information needs, determining information sources, outlining general information flow and database system, hardware and software configuration, documenting the conceptual design.

Unit V: (Hrs: 8)
Organization for implementation, planning the implementation, organization training and development, acquisition, conversion, testing, operation, evaluation and maintenance.

Unit-VI: Recent Trends and Applications (Hrs 3)
Recent trends and advance topics.

Text Books:
2. Management Information Systems by S. Sadagopan (PHI Pub.)

Reference Books:
1. Management Information Systems by James A. Obrien (Galgotia Pub.)
2. Management Information Systems the Managers View by Robert Schultueis and Mary Sumnanov.

BITL309 CYBER LAWS ELECTIVE - I
[4-0-0-4] Total Hours: 45 hours

Pre-requisite: NA
Co-requisite: NA

Course Objectives
1. This course introduces students a critical understanding of Cyber Law.
2. This course also aimed to develop skill for dealing with frauds, deceptions (confidence tricks, scams) and other cyber crimes such as child pornography, that are taking place via Internet.
3. This course also explores the legal and policy development in various countries to regulate Cyberspace

Course Outcomes
Upon successful completion of the course, students will be able to
1. CO1: Identify the emerging legal issues in a digital networked environment including general issues of jurisdiction and enforcement of rights and liabilities in cyberspace
2. CO2: Consider developments in specific areas of law arising in cyberspace including intellectual property, regulation of content /censorship, privacy and electronic commerce
3. CO3: Evaluate how these developing concepts affect the flow of information in society and the work of information professionals
4. CO4: Identify and analyze recent developments in national and global information policy, the nature of the policy making process and the identities and positions of the various stakeholders
5. CO5: Consider the role of the information professions in this policy making process; and Identify and evaluate resources and materials treating the Law of Cyberspace and IPR
6. CO6: Identify emerging issues related to area of cyber crimes and cyber laws

Course Syllabus

Unit-I: (Hrs: 8)
Introduction:
Basic Concepts of Technology and Law Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence

Unit-II: (Hrs: 8)

Unit-III: (Hrs: 9)
Unit-IV: International Scenario in Cyber Laws (Hrs:9)
International Scenario in Cyber Laws:
Data Protection Laws in EU and USA, Child Abuse Protection Laws in EU and USA, Cyber Laws – the Malaysian Approach.

Unit-V: Cyber Law Issues for Management (Hrs:8)
Cyber Law Issues for Management:
Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management, Cyber Law Compliancy Audit

Unit-VI: Recent Trends And Applications (Hrs:3)
Recent trends and advance topics.

Text Books:

Reference Books:
1. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi
2. “Handbook Of Cyber Laws" By Sharma Vakul

BCSL312 COMPUTER GRAPHICS & VISUALIZATION (4-0-0-4)
Total Hrs: 45
Pre-requisite: Applied Mathematics
Co-requisite: NA

Course Objectives:
1. This course introduces basic fundamentals of computer graphics while making them aware of basic principles of computer graphics.
2. It is also aimed at developing fundamental data structure and algorithm for modeling.
3. This course also provide career opportunities in developing Video Games, Virtual Reality applications, computer simulation, computer aided design and web design

Course Outcomes:
Upon successful completion of the course, students will be able to
1. CO1: Identify the fundamentals of computer graphics, various display devices and able to perform basic object generation.
2. CO2: Demonstrate various filling and clipping algorithms for objects.
3. CO3: Apply various transformation techniques for animation
4. CO4: Analyze various projection and hidden surface removal techniques.
5. CO5: Design curve generation techniques and visualization techniques.
6. CO6: Evaluate advanced modeling techniques and tools in the area of computer graphics.

Unit-I: Introduction (7 Hrs)
Introduction to Computer Graphics and Image Processing, Basic fundamentals of random scan, raster scan devices, Stereoscopic and Virtual Reality Systems, line and circle drawing algorithms.

Unit-II: Polygon Filling Methods (8 Hrs)
Seed fill, fence fill, edge flag algorithm, and scan conversion techniques, alaising and antialiasing techniques, clipping algorithms.

Unit-III: Transformations (9 Hrs)
Basic 2D transformation, composite transformations - translation, rotation, scaling, reflection, and shear views, windowing, Introduction to 3D transformation.

Unit-IV: Projections and Elimination (8 Hrs)
Three dimensional display methods, parallel, perspective projections and types, hidden line and surface elimination techniques, shading and rendering.

Unit-V: Curve Generation (10 Hrs)
Curve Generation: Cubic Spine, Bezier, B-Spline, blending of curves and other interpolation techniques, Introduction to Visualization, Applications, Visualization Techniques - parallel coordinates – a, charts (pie chart, bar chart, histogram, function graph, scatter plot, etc.), graphs (tree diagram, network diagram, flowchart, existential graph, etc.) Venn diagram Euler diagram etc.

Unit-VI: Trends and Applications (3 Hrs)
Recent trends in Computer Graphics and Visualization, Advanced topics & its Application

Text Books:

Reference Books:
SIXTH SEMESTER

BITL303 SOFTWARE ENGINEERING [3-0-2-5]
Total Hours: 36 hours
Evaluation Scheme: Theory

Pre-requisite: NA
Co-requisite: NA

Course Objectives
1. This course introduces basic idea of software engineering while making them aware of basic mechanism of software engineering.
2. It is aimed at developing skills to provide development solutions to variety of real life situations which involve software engineering.
3. Students learn appropriate cost estimations for developed software.
4. This course provides career opportunities in subject area of software requirement, software design, and software testing quality management, Configuration management.

Course Outcomes
Upon successful completion of the course, students will be able to:
1. CO1: Identify life cycle models involved in designing softwares
2. CO2: Develop an appropriate design technique for software development problems and analyze them with proper requirements.
3. CO3: Apply advanced development technique and tools in software engineering, modeling, design and testing software
4. CO4: To be aware of different life cycle models, requirement dictation process analysis modeling and specification architectural detailed
5. CO5: Design methods implementation and testing strategies, verification and validation techniques.
6. CO6: Apply Project planning and management, Use of CASE tools in recent Areas

Course Syllabus
Unit-I: (4 Hrs)
Software and software engineering. The importance of software, software-software myths, software engineering paradigms, generic view of software egg, software metrics, measures and metrics, estimation, risk analysis, scheduling, size oriented metrics; function oriented metrics, metrics of software quality.

Unit-II: (6 Hrs)
Software project estimation and planning, decomposition techniques, LOC and FP estimation, effect estimation, risk analysis, identification, projection, assessment, management and monitoring, software reengineering, requirement analysis, tasks, analyst, software prototyping, specification principles, representation and the software requirements specification.

Unit-III: (8 Hrs)
Object oriented analysis and data modeling object oriented concepts, identifying objects, specifying attributes, defining operations, inter object communication finalizing object definition, object oriented analysis modeling, data modeling, data objects, attributes and relationships entity relationship diagrams, alternative analysis techniques, requirement analysis methods, data structure oriented methods, data structured system development warner diagrams and the DSSD approach, Jackson system development.

Unit-IV: (7 Hrs)
Software design fundamentals, The design process, design fundamentals, effective modular, design dataflow oriented design, transform analysis, transaction analysis, design heuristics, object oriented design. Object oriented design concepts, object oriented design methods. Refining operations, program components & interfaces, implementation detail design, User interface design, human factors, human computer interface design, interface-design guidelines, interface standards.

Unit-V: (7 Hrs)
Software quality assurance, software quality factors quality assurance, quality metrics, Halstead’s S/W science, software testing techniques, S/W testing fundamentals; White box testing, black box-testing, validation testing, system testing, debugging software maintenance maintainability, maintenance tasks, reverse engineering and re-engineering.

Unit VI: Recent Trends And Applications (3Hrs)
Recent trends and advance topics

Text Book
Software Engineering by D.Bell, I. Morrey- PHI Pub.

Reference Books:

BITP303 SOFTWARE ENGINEERING
Total Hours: 20 hours
Evaluation Scheme: Practical
1. Introduction to Rational rose software
2. Identify software requirement specification and write a document for the same. CO1
3. Identify Functional and Non-functional requirements and write a document for the same.CO2
4. Design a Use case diagram CO3,CO5
5. Design a Class diagrams CO3,CO5
6. Design a Sequence diagrams CO3,CO5
7. Design a Collaboration diagrams CO3,CO5
8. Design a State chart diagrams CO3,CO5
9. Design an Activity diagrams CO3,CO5
10. Design a Component diagrams CO3,CO5
11. Design a Deployment diagrams CO3,CO5
12. Open Ended practical. CO4
   a. Test case design implementation.
   b. Automation tools and implementation.

BITL304 COMPUTER SYSTEM SECURITY
Upon successful completion of the course, students will be able to:

1. Apply and learn how to use encryption. Identify and use appropriate protection measures against malicious code.
2. Apply the modern principles of physical security, authentication, and access control.
3. Learn design principles behind trusted systems, their features, and the appropriate degree of assurance.
4. Apply knowledge to plan, implement, and assess security protection mechanisms in computer systems and networks.
5. Develop and deploy an appropriate security method for software development problems and analyze them with their cost estimation.
6. Identify latest technology and recent trends in the area of Computer security.

Course Syllabus

Unit I: (7 Hrs) Introduction: attacks, services, mechanisms, security attacks, security services, a model for internet work security, encryption model, steganography, classical encryption techniques, modern techniques - simplified DES, block cipher principles, data encryption standard, strength of DES, differential & linear cryptanalysis, block cipher design principles, block cipher modes of operation, Algorithm - triple DES, international data encryption algorithm, blowfish, RCS, CAST, RC2, characteristics of advanced symmetric block ciphers.

Unit II: (8 Hrs) Confidentiality using conventional encryption: placement of encryption function, traffic confidentiality, key distribution, random number generation. Public key cryptography: principles, RSA algorithm, key management, diffie-hellman key exchange, elliptic curve remainder theorem, discrete logarithms.


Unit IV: (8 Hrs) Networks security practice: authentication applications - kerberos. X.509 directory authentication service, Kerberos encryption techniques, E-mail security: Pretty Good Privacy (PGP), data compression using ZIP Radix-64 conversion. PGP random number generation, IP security: overview, architecture, authentication header, encapsulating security payload, combining security associations, key management.


Unit VI: Recent Trends And Applications in cryptography (3 Hrs) Recent trends and advance topics

Text Books:

Reference Books:
2. Introduction to Data Compression 2/c by Khalid Sayood (Morgan kaufmann/Harcourt India)

BCSL308 LANGUAGE PROCESSORS

Course Objectives:
1. This course introduces student's general idea of language processors.
2. This course also introduces designing structure and implementation of it.
3. They are also aimed to develop skills to understand optimization technique.

Course Outcomes:
Upon successful completion of the course, students will be able to

CO1: Upon successful completion of the course, students will be able to
CO2: List basic concepts of language processors.
CO3: Explain different parsing techniques.
CO4: Apply knowledge of semantic analysis and construct three address codes.
CO5: Discuss concept of storage Management.
CO6: Evaluate code generator, discuss the different issues of code generation.

Course Syllabus
Unit -I : Introduction (Hrs: 6)
Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer, LEX.

Unit -II : Syntax Analysis (Hrs:6)
Specification of syntax of programming languages using CFG, Top-down parser, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers, Study of YACC.

Unit -III : Syntax Directed Translation (Hrs:7)
Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations: postfix, syntax tree, TAC, translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit -IV : Storage Allocation And Error Handling (Hrs.7)
Run time storage administration, stack allocation, symbol table management, Error detection and recovery: lexical, syntactic, semantic.

Unit -V : Code Optimization (Hrs:6)
Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression, Code generation – Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Unit VI : Trends in Language Processor (Hrs:3)
Recent trends in Language Processor, Compiler tools, Advanced topics & its Application

Text Books:

Reference book:

BCSP308 LANGUAGE PROCESSORS
Total Hours: 20 hours

Evaluation Scheme: Practical
List of Practical:-
1. Study the syntax of LEX specifications built-in functions and variables. And write a LEX program to convert a number in words to integer.
2. Write a LEX Program to Count no. of lines, blanks, words & characters supplied at a command prompt
3. Write a LEX program to count the words starting with ‘a’
4. Write a LEX program to calculate the average of given numbers.
5. Implement Finite Automata in LEX for Odd numbers of a’s.
6. Write a LEX Program to convert lower case to upper case and upper case to lower case.
7. Implement a LEX program to recognize whether a given sentence is a simple or compound.
8. Write a LEX program to find the number of vowels and consonants.
9. Write a LEX program to convert an octal number to decimal number.
10. Write A LEX Program To Convert Decimal Number To Hexadecimal Number.
11. Write a LEX program for basic desktop calculator using YACC.
*Open ended design of Practical.

BHUL100 ENGINEERING ECONOMICS AND INDUSTRIAL MANAGEMENT [3-0-0-3]

Total Hours: 45 hours

Pre-requisite: Management Information System
Co-requisite: NA

Course Objectives
1. This course introduces the quantitative approach to engineering decision making while making aware of fundamentals of engineering economics.
2. Students will be aware of industrial product management.

Course Outcomes
Upon successful completion of the course, students will be able to
CO1: Apply general problem solving process
CO2: Use basic cost concepts used in economic analysis
CO3: Apply concept of time value of money & economic equivalence
CO4: Analyze the commonly used methods for comparing investment alternatives
CO5: Apply the techniques for incorporating depreciation and income tax calculations into economic analyses
CO6: Identify the procedures for performing benefit cost analysis of projects in the public sector.

Course Syllabus
Unit I: Demand Utility and indifference curves, Approach to Analysis of demand, elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity, Marginalize.
Unit II (08 Hrs)
Laws of Return and costs, price and output determination under perfect competition, monopoly, monopolistic competition, oligopoly, Depreciation and methods for its determination.

Unit III (7 Hrs)
Functions of central and commercial banks Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Monetary and cycles, New economic policy, Liberalization, Globalization, Privatization, Market friendly state. Fiscal policy of the government, Meaning and phases of business.

UNIT IV (8 Hrs)
Definition, Nature and scope of management, Functions of management - Planning, organizing, Directing, Controlling, Communicating

Unit V (07 Hrs)
Meaning of marketing management, Concept of marketing, Marketing Mix, Administrative and cost plus pricing, Channel of distribution, Advertising and sales promotion.

Unit VI (08 Hrs)

Text Books
1. Modern Economics by H.L.Ahuja, S. Chand & Co.

Reference Book
1. Monitory economics by M.L.Seth
4. Managerial economics by Joel dean, Prentice Hall India.
6. Marketing Management by Philip Kotler
7. Marketing Management by V.Ramaswamy, Macmillan Publishers India Ltd.
8. Financial Management by I.M. Pandey

MBL105- GENERAL PROFICIENCY –V :
Course Objectives: -To develop the technical presentation and report writing skills for better employability of students

Course Outcomes :
1 An ability to perform better in group discussion and interviews
2 An ability to write a technical report in an effective way
3 On report writing, GD, Interview Techniques.

4 No Scheduled classes in time – table.
5 A 3 to 5 days workshop shall be conducted.
6 Syllabus to be approved by Board of Studies for Interdisciplinary Courses.

MBL106- GENERAL PROFICIENCY -VI
Course Objectives
1. To orient the students for research in the area
2. of their interest and introduce them the step
3. wise procedure for carrying out the research.
4. To introduce various mathematical and
5. simulation tools useful for research activity
6. To introduce them the methods for
7. safeguarding the intellectual property rights.

Course Outcomes :
1. Understand the need and importance of research
2. Use different analytical and simulation tools for research
3. To carry out literature survey
4. To Present results and write a project report

OPEN ELECTIVES
For syllabus of open elective subjects, please refer syllabus provided in last

BECL409 DIGITAL IMAGE PROCESSING ELECTIVE-II
[ 4-0-0-4]
Total Hours: 45
Pre-requisite: NA
Co-requisite: NA
Course Objectives:
1. To provide image fundamentals and mathematical transforms necessary for image processing.
2. To gain information of various transform techniques.
3. To give information of basic morphological algorithms
4. To understand various image processing techniques

Course Outcomes:
Upon successful completion of the course, students will be able to:

At the end of the course the student shall be able to:

CO1: Understand the fundamentals of the human visual system and perception with knowledge of imaging systems and processing units.

CO2: Demonstrated understanding of spatial filtering techniques, including linear and nonlinear methods, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

CO3: Demonstrated understanding of 2D Fourier transform concepts, including the 2D DFT and
FFT, and other transforms (DCT, Haar, WHT) and their use in frequency domain filtering.

**CO4:** To recognise degradation problem in digital image processing, and to decide upon appropriate methodologies in their solution and to understand the principles of image compression.

**CO5:** Able to employ morphological filtering techniques to clean up and cluster image for further analysis.

**CO6:** Detect/Extract regions of interest from an image using various thresholding and segmentation techniques and apply these techniques to solve real-world image processing problems.

**Course Syllabus**

**Unit I:** (7 Hrs)
Origins of digital image processing. Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

**Unit II:** (7 Hrs)
Basic intensity transformation and spatial filtering, Image negatives, log transforms, power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions.

**Unit III:** (7 Hrs)
Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

**Unit IV:** (8 Hrs)
Model of image Degradation/Restorations process, Noise models, Restoration in the presence of noise only, periodic noise reduction by Frequency domain filtering, Image reconstruction from Projections, Image compression models, Huffman coding, LZW coding, Run length coding, Bit-plane coding.

**Unit V:** (8 Hrs)
Some basic morphological algorithms, Boundary extraction, convex hull, thinning, skeletons, morphological Reconstruction. Color image processing, color models, RGB color models, CMY and CMYK color models the HSI color models.

**Unit VI:** (8 Hrs)
Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Region-based segmentation, watershed segmentation algorithm Applications of segmentation.

Advanced topics on Image processing technology and algorithms.

**Text Books:**


**Reference Books:**


**BITL 403 MULTIMEDIA SYSTEMS**
ELECTIVE-II [4-0-0-4]
Total Hours: 45
Evaluation Scheme: Theory

Pre-requisite: NA
Co-requisite: NA

**Course Objectives**

Upon successful completion of the course, students will be able to

**CO1:** Apply basics of multimedia systems like audio, video, image, text, tools, etc.

**CO2:** Using the Multimedia hardware and platform for providing real-time solutions

**CO3:** Develop an appropriate multimedia tool for multimedia system problems

**CO4:** Analysing the requirement of multimedia system in various walk of life

**CO5:** Identify the exact need of multimedia systems involved in the real-life applications.

**CO6:** Identifying the latest tools for Multimeida System Course Syllabus

**Unit I:** (7 Hrs)
Multimedia definitions, CD-ROM and the multimedia highways, uses of multimedia introduction to making multimedia, the stages of projects, requirements to make good multimedia, multimedia skills and training, the multimedia tea, training opportunities in multimedia.

**Unit II:** (7 Hrs)
Multimedia hardware, Macintosh and Windows production platforms, hardware peripherals connections, memory and storage devices, input devices output hardware, communication devices, media software, basic tools, making instant multimedia authoring tools.

**Unit III:** (8 Hrs)
Multimedia building blocks- text, sound, images animations, video. Assembling and delivering a project, planning and costing, designing and producing Content and talent, delivering, CD-ROM technology, DVD Tech.

**Unit IV:** (7 Hrs)
Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message

Unit V : (8 Hrs)
Multimedia and Internet- History, web servers, web browsers, VRML, working on the web: text, animation, images and sound for the web, multimedia Applications, media communication, media consumption, media entertainment and Multimedia games.

Unit VI: (8 Hrs)

Recent trends/ advance topic.

Text Books:
2. Multimedia systems design by K.A. Andleigh, K. Thakkar (PHI Pub.)

Reference Books:

BCSL 414 DATA MINING & WAREHOUSING
ELECTIVE-II [4-0-0-4] Total Hours: 45

Evaluation Scheme: Theory
Pre-requisite: NA
Co-requisite: NA

Course Objectives:
1. This course introduces principles, concepts, functions and uses of data warehouses, data modeling and data mining in business.
2. A DW and DM technique is usually business driven and will work to improve the direction of the company by aligning the data warehouse technology with Business strategy.
3. This course also provide carrier opportunities in data warehouse design, query processing, data mining tools and technique.

Course Outcomes
Upon successful completion of the course, students will be able to
1. CO1: Identify the features and applications of data warehouses
2. CO2: Describe and Identify data processing methods used to efficiently design and manage data storage in data

3. CO3: Apply knowledge discovery process and associated algorithms to solve real-life applications
4. CO4: Analyze & plan a conceptual framework with popular data mining software
5. CO5: Design data mining algorithms using classification and clustering concepts
6. CO6: Evaluate usability and functionality of designed algorithm in the field of research and development Know advanced technique and tools in the area of data warehouse and data mining.

Course Syllabus
Unit I- Introduction to Data Warehousing (7 Hrs)
Introduction to Decision Support System: DSS Defined, History of DSS, Ingredients of DSS, Data and Model Management, DSS Knowledge base, User Interfaces, The DSS Users, Categories and Classes of DSSs Need for data warehousing, Operational & informational data, Data Warehouse definition and characteristics, Operational Data Stores.

Unit II-Data warehouse architecture (7 Hrs)
Data warehouse Components, Architectural components, Data Preprocessing: Why? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization and Concept Hierarchy Generation for numeric and categorical data, significant role of metadata, Building a Data warehouse, Benefits of Data Warehousing.

Unit III- Multidimensional data Models (8 Hrs)

Unit IV:- Introduction to data Mining (10 Hrs)

Unit V- Knowledge Discovery in Large Data Sets (10 Hrs)
Classification, Knowledge Discovery Classification Based on Association Rule Mining, Other Classification Methods Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster
Analysis, A Categorization of Clustering Methods. Introduction to Knowledge Discovery, innovative techniques for knowledge discovery, application of those techniques to practical tasks in areas such as fraud detection, scientific data analysis, web mining, Introduction to huge data sets such as Web, telecommunications networks, relational databases, object-oriented databases, and other sources of structured and semi-structured data, Problem of Large Data sets 20

**Unit VI: Recent Trends in Data Mining and warehousing**

20 Hrs

Recent trends in Data Mining and Warehousing Advanced topics & its Application

**Text Book**

Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

**Reference Books**


**BCSL 311 E-COMMERCE ELECTIVE-II**

[4-0-0-4]  
**Total Hours: 45 hours**  
**Pre-requisite:** NA  
**Co-requisite:** NA

**Course Objectives:**

1. This course introduces student's fundamental concepts of Ecommerce.
2. It is aimed at developing skills to consumer e applications and organizational applications of e-commerce.
3. This course provides carrier opportunities as web applications development and application engine design.

**Course Outcomes:**

Upon successful completion of the course, students will be able to:

CO1: To use the basics of E-commerce  
CO2: Identify the technique and issues related to E-commerce  
CO3: Apply advanced tools in area of E-commerce applications  

CO4: Understand and implement new approaches to address the challenges of security and transaction integrity for E-commerce applications  
CO5: Managing e-commerce project implementation followed by handling international nature of e-commerce  
CO6: Identify latest technology and recent trends in the area of e-commerce

**Course Syllabus**

**Unit I : (7 Hrs)**

Introduction to electronics-commerce: The scope of E-COM, E-COM and trade cycle, electronic market, electronic data interchange, internet commerce, E-Commerce in perspective, the value chain, supply chains, Electronics Commerce Software: What kind of software solutions Do you need? marketing smarts, hosting services, basic packages, midrange package, enterprise solutions for large firms. (8)

**Unit II : 7 Hrs**

Business to Business Electronics-commerce: Inter-organizational transactions, electronics, electronics markets, electronics data interchange (EDI), EDI-technology, EDI and business, inter-organizational e-com. (8)

**Unit III : 7 Hrs**

Business to consumer electronic commerce: consumer trade transactions, the elements of e-commerce – elements, e-visibility, the e-shop, online payment, delivering the goods, after sales service, internet e-com security, a website evolution mode.e-business: Internet book shops, grocery supplier, software supplies and support, electronic newspaper, internet banking, virtual auctions, on-line share-dealing, e-diversity. (6)

**Unit IV: (8 Hrs)**


**Unit V: (8 Hrs)**


Unit VI: Recent trends in electronics-commerce, Advanced topics & its Application. (8 Hrs)

**Text Books :**

...
1. e-Commerce by David Whiteley (McGrew Hill Pub.)
2. Electronics-Commerce by Gary P. Schneider & James T. Perry.
   (COURSE TECHNOLOGY Thomson Learning)

**Reference:**
SEVENTH SEMISTER

BITL 413 REAL TIME OPERATING SYSTEMS [4-0-0-4] Total Hours: 36 hours
Pre-requisite: Operating System
Co-requisite: NA

Course Objectives
1. To study Real-Time Applications, Commonly Used Approaches and OS services, types and factors RTOS.
2. To study Concept and of Task scheduling, Interrupt Handling
3. To study Comparison and application of various RTOS
4. To introduce new approaches to operating systems design that address the challenges of security, robustness, and concurrency

Course Outcomes
Upon successful completion of the course, students will be able to
1. CO1: Apply the knowledge Real Time Operating Systems and its applications in real scenarios
2. CO2: Apply different used approaches for realtime systems
3. CO3: Gain knowledge Working and implementation of real time applications.
4. CO4: Design scheduling algorithms related to real time applications
5. CO5: Apply concepts of real vs ideal clocks and their synchronization
6. CO6: Identify and use recent trends in RTOS of development

Course Syllabus
Unit-I (7 Hrs)

Unit-II Software Architectures: (7 Hrs)

Unit III (7 Hrs)

Unit IV (8 Hrs)
Threads And Task Communication: Threads, Context Switching overheads, Scalability, Embedding with application code. Task Scheduling, Interrupt handling, Inter task communication issues in Task management- Processes and Threads, Scheduling, Synchronization and communication.

Unit V (8 Hrs)
Execution Time Prediction: Prosperities of Real and ideal clocks, Clock Servers – Lamport’s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization-Centralized Synchronization, Distributed Synchronization.

Unit VI (8 Hrs)
Recent Trends In Rtos: Real Time Functions and Services, OS Architectures-Real Time UNIX and POSIX, Emerging trends in real time operating systems. Comparison and application of various RTOS. RTOS examples Vx Works. Advance topics on Embedded Issues

Text Books:

References
1. Real Time Systems : C.M. Krishna & Kang G. Shin
3. Real-time concepts for embedded systems, Qing Li, Caroline Yao
4. Real-time systems: design principles for distributed embedded applications, By Hermann Kopetz

BITP413 REAL TIME OPERATING SYSTEMS Total Hours: 20
Evaluation Scheme : Practical
Practical list
1. Real Time Operating System introduction in detail CO1
2. Do Installation of RTOS VxWorks 6.8 simulator.CO1 & CO2
3. Explore the IDE of VxWorks operating system.CO1
4. To explore how to run programs in Wind River workbench.CO2
5. Write a C program to print “Hello World ” in VxWorks workbench.CO2
6. Do installation of debugger.CO1 & CO2
7. How to download code in workbench hardware in VxWorks.
   a. CO2
8. To implement one application of VxWork.CO2
9. Open Ended Practical: CO3

BITL 401 HUMAN COMPUTER INTERACTION [3-0-0-3] Total Hours: 45 hours
Pre-requisite: Software Engineering
Co-requisite: NA

Course Objectives
1. This course introduces students the concept of Human-Computer Interaction.
2. It is also aimed to skill Interaction design methodologies.

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3. This course also introduces how to apply the Human-Computer Interaction concepts to the current interaction designs.

**Course Outcomes**

Upon successful completion of the course, students will be able to:

- CO1: Use fundamental concepts in HCI in real life
- CO2: Carry out a range of different types of user study and usability study
- CO3: Produce different types of low-fidelity and mid-fidelity prototypes
- CO4: Design lifecycle, and implement a complete user-centered design process including user studies, prototyping, and evaluation
- CO5: Apply different methods and approaches in HCI; and be able to provide such critique in applied settings
- CO6: Describe implementation, and justify approach to, user centred design processes for a range of real-world scenarios

**Course syllabus**

**Unit - I: Introduction**

[6 Hrs]

Introduction, A badly designed interactive system, who designs interactive systems, Engineering, What is useful or usable. Making interactive systems feel natural for users Introduction, Natural computing, Natural computing and user-cent red system design, Six principles of natural computing, Core concepts, Interactive design, Strengths and weaknesses of interactive systems.

**Unit – II: User modeling**

[10 Hrs]


**Unit – III: Task analysis**

[8Hrs]

Introduction, Task analysis, Whit is task analysis, Purposes of task analysis, Approaches to task analysis, Hierarchical task analysis. Functional Design Why are we doing this? A Historical Perspective, Who Will This System Serve?What Are We Trying To Do? Object-Based Task/Function Models

**Unit – IV: Multiple views Models**

[10 Hrs]

: Review of Model-View-Controller, Multiple Views with Differing View Controls Synchronized Selection, Managing Model Persistence Look and Feel: Consistency, Look, Feel.

**Unit – V: Interface Design Tools**

[10 Hrs]


**Unit – VI: Recent trends/ advance topic.**

**Books:**


**Reference Books:**

2. Interaction Design beyond human-computer interaction Authors: Preece, Rogers, and Sharp

**BECL410**

**EMBEDDED SYSTEMS**

[3-0-0-3] Total Hr.:[ 45 Hrs.]

**Course Prerequisite:**

Microprocessor Based Systems (BECL303)

**Course Objectives**

1. To study and understand various embedded systems.
2. To understand the design parameters of embedded systems applications.
3. To study and impart different tools for embedded system design.

**Course Outcomes:**

At the end of the course the student shall be able to:

- CO1: Select Appropriate Microcontroller, Techniques & understand the Architecture of 8051.
- CO2: Design 8051 Programs For Embedded Applications.
- CO3: Design and Interface memory for Real Time applications using LED & LCD.
- CO4: Understand & design Programs for ARM base applications.
- CO5: Make Use Of ARM7 Controller For Designing Of Embedded Applications
- CO6: Select And Make Use of Appropriate Bus Standard for Design application of Embedded systems.

**Course Content:**

**Unit I:**

( 8Hrs)


**Unit II:**

( 8 Hrs)

8051 Instruction Set, Addressing modes & programming. 8051 Timers, Serial I/O

**Unit III:**

( 8 Hrs)

Memory Interfacing. Programming, Real time interfacing with LED, LED display, LCD display
Unit IV: (8 Hrs)
RISC Controller : PIC Micro-controllers – overview; features, PIC 16c6x/7x –architecture, file selection Registers.

Unit V: (7 Hrs)
RISC Controller : PIC Micro-Controllers(PIC 16c6x/7x)– Memory organization, Addressing modes, Instruction set, Timer Modes and Serial I/O, Programming.

Unit VI: (6 Hrs)
Industrial Interfacing Buses: PCI, ESA, EISA, I2C, USB, RS232, recent trends in embedded systems.

Text Books:

Reference Books:

BECP410 EMBEDDED SYSTEMS (0-0-2-1) Total Hrs: 30

List of Practicals:
1. Use of Microcontroller tools for programming (Keil).
2. Write a program to perform arithmetic Operation using 8051 Microcontroller.
3. Write a program to perform addition of two arrays using 8051 Microcontroller
4. Write a program to perform Array Sorting
5. Write a program to perform Interrupt Operation
6. Write a program to interface with LED Display
7. Write a program to interface ADC with 8051 microcontroller.
8. Write a program to perform serial communication using 8051 microcontroller.
9. Write a program to perform arithmetic Operation using ARM7 Microcontroller
10. Write a program to perform addition of two arrays using ARM7 Microcontroller
11. Write a program to generate square wave using 8051 microcontroller
12. Open Ended Mini Project
   a. Write a program to interface stepper motor to 8051 microcontroller and to rotate stepper motor in a clockwise and anti clockwise direction.

BITL 404 TCP/IP
Evaluation Scheme: Theory [3-0-1-4] Total Hrs: 45

Pre-requisite: Computer Networks
Co-requisite: NA

Course Objectives:
1. This course introduces student’s fundamental concepts of Ecommerce.
2. It is aimed at developing skills to consumer e applications and organizational applications of ecommerce.
3. This course provides carrier opportunities as web applications development and application engine design.

Course Outcomes
Upon successful completion of the course, students will be able to
CO1: Apply the basics of TCP/IP.
CO2: Identify principal beyond TCP/IP involved in the real time applications.
CO3: Develop an appropriate mathematical formulation for the networking problems, and analyze them in order to find the most suitable solution.
CO4: Designing of security protocols for cryptographic algorithm
CO5: Apply tools in multimedia information and networking for realtime protocols
CO6: Apply advanced computing techniques and tools in the area of networking and TCP/TP systems, its modeling and analysis.

Course Syllabus
Unit-I: (Hrs: 8)

Unit-II: (Hrs: 7)

Unit-III: (Hrs: 7)

Unit-IV: (Hrs: 7)

Unit-V: (Hrs: 8)


Evaluation Scheme: Practical
Practical List:-
1. Configuring Internet IP address
2. Assigning IP address using CIDR
3. Creating an echo-client-server
4. Building client for TIME protocol
5. Configuring APACHE server
6. Capture and decode Ethernet frame
7. Decode header fields of IP datagram
8. Decode header fields of TCP header
9. Designing an internet server with web hosting facility
10. To build concurrent sever in Linux
11. To implement TCP/IP socket communication.
12. To configure a DNS Server.
13. TCP/IP socket communication in Java
14. Open Ended Practical.

BCSL 405 : NATURAL LANGUAGE PROCESSING
ELECTIVE – III
[4-0-0-4]
Pre-requisite: Language Processor
Co-requisite: NA

Course Objectives:
1. This course introduces student the basics and concepts in natural language processing making them aware of the statistical and empirical methods in solving problems involving natural (human) language.
2. It is aimed at developing skills to work with text, speech, and other language data.
3. This course also aims to develop skill to build real tools to learn technique beyond NLP. This course provides carrier opportunities in NLP and NLP research.

Course Outcomes
Upon successful completion of the course, students will be able to
1. CO1 : Understand the basic concept of natural language processing.
2. CO2: Understand and implement probabilistic models in code, estimate parameters for such models, and run meaningful experiments to validate such models.
3. CO3: Understand the statistical and empirical methods in solving problems involving Natural Language.
4. CO4: Implement a system which processes natural language.
5. CO5: Understand the concept of Semanitic Analysis
6. CO6: Apply recent trends in NLP

Course Syllabus
Unit I: Introduction (8 Hrs)
NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The
problem of ambiguity. The role of machine learning. Brief history of the field.

Unit II: N-gram Language Models (8 Hrs)

Unit III: Speech Tagging And Sequence Labeling (9 Hrs)

Unit IV : Syntactic Parsing (8 Hrs)
Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

Unit V: Semantic Analysis (9 Hrs)

Unit VI: Applications Of NLP (3 Hrs)
Recent trends in Natural Language Processing, Advanced topics & its Application

Book:
SPEECH and LANGUAGE PROCESSING, an Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Second Edition by Daniel Jurafsky and James H. Martin

BITL 407 ADVANCED WEB TECHNOLOGIES
ELECTIVE – III
[4-0-0-4]
Total Hrs: 45
Pre-requisite: Introduction to Internet Programming
Co-requisite: NA

Course Objectives
1. This will help student to learn about developing of web based applications using CGI programming language, Perl, PHP, Dream weaver, J2ME.

Course Outcomes
Upon successful completion of the course, students will be able to
CO1: Understand the basics of web based application development.
CO2: Identify the exact method for development of real life web base applications.
CO3: Develop a code for web application and analyze them, with proper selection of language.
CO4: Understand advanced language and tools in the area of web base application, system modeling and analysis.
CO5: Identify the exact method and advanced tools for embedded systems application development.
CO6: Identify advanced tools and recent trends in the area of web application development

Course Syllabus
Unit I: (7 Hrs)

Unit II: (7 Hrs)
Perl basics: Variables and Data Types, Expressions, Operators, and Control Structures, Functions, Arrays, Object-Oriented PHP., Strings and Regular Expressions, File I/O and the File System, Databases, PHP and Dynamic Site Development.

Unit III: (7 Hrs)

Unit IV: (8 Hrs)
Dream weaver basics: Internet Access and HTML, Planning Web Sites, The Dream weaver Environment, Viewing and Managing HTML Code, Creating a Web Site, Defining a Web Site, Creating a Basic Web Page and Page Properties, Building a Web Site, The Site Panel and Templates, Adding Content to Web Pages, List Formats and Graphic File Types, Inserting a Table and Adjusting Table Properties, Using Graphics in Table Cells and, Nested Tables, Using Table Layout View, Creating and Using a Repeating Region Template.

Unit V: (8 Hrs)
Working with Links, Creating Internal and External Hyperlinks, Creating an Image Map and Anchors, Enhancing Navigation in a Site, Framesets Reusable Navigation Bars, Managing and Uploading a Web Site.

Unit VI: (8 Hrs)
J2ME basics: J2ME specifics ME components: KVM, J2ME, CLDC, MIDP, Overview of profile system, Architecture, Differences between J2ME environments, Comparisons between J2ME and Personal Java. MIDP: Mobile information device profile, Creating MIDP applications, Middlet suites and deployment MIDP GUI: Graphical User Interfaces with MIDP Displays, Commands, Pointers, Screens Animations and drawing. Recent trends/ advance topic.

Text Books::
2. Begining PHP 5 and MySQL. W.Jason Gilmore

Reference Books::

314
3. CGI programming in C & Perl by Thomas Boutell Addison-Wesley Publication.

BITL 408 DISTRIBUTED DATA BASES AND OBJECT ORIENTED DATA BASES

ELECTIVE – III

Theory [4-0-0-4]
Total Hrs: 45
Pre-requisite: Database management System
Co-requisite: NA

Course Objectives

1. This course introduces student the fundamental concept of distributed and object oriented databases making them aware of techniques of designing and managing data in distributed environment.
2. It is also aimed developing skills to provide solutions to real life applications which involve distributed databases.
3. This course provides carrier opportunities in subject areas of design of distributed and object oriented databases modeling and analysis.

Course Outcomes

Upon successful completion of the course, students will be able to
CO1: Apply the basics of distributed and object oriented databases.
CO2: Identify methods and techniques to design the distributed and object oriented
CO3: Develop mathematical formulation for optimization
CO4: Apply techniques in manipulation and handling of data in distributed and object oriented environment
CO5: Apply OODBMS concepts in real-life problems
CO6: Apply advanced technique and tools in area of distributed and object oriented databases

Course Syllabus

Unit I: (7 Hrs)
Distributed databases features - distributed database management systems - review of databases and computer networks, levels of distribution transparency. Reference architecture, type of data fragmentation, distribution transparency for read only applications and update applications. distributed database access primitives and integrity constraints.

Unit II: (7 Hrs)
Distributed database design, a frame work for distributed database design, the design of database fragmentation, the allocation of fragments. translation global queries to fragment queries, equivalent transformation for queries. transforming global queries into fragment queries. Distributed grouping and aggregate function evaluation, parametric queries.

Unit III: (8 Hrs)
Query optimization, problems in query optimization. objectives in query process optimization. objectives in query optimization. simpler representation of queries, model for query optimization, general queries, general queries. concept of two phase commit, resolving dmsrHbume transaction. concept of replication, snapshot on replication and multimaster replication. conflict resolution in MultiMate replication, concurrency control and database recovery in distributed databases.

Unit IV: (8 Hrs)
The evolution of object oriented concepts. object-oriented concepts, characteristics of an object-oriented data model, object schemas, class-subclass relationships. Inter object relationships, late and early binding, and support for versioning. Similarities & differences between OODM and other data models, features of air object-oriented databases management system, OODBMS architectural approaches-extended relational model approach, semantic database approach, object oriented database programming language extension approach. DBMS generator approach. object definition language and object query language.

Unit V: (10 Hrs)
OODBMS architectures, performance issues in OODBMS. application selection for OODBMS, database design for an object relational database management system (ORDBMS). structured types & ADTs. object identity, extending ER model. Using nested collections, storage and access methods, query processing, query optimization. design and architecture of POSTGRES. distributed computing in CORBA and BiB.

Unit VI: (5 Hrs)
Recent trends/ advance topic.

Books:
1. Distributed data bases principles and systems by Ceri & Pelagatti (McGraw Hill Publ.)
2. Fundamentals of Database System by Eliniskv & Navathe (3Td Ed. Addison W., elsey)

Reference Books::
2. Database System - Design Jinpicingentation & Management by Peter Rob & Carlos Coronel. (Course Tech.)

BECL 413 WIRELESS COMMUNICATION

ELECTIVE – III [4-0-0-4]
Total Hrs: 45

Course Prerequisite:
Computer Networks (BITL302), Communication Protocol Design (BECL427), Wireless Sensor Networks (BECL 428)

Course Objectives:
1. To understand the concept of wireless communication
2. To study the design and implementation of wireless system
3. To understand and explain protocol design issues and protocol designs for wireless communication.

Course Outcomes:
1. At the end of the course the student shall be able to:
2. CO1: Apply the basic concept of wireless communication and distinguish the major cellular communication standards (1G/2G/3G/4G systems)
3. CO2: Use the knowledge of cellular system components in designing of protocol for call identification & establishment.
5. CO4: Analyse the GSM /TDMA system architecture, protocol, techniques.
6. CO5: Apply the knowledge of modulation & diversity techniques to improve performance for mobile radio channels in wireless communication.
7. CO6: Analyse LAN, PAN, MAN & Bluetooth technology in wireless communication system.

Course Content:
Unit I: (07 Hrs)

Unit II: (07 Hrs)
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, OFDM, UWB radio techniques Cellular component identification Call establishment.

Unit III: (08 Hrs)
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security.

Unit IV: (08 Hrs)
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers. GSM system operation, Traffic cases, Call handoff, Roaming, GSM protocol architecture. TDMA systems.

Unit V: (08 Hrs)
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Diversity Combining Techniques, Typical GSM Hardware.

Unit VI: (07 Hrs)
Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.20X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies, emerging trends in wireless communication.

Text Books:

Reference Books:

BMEL509  INDUSTRIAL ROBOTICS (3-0-0-3)
Total Hrs.45

Pre-requisite:
1. BITL104 Basic of computing
2. BMEL204 Kinematics of machine

Course Objectives:
1. To understand robot anatomy.
2. To study basic control system models.
3. To learn actuation and feedback components.
4. To study sensors and grippers.
5. To learn the applications in material handling, machining, welding, assembly, etc.
6. To study robot cell layouts.

Course Outcomes:
After successfully completing the course, students will be able to
1. CO1:Understand robot anatomy and manipulator kinematics.
2. CO2:Apply control system as per the requirement.
3. CO3:Use various robot actuation and feedback components as per the need
4. CO4:Evaluate alternatives and select robot for material handling applications
5. CO5:Suggest specifications of robots for welding and assembly operations
6. CO6:Design robot work cell considering machine interface and cycle time analysis
Course Contents

UNIT – I (CO1) (7 Hrs)
Automation and Robotics, Robot anatomy, configuration of robots, joint notation schemes, work volume, introduction to manipulator kinematics, position representation, forward and reverse transformations of a 2-DOF arm, a 3-DOF arm in two dimension, a 4-DOF arm in three dimension, homogeneous transformations in robot kinematics, D-H notations, solving kinematics equations, introduction to robot arm dynamics.

UNIT – II (CO2) (7 Hrs)
Basic control system models, slew motion, joint-interpolated motion and straight line motion, controllers like on/off, proportional, integral, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative.

UNIT – III (CO3) (8Hrs)
Robot actuation and feedback components position and velocity sensors, actuators and power transmission devices, mechanical grippers, vacuum cups, magnetic grippers, pneumatic, electric, hydraulic and mechanical methods of power and control signals to end effectors.

UNIT – IV (CO4) (8 Hrs)
General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and related operations, machine loading and unloading, die casting, plastic molding, forging, machining operations, stamping press operations using robots.

UNIT – V (CO5) (7 Hrs)
Application of robot in spot welding continuous are welding, spray coatings, Robots in Assembly Operations.

UNIT – VI (CO6) (8 Hrs)
Robot cell layouts, multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis.

Text Book :

Reference S Books:

BECL 423 PATTERN RECOGNITION
ELECTIVE – IV [4-0-0-4]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives
1. This course introduces the fundamentals of Pattern recognition.
2. The students skilled to choose an appropriate feature and pattern classification algorithm for a pattern recognition problem.
3. The course also skill the students to properly implement the algorithm using modern computing tools such as Matlab, Open CV, C, C++ and correctly.

Course Outcomes
Upon successful completion of the course, students will be able to
1. Understand the nature and inherent difficulties of the pattern recognition problems.
2. Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood.
3. Identify and Select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
4. Implement algorithm using available resources and to properly interpret and communicate the results clearly and concisely using pattern recognition terminology classification, Clustering
5. Identify And Design Wave Forms
6. Recent Trends

Course Syllabus

Unit I: (7 Hrs)
Statistical Decision Theory, Probability-probabilities of events, random variables, joint distribution & densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

Unit II: (7 Hrs)
Statistical Decision Making —Bayes theorem, multiple features, conditionally independent features, decision boundaries, unequal cast of error, estimation of error rates, the leaving-9ne-out technique characteristics curve, estimating the composition of population.

Unit III: (7 Hrs)
Non parametric decision Making — Histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate functions.
minimum squared error estimation functions, choosing a decision making technique.

Unit IV: (8 Hrs)
Clustering — Introduction, hierarchical clustering, partitioned clustering.

Unit V: (8 Hrs)
Processing of waveforms and images- Gray level scaling transformations, equalization geometric image scaling and interpolation, smoothing transformation, edge detection, line detection and template matching, logarithmic gray level scaling, statistical significance of image features.

Unit VI: (8 Hrs)
Recent trends/ advance topic.

TEXT BOOKS:
1. O'Reilly , “Developing Bioinformatics Computer Skill”.
2. J.F. Griffths, “An Introduction to Generic Analysis”

REFERENCE BOOKS:
1. Michel Starkey and Ramnath Elaswarapu, “Genomic Protocols”

BITL 410 SOFTWARE TESTING
ELECTIVE – IV:
[4-0-0-4]
Total Hrs: 45
Pre-requisite: Software Engineering
Co-requisite: NA

Course Objectives
1. This course introduces basics of software testing at the function, class and application level. his course is also aimed to develop concepts of black-box (functional and boundary) and white-box (coverage-based) testing, and apply these concepts to small programs and components (functions and classes).
2. This course introduces the software engineering discipline of software quality engineering and to
3. The legal and societal issues of software quality.
4. This course also provides the carrier opportunities in the field of software testing

Course Outcomes
Upon successful completion of the course, students will be able to
1. CO1: Apply the distinctions between validation testing and defect testing
2. CO2: Apply the principles of system and component testing
3. CO3: Design the strategies for generating system test cases
4. CO4: Identify characteristics of tools used for test automation
5. CO5: Identify Software Quality and Assurance practices and various software testing techniques through case studies
6. CO6: Apply advanced computing techniques and tools in software testing

Course Syllabus
Unit I: (7 Hrs)
What is Bio informatics and why study it? Basic concepts, Protein and amino acid, DNA and RNA, sequence, structure and functions.

Unit II: (7 Hrs)
Bioinformatics database: Introductions, type of database, Nucleotide sequence database: Primary Nucleotide sequence database:

Unit III: (7 Hrs)
EMBL, Genebank, DDBJ and Secondary Nucleotide sequence database: UniGene, SGD, EMI Genomes, and Genome Biology.

Unit II: (7 Hrs)

Unit III: (7 Hrs)

Unit IV: (8 Hrs)

Unit V: (8 Hrs)
People and organizational issues: Common people issues and myths in testing, providing career paths in testing, Organizational structures for testing teams, geographically distributed testing teams and success factors. Test Metrics Product Metrics, Process Metrics, Progress Metrics, and Use of metrics in ascertaining product release.

Unit VI: (8 Hrs)
Recent trends/ advance topic.

Books:

Reference Books:

BITL 411 ENTERPRISE RESOURCE PLANNING

ELECTIVE – IV [4-0-0-4]
Total Hrs: 45
Pre-requisite: NA
Co-requisite: NA

Course Objectives
1. This course introduces student the general idea of enterprise resource planning making them aware of analyze the factors and forces which facilitate ERP systems.
2. It is also aimed at developing skills to implement ERP systems.
3. This course provides carrier opportunities in subject areas of design of ERP system used for decision making process.

Course Outcomes
Upon successful completion of the course, students will be able to
CO1: Identify the business need on ERP architecture
CO2: Identify factors and forces which facilitate development of ERP systems.
CO3: Identify how organizational factors such as managements role and organizational culture contribute to successful ERP
CO4: Identify ERP Implementations for Business Processes
CO5: Apply ERP In Various Industries
CO6: Apply the advanced technique and tools for ERP system implementation.

Course Syllabus
Unit I: (7 Hrs)
Introduction business needs and ERP, ERP as an overview, entries as an overview, benefits of erp, erp and related technologies, erp architecture, business process reengineering, data warehousing, data mining, on line analytical processing supply choice management.

Unit II: (7 Hrs)
ERP implementation: client server architecture and erp, erp implementation life cycle, implementation methodologies, Implementation - the hidden cost, organizing implementations, vendors, consultants and users, contracts with vendors, consultants and employees, project management and monitoring. After erp implementation.

Unit III: (7 Hrs)

Unit IV: (8 Hrs)
Selection of ERP, SWOT analysis of various ERP products supply chain enabled ERP.

Unit V: (8 Hrs)
ERP and Electronic Data Interchange (EDI) integration, ERP in manufacturing and non manufacturing industries.

Unit VI: (8 Hrs)
Recent trends/ advance topic.

Books:
1. ERP Demystified by Aleris Leon (TMH Pub.)

Reference Books:
1. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentageon Pren.)

BITP401 Project Phase I Seminar

Course Objectives
3. To understand and study the process of literature review and to put forward the findings.

4. To get the detailed practical knowledge about latest technology by designing any system or prototypes by using acquired technical knowledge and skills.

Course Outcomes:
1. At the end of the course the student shall be able to:

2. CO1: Use the acquired technical knowledge to solve any problem related engineering, environmental, social.

3. CO2: Propose and convince design method through effective presentation.

4. CO3: Search and study literatures from conference, journals in concern area.

5. CO4: Deliver Progress seminars and execute project as group member.

6. CO5: Make proper documentation of project via project report.

7. CO6: Implement propose design through prototype or software.
EIGHTH SEMESTER

BITP402 Industrial Project Phase II
Evaluation Scheme: Practical [16P]
Six Months

Course Objectives

8. To expose and explore students to potential employers
9. To gain on job experience in an industry/research environment so as to help students to meet requirements of career prospects
10. To satisfy curiosity and sharpen up research potential at research organization for research minded students
11. To develop personality and soft skills
12. Provide opportunity to undertake real time, innovative and research based project in industry
13. To gain knowledge of managerial aspect such as finance, team work, team leading, testing etc followed by industry while conducting project

BITP412: Self Study [2C]
# LIST OF OPEN ELECTIVES OFFERED

APART FROM DEPARTMENTAL ELECTIVES

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