SCHEME OF B.E. (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior & Attendance

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (20)	ESE (60)	Int.	Ext.	
SEM-III												
BAML201	Applied Mathematics – III	4	-	-	4	4	20	20	60	-	-	100
BECL 201	Electronic Devices & Circuits	3	1	-	4	4	20	20	60	-	-	100
BECP 201	Electronic Devices & Circuits	-	-	2	2	1	-	-	-	50	-	50
BEEL201	Network Theory	3	1	-	4	4	20	20	60	-	-	100
BECL 202	Communication Electronics	3	1	-	4	4	20	20	60	-	-	100
BECP 202	Communication Electronics	-	-	2	2	1	-	-	-	25	-	25
BCSL201	Data Structures using C	3	1	-	4	4	20	20	60	-	-	100
BCSP201	Data Structures using C	-	-	2	2	1	-	-	-	25	-	25
MBL102	General Proficiency-II	1	-	2	3	Audit Course	-	-	-	G	-	-
	Total	**17**	**4**	**8**	**29**	**23**						**600**

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (20)	ESE (60)	Int.	Ext.	
SEM-IV												

BEEL 310	Power Electronics	4	-	-	4	4	20	20	60	-	-	100
BEEP 310	Power Electronics	-	-	2	2	1	-	-	-	25	-	25
BCSL 202	Computer Architecture & Organization	3	1	-	4	4	20	20	60	-	-	100
BECL 301	Digital System Design	3	1	-	4	4	20	20	60	-	-	100
BECP 301	Digital System Design	-	-	2	2	1	-	-	-	25	-	25
BECL 205	Field Theory	3	1	-	4	4	20	20	60	-	-	100
BECL 302	Analog Systems & Design	3	1	-	4	4	20	20	60	-	-	100
BECP 302	Analog Systems & Design	-	-	2	2	1	-	-	-	25	-	25
BECP 206	Modeling & Simulation	-	-	2	2	1	-	-	-	25	-	25
MBL103	General Proficiency-III	1	-	2	3	Audit Course	-	-	-	G	-	-
	Total	**17**	**4**	**10**	**31**	**24**						**600**

SCHEME OF B.E. (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior & Attendance

Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**					
							Theory			**Practical**		**Total**
		Th.	**Tu**	**Pr.**	**Total**		**(TAE) (20)**	**(CAE (20)**	**ESE (60)**	**Int.**	**Ext.**	
SEM-V												
BECL 303	Microprocessor Based Systems	3	1	-	4	4	20	20	60	-	-	100
BECP 303	Microprocessor Based Systems	-	-	2	2	1	-	-	-	25	25	50
BECL 304	Signal & Systems	3	1	-	4	4	20	20	60	-	-	100
BECL 401	Television Engineering	3	1	-	4	4	20	20	60	-	-	100

BECP 401	Television Engineering	-	-	2	2	1	-	-	-	25	25	50
BECL 403	Digital Communication	3	1	-	4	4	20	20	60	-	-	100
BECP 403	Digital Communication	-	-	2	2	1	-	-	-	25	-	25
BITL302	Computer Networks	4	-	-	4	4	20	20	60	-	-	100
BECP 305	Electronics Workshop Practice-I	-	-	2	2	1	-	-	-	25	-	25
BECP 311	Self Study	-	-	2	2	2	-	-	-	50	-	50
MBL104	General Proficiency-IV	-	-	2	2	Audit Course	-	-	-	G	-	-
	Total	**16**	**4**	**12**	**32**	**26**						**700**

Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**					
							Theory			**Practical**		**Total**
		Th.	**Tu**	**Pr.**	**Total**		**(TAE) (20)**	**(CAE) (20)**	**ESE (60)**	**Int.**	**Ext.**	
SEMESTER-VI												
BECL 315	Telematics	3	-	-	3	3	20	20	60	-	-	100
BECP 315	Telematics	-	-	2	2	1	-	-	-	25	25	50
BECL 405	Digital Signal Processing	3	-	-	3	3	20	20	60	-	-	100
BECP 405	Digital Signal Processing	-	-	2	2	1	-	-	-	25	25	50
BHUL301	Engineering Economics & Industrial Management	3	-	-	3	3	20	20	60	-	-	100
BEEL 312	Control System Engineering	3	-	-	3	3	20	20	60	-	-	100
XXXXXX	Elective – I	3	-	-	3	3	20	20	60	-	-	100
BECP 307	Minor Project	-	-	2	2	2	-	-	-	50	-	50
XXXXXX	Open Elective	3	-	-	3	3	20	20	60	-	-	100
MBL105	General	2	-	-	2	Audit	-	-	-	G	-	-

	Proficiency-V					Course						
MBL106	General Proficiency-VI (Research Methodology)	2	-	-	2	Audit Course	-	-	-	G	-	-
	Total	**22**	**-**	**6**	**28**	**22**	**120**	**120**	**360**			**750**

Elective –I **:** BCSL312: Computer Graphics & Visualization, BECL427: Communication Protocol Design

BECL406: CMOS VLSI Design , BECL417: Sensors & Transducers

OPEN ELECTIVES

BAML301 Optimization Techniques – Mathematics.

BCEL430 Environmental Science – Civil And Chemistry.

BECL417 Sensors And Transducers – Electronics And Telecommunications

BECL430 Intellectual Property Right – Interdisciplinary

BITL430 Foundation Course In Information Technology And Management It & Mba.

BMEL401 Nano-Technology – Mechanical And Physics

BMEL402 Unconventional Energy Systems – Mechanical And Electrical.

BPHL302 Material Science – Physics.

CSEL413 Genetic Engineering – Computer Science.

MBEL209 Finance For Non Financials.

MBEL201 Principles Of Business Management.

MBEL202 Foundation Course In Marketing Management.

MBEL203 Foundation Course In Human Resource Management

MBEL204 Business Legislation

MBEL205 Foundation Course In Accounting.

MBEL206 Quantitative Decision Making

} MBA

MBEL207 Financial Management.

BECL431 Fuzzy Logic

MBEL200 Constitution of India

SCHEME OF B.E. (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

*TAE will be based on Home Assignment, Seminar, Quiz, Surprise Test, Group Discussion, Debate, General Behavior & Attendance

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (20)	ESE (60)	Int.	Ext.	
SEMESTER-VII												
BECL 413	Wireless Communication	3	-	-	3	3	20	20	60	-	-	100
BECL 414	Optical Communication	3	-	-	3	3	20	20	60	-	-	100
BECP 414	Optical Communication	-	-	2	2	1	-	-	-	25	25	50
BECL410	Embedded Systems	3	-	-	3	3	20	20	60	-	-	100
BECL 306	Microwave Engineering	3	-	-	3	3	20	20	60	-	-	100
BECP 306	Microwave Engineering	-	-	2	2	1	-	-	-	25	25	50
XXXXX X	Elective-II	3	-	-	3	3	20	20	60	-	-	100
XXXXX X	Elective-III	3	-	-	3	3	20	20	60	-	-	100
BECP408	Project Phase I : Project	-	-	4	4	2	-	-	-	50	-	50
	Total	**18**	**-**	**8**	**26**	**22**						**750**

Elective –II

BECL409 DIGITAL IMAGE PROCESSING

BECL424 APPLICATION SPECIFIC INTEGRATED CIRCUITS DESIGN

BMEL403 MECHATRONICS

BECL428 WIRELESS SENSOR NETWORKS

BECL415 RADAR & SATELLITE COMMUNICATION

Elective-III

BMEL420	ROBOTICS
BECL422	MICROELECTROMECHANICAL SYSTEMS (MEMS)
BECL425	RTOS
BECL416	MOBILE COMMUNICATION
BEEL420	PLC & SCADA

Sub. Code	**Name of the Course**	**Teaching Scheme**				**Credits**	**Evaluation Scheme**					
							Theory			**Practical**		**Total**
		Th.	**Tu**	**Pr.**	**Total**		**(TAE) (20)**	**(CAE (20)**	**ESE (60)**	**Int.**	**Ext.**	
SEMESTER-VIII												
BECP411	Industry Project Internship	-	-	30	30	20	-	-	-	250	250	500
	Total	**-**	**-**	**30**	**30**	20						500

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

1. Use Laplace and Z-Transform in analyzing Electronics and Communication systems.
2. Apply concepts of Partial Differential Equations and Fourier series in solving engineering problems
3. Apply concepts of complex variables and Calculus of Variation to solve engineering problems.

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: (10Hrs)

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 Laurentz'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:

1. Grewal, B.S, Higher Engineering Mathematics, Thirty eighth Edition, Khanna Publishers, 2004.
2. Kreyszig, E., Advanced Engineering Mathematics, Eighth Edition, John Wiley & Sons, 2000.

Reference Books:

1. Jain, R.K. and Iyengar,S.R.K, Advanced Engineering Mathematics, Third Edition, NEW DELHI, Narosa Publishers, 2007.

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 :

At the end of the course the student shall be able:

1. Understand the functions, operations and applications of different Diodes, BJT and CMOS Devices.
2. Apply semiconductor theories to design analog electronic circuits and investigate their performance
3. Design and analyze oscillators, feedback and power amplifiers.
4. Acquire hands-on laboratory experience, utilizing oscilloscopes and other modern test equipments

Course Content:

Unit I: PN JUNCTION DIODE (10 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 (10Hrs)

Theory of operation, Static Characteristics, Break down voltages, Current voltage, Power Limitations, Ebers-moll Model, Continuity Equation, Biasing BJT, Different Biasing arrangement, Stability factor, thermal runaway, Power Transistors. CE, CB, CC Classification and Characteristics, Small Signal Analysis, Regulators: Design of Shunt & Series regulators, Introduction to SMPS ,

Unit III: FEEDBACK AMPLIFIERS & OSCILLATORS (10 Hrs)

Feedback Amplifiers, Classification of Oscillators, Stability, Bark Hausen Criteria, Design of RC, LC and Crystal Oscillators.

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, Emitter follower, Applications .

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, Diode and MOSFET , Transistors, MOSFET Switches, Transmission Gate, Inverter - DC, AC Analysis. Advance topics on the subject.

Text Books:

1. Christos C Halkias, Jacob Millman, Jit Satyabrata, Millman's Electronic Devices and Circuits, 2nd Edition, The McGraw-Hill Company, 2011
2. S Salivahanan, N Suresh Kumar, Electronics Devices and Circuits, 3rd Edition, Mc Graw Hill, 2008
3. Millman and Halkies, 'Integrated Electronics', 2nd Edition, McGraw-Hill Inc, 2009

Reference Books:

1. Robert L. Boylestad, Louis Nashelsky, Electronics devices and Circutis and Theory, 10th Edition, Pearson India, 2009
2. Nagrath I J, Electronics Devices and Circutis, 3rd Edition, Phi Learning Pvt Ltd, 2009

BECP 201 ELECTRONIC DEVICES & CIRCUITS Total Hrs : 20

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 pushpull 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.:[60 Hrs.]

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 :

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

1. Simplify circuits using mathematical tools, network theorems or network reduction approach.
2. Understand the analysis techniques of electrical networks and also synthesis of passive networks

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 (10Hrs.)

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:

1. Van Valkenburg, 'Network Analysis, 3rd Edition, Prentice Hall of India, 2001
2. Kelkar and Pandit, Linear Network Theory, 1st Edition, Pratibha Publication, 1995

Reference Books:

1. Sudhakar and S.P. Shyam Mohan, Circuit and Network, 2nd Edition, Tata Mc Graw Hill, 2002
2. D. Roy Choudhary, Network and System, 1st Edition, New Age International Publication, 1998
3. G.K. Mittal, Network Analysis, 11th Edition, Khanna Publication, 2003
4. B.R. Gupta, Network Systems & Analysis, 2nd Edition, S. Chand publication, 2005

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.
2. To understand the concept of multiplexing.
3. To understand theory of digital modulation.
4. To understand working of radio receivers.

Course Outcomes :

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

1. Understand the fundamentals of communication systems and to perform amplitude and angle modulation and demodulation of analog signals
2. Perform and analyze PAM, PCM and PWM
3. Analyze FDM and TDM systems.
4. Design and conduct experiments, using modern communication tools necessary for various engineering applications.

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.)

Angle modulation, frequency modulation spectrum reactance tube and FET modulators, Armstrong method, FM transmitters, frequency stabilization methods, FM discriminator, foster Seeley, PLL detectors, stereo phonic FM, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, IFRR, Tracking, De-emphasis, Mixers.

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:

1. Kennedy, Davis, Electronics Communication System, 4th Edition, TMH, 2010
2. Roddy & Coolen, Communication Electronics, 4th Edition, PHI, 2010
3. Frenzel, Communication Electronics Principles and Applications, 3rd Edition, TATA McGraw-Hill, 3rd Edition, 2011
4. U.A.Bakshi, A.P.Godse, Communication Engineering, 3rd Edition, Technical Publications, 2009

Reference Books:

1. B.P.Lathi, Modern Digital & Analog Communication Systems, 3rd Edition, Oxford Press Publication, 1998
2. Simon Haykin, Digital Communication, 3rd Edition, Wiley and sons, 2003
3. John G.Prokis, Digital Communication, 3rd Edition, TMG, 2002
4. Shanmugham, Digital Communication, 4th Edition, Wiley student, 2009

BECP202 COMMUNICATION ELECTRONICS

LIST OF EXPERIMENTS : (30Hrs)

1. Generation of Amplitude Modulation using transistor BC 548 and Calculate modulation index. Perform simulation in MATLAB.
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 andVerify results using Microcap.
6. Generation of Pulse Width Modulation (PWM) signal using IC 555 on breadboard and Verify results using Micro-cap.
7. Generation of Pulse Position Modulation (PPM) signal using IC 555 on breadboard. And Verify results using Micro-cap.
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 Simulink
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

BCSL201 DATA STRUCTURES USING C [3-1-2-5]
Total Hr.:[60 Hrs.]

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 :

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

1. Understand the Basics of structure of data using C Language
2. Develop an appropriate structure for data structure problems and analyze them for certain applications.
3. Understand advanced techniques for sorting and searching data efficiently.
4. Apply the programming and data structure concepts in C

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; 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)

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 (10 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)

Introduction,Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees,Traversal Algorithms Using Stacks,Header Nodes; Threads ,Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree,Balanced Binary Trees,AVL Search Trees,Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree,B-Trees ,Searching, Insertion and Deletion in a B-tree,B+-Trees

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:

1. Seymour Lipschutz, Schaums Outlines, Data Structures with C, 1st Edition, Tata Mc Graw Hill, 2010

Reference Books:

1. S. Sahani, Data Structures in C, 2nd Edition, Galgotia Publication, 2003
2. D.Samantha, Classic Data Structure, 2nd Edition, PHI Publications, 2004

BCSP201 DATA STRUCTURES USING C
Total Hrs: 20

LIST OF EXPERIMENTS:

1. Write and execute a program in C to implement stack using arrays
2. Write and execute a program in C to implement queue using arrays
3. Write and execute a program in C to implement simple linked list
4. Write and execute a program in C to implement stack using linked list
5. Write and execute a program in C to implement queue using linked list
6. Write and execute a program in C to implement doubly linked list
7. Write and execute a program in C to implement circular linked list.
8. 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 inorder, preorder and postorder 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

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.

Topic	Learning Goals	Activities
The Alphabets and accents	Pronunciations techniques	Worksheet and charts

Number 1 to 20		
Greetings & Salutations	Articles , Personal Pronoun	Day timing , Daily routines forms of respects , Vocabulary
Family and relations	Shapes and colors , Possessive Pronouns , Gender , Negative Sentence	Relations, Day of week
Weather and Seasons	Climate , Fabrics & Clothes , sizes , interrogatives , Basic verbs	Group Activities , Paragraph writing including , Names of months , Seasons , Sky , Stars
House & Household things	Describing neighborhood. Present Tense	Furniture , Household articles, Colors
Visit to supermarket	Learning the shopping etiquettes , vocabulary of food items , conversing with shopkeepers etc , Plurals	Project on vocabulary of vegetables and fruits , Bakery products , Group Activity / Role play
Timing , Telephonic Conversions	How to Ask time , converse on telephone	Timing and clock (Hours & Minutes)
Visit to city , Prominent places and park	Nature , Directions , Means of transportations, Tenses contd….	Self introductions , Role-play , preparing charts
In Restaurant / Hotel	Ordering eatables , Table manner .Verbs	Enhancing vocabulary of food Dishes , cutlery
Visit to Doctor	Health matters, illness. Commonly used verbs contd..	Worksheets , projects
French / German /Spanish culture – monuments , delicacies , wines visa vis Indian culture Diwali festival	Vocabulary of clothes , Accessories , Cuisines , Beverages , Adjectives	Presentations by students , situation based conversations
Receiving Guests/ Entertaining people / Good Bye's	Customs , Traditions , Manners , welcome & Audieu's	Activities , Role play , Assignments

FOURTH SEMESTER

BEEL310 POWER ELECTRONICS
(4-0-2-5) Total Hr.:[60 Hrs.]

Course-Prerequisite :Basic Electrical (BEEL106), Basic Electronics (BPHL105), Electronic Devices & Circuits (BECL201), 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:

1. Select the device appropriate to the design for current, voltage and frequency specifications
2. Understand the design issues for solid devices based converter, inverter and chopper circuits for power applications.
3. Know and understand the harmonics, filters and PWM techniques.
4. Design the circuit for various power electronics application using semiconductor devices.

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, Uni- junction transistors, Triggering circuits and opto couplers.

Unit II: Line commutated converters: (10 Hrs.)

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 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 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: (10 Hrs.)

Principles of step down chopper, step up chopper classification, impulse commutated and resonant pulse choppers. Multi phase choppers. Application of choppers, Inverters: Basic series resonant. Inverter, half bridge and full bridge series resonant inverters.

Unit VI: Single phase and three phase invertors:
(10 Hrs.)

Single phase and three phase bridge invertors, commutation and trigger-circuits for forced com mutated 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:

1. M.H. Rashid, Power Electronics Circuits , Devices and Applications, 4th Edition, Pearson Education Publication, 2013
2. C. W. Lander, Power Electronics, 3rd Edition, Paper Back Publication, 1993

3. Dr. P. S. Bimbhra, Power Electronics, 4th Edition, Khanna Publishers, 2012

Reference Books:

1. P.C.Sen, Power Electronics, 30th reprint, 30th Reprint Tata McGraw Hill, 2001
2. Dr. M. Ramamoorthy, An Introduction to Thyristers and their Applications, 2nd Edition, East-West Press, 1991

BEEP310 POWER ELECTRONICS

LIST OF EXPERIMENTS : (30 Hrs)

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 cycloconverter 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 (BITL104), Basic Electronics (BPHL105)

Course-Co requisite :Digital System Design (BECP301)

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:

1. Understand the basic structure and operation of a digital computer.
2. Understand different types of control and concept of pipelining and ways of communicating with I/O devices and interfaces..
3. Understand organization and design of memory .Concept, structure and operation of Cache memory and virtual memory.

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, Microprogrammed 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.)

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution Units, performance considerations, Basic concepts in parallel processing & classification of parallel architectures. Vector Processing, Array Processors. Recent trends in Computer Architecture & Organization, Advanced topics & its Application.

Text Books:

1. V.C.Hamacher, Z.G.Vranesic and S.G.Zaky, Computer Organisation, 5th Edition, McGraw Hill, 2002
2. A.S.Tanenbaum, Structured Computer Organization, 4th Edition, Pearson Education, 2006
3. M Mano, Computer System and Architecture, 3rd Edition, Prentice Hall, 1993

Reference Books:

1. W. Stallings, Computer Organization & Architecture, 7th Edition, Pearson Education, 2008
2. J.P.Hayes, Computer Architecture & Organization, 3rd Edition, McGraw Hill, 2012

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:e 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 :
1. Understand digital systems modeling using VHDL.
2. Write correct synthesizable System VHDL models along with test benches.
3. Design digital systems that are reconfigurable for testing.
4. Simulate and synthesize programming models for digital circuits using ISE and Quartus tools.

UnitI: Introduction (12 Hrs.)
Introduction to VHDL, Methodologies, design Units, data objects, VHDL data types, Attributes.

Unit II: VHDL Statements and concept of delays. (8 Hrs.)

Concurrent and sequential statements, inertial and transport delays, delta delay, signal drivers.

Unit III: Programming concepts. (8 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.)
Introduction to place & route process, Introduction to ROM, PLA, PAL, Architecture of CPLD (Xilinx / Altera). Advanced trends in digital system design.

Text Books:

1. Stephen Brown, Zvonko Vranesic, Fundamentals of Digital Logic with VHDL design, 4th Edition, TMH, 2006

2. S.S. Limaye, 'VHDL A Design Oriented Approach', 4th Edition, The Mc Graw Hill, 2009
3. Manjita Shrivastava, Digital Design HDL-based approach, 2nd Edition, Cenage Learning, 2011

Reference Books:

1. J Bhasker, VHDL Primer, 3rd Edition, Pearson Education, 2007
2. Douglas Perry, VHDL, 3rd Edition, TMH, 2008
3. Zainalabedin Navabbi, VHDL, 3rd Edition, McGraw-Hill professional, 2007

BECP301 DIGITAL SYSTEM DESIGN

LIST OF EXPERIMENTS (30 Hrs)

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:

1. Apply vector calculus to understand the behavior of static electric fields and static magnetic fields in standard configurations
2. Understand the concept of Maxwell's equation for static and time varying fields.
3. Workout simplified solutions to problems of electromagnetic wave propagations, waveguides and antennas

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 circuital law and applications,Magnetic flux and Flux density,Scalar and Vector magnetic potentials.

Unit III MAXWELL'S EQUATIONS AND BOUNDARY CONDITIONS:
(8Hrs)
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, Poynting vector and Poynting 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:
(**8Hrs)**
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:

1. W.H Hayt. and J.A. Buck, Engineering Electromagnetics, 7th Edition, Tata Mc-Graw Hill, 2006
2. A.U.Tinguria, Fundamentals of Electromagnetic Fields, 3rd Edition, Denett & Co., 2010

Reference Books:

1. K. D. Prasad, Antenna & wave propogation, 3rd Edition, PHI Publication, 2009
2. E.C. Jordan and K.C. Balamin, Electromagnetic Waves and Radiating System, 2nd Edition, Prentice Hall of India Private Limited, 1985
3. J.D Krauss, Electromagnetics, 3rd Edition, Mc-Graw Hill, 1984
4. Rao, Elements of Engineering Electromagnetics, 6th Edition, Pearson education, 2006

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:

1. Apply OPAMP fundamentals in design, evaluation and analysis of analog applications.
2. Design filters, oscillators and analog systems.
3. Develop and design analog system for linear and non linear operations.

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)
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 (9Hrs)
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 (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 Clampers, 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:

1. Ramakant Gayakwad., Op-Amps And Linear Integrated Circuits, 3rd Edition, PHI, 1993
2. K.R.Botkar, Integrated Electronics, Khanna Publishers,1996

Reference Books:

1. Franco, 'Design With Operational Amplifiers And Analog Integrated Circuits', 2nd Edition, McGraw-Hill., 1992
2. Coughlin and Driscol, Op-Amps And Linear Integrated Circuits', 5th Edition, PHI,1998
3. Sedra and Smith, 'Microelectronic Circuits', 4th Edition, Oxford University Press, 1996

BECP302 ANALOG SYSTEMS AND DESIGN

LIST OF EXPERIMENTS (30Hrs)

1. Design and simulate buffer amplifier using IC 741.
2. Design and verify gain and frequency response of Inverting and Non-inverting amplifier using IC 741.
Show its simulation results on microcap.
3. Design and verify gain and frequency response of Integrator and Differentiator ckt. Using IC 741. Show its simulation results on microcap.
4. Verify Op-amp parameters (1) CMRR (2) Slew Rate.
5. Verify and simulate Clipper circuit using IC 741.
6. Design and verify Multivibrator circuits using IC 555.
7. Design any regulator IC application on breadboard.
8. A) To design a Zener Shunt Voltage Regulator.
B) Simulate the Zener Shunt Voltage Regulator and observe the waveform using microcap.
9. A) To design a Wein Bridge Oscillator.
B) Generate the oscillations in microcap using Wein Bridge oscillator.
10. A) To design 2nd order Low Pass Filter.
B) To study the frequency Vs gain characteristic of Low Pass Filter using Microcap
11. A) Study of Low Voltage Regulator using IC 723.
B) Simulate and observe the regulated waveform on microcap.
12. 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)

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:

1. Design and Simulate the linear and non-liner based analog and digital circuits for engineering applications.
2. Apply different simulation tools for desired simulation results and apply visualization techniques to support the simulation process

LIST OF EXPERIMENTS (30Hrs)

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.
5. Design Differential amplifier 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
13. Open Ended modeling experiments

MBL103: GENERAL PROFICIENCY-III : SOFT SKILLS

SEMESTER-IV [1L+2P]

Teaching Scheme:

Lectures: 1Hrs /Week

Practical: 2 Hrs /Week

Audit course

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:

At the end of the course the 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.

GP-III Hobby Classes

1. Pranayam and Meditation
2. Nature Club and Trekking
3. Guitar
4. Sketching
5. Volleyball
6. Dancing
7. Spirit of Entrepreneurship
8. Electronics Circuit Design
9. Photography
10. Expressing Yourself
11. Synthesizer
12. Soft Skills and Campus recruitment Training(CRT)
13. Kathak
14. English Drama
15. Horse Riding
16. Professional Ethics

FIFTH SEMESTER

BECL303 MICROPROCESSOR BASED SYSTEMS [3-1-2-5) Total Hr.:[60 Hrs.]

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 :

1. Understand the architecture and programming of processor family.
2. Understand hardware and software aspects of microprocessor based systems
3. Interface peripheral devices with microprocessors.

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)

Architecture, Interfacing and programming of Peripherals, 8259 & 8251, Serial Communication Standards RS 232, RS 485,

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:

1. D.V. Hall, Programming & Interfacing of 8086 / 8088, 3rd edition, TMH, 2012
2. A K Ray & Bhurchandi, Advanced Microprocessor & peripherals, 2nd edition, TMH, 2012
3. Yu-Cheng Liu & Glenn A Gibson, Microcomputer systems 8086/8088 family, Architecture, Programming and Design, 2nd edition, Prentice Hall of India, 2003

Reference Books:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, 5th Edition, Penram International, 2013
2. Barry B. Brey, The Intel microprocessors Architecture, Programming & interfacing, 8th edition, Pearson Education, 2008

BECP303 MICROPROCESSOR BASED SYSTEMS
[30Hrs]

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].
2. Write an ALP to compare a string by using string related instructions of 8086.
3. Write an assembly language program for 8086 to generate Fibonacci series and store it from memory location 0050H.
4. Write an ALP to find the Number in Memory Array.
5. Write an ALP to arrange a string in Ascending/Descending order.
6. Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED's.
7. Interface 8253 with 8086 microprocessor
8. Interface 8251 with 8086 microprocessor
9. Interface peripheral device Analog to Digital Converter ADC with 8086 using 8255
10. 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:

1. Obtain a system response to standard signals and then to any signals.
2. Represent the systems in time and frequency domain using fourier transforms
3. Understand and analyze discrete time signals for information measures.

Course Content:

Unit I: PROBABILITY (10 Hrs)

Random process, probability, random variables, processes stationary, mean correlation covariance functions, time average and ergodicity, transmission of random process through a linear filter, spectral density, Guassian process noise, narrow band noise, envelope of sine wave plus narrow band noise.

Unit II: LINEAR TIME-INVARIANT SYSTEM (12 Hrs)

Different Types Of Signals; Linearity, Time Invariance And Causality; Impulse Sequence, Impulse Functions And Other Singularity Functions Time-Domain Representation And Analysis Of LTI Systems Based On Convolution And Differential Equations, Convolution Sum, Convolution Integral And Their Evaluation, Properties Of LTI Systems.

Unit III: CONTINUOUS TIME FOURIER TRANSFORM [CTFT] (10 Hrs)

Representation Of Aperiodic Signal, Fourier Transform For Periodic Signals, Properties Of CTFT, Properties Of CTFT, Convolution Property

Unit IV: DISCRETE TIME FOURIER TRANSFORM [DTFT]

(10Hrs) Representation Of Aperiodic Signal, Fourier Transform For Periodic Signals, Properties Of CTFT, Properties Of CTFT, Convolution Property.

Unit V: SAMPLING (08 Hrs)

Sampling Theorem, Effect Of Under Sampling, and Sampling Of Discrete -Time Signals.

Unit VI: INFORMATION THEORY (10 Hrs)

Information measures, Entropy, Chaney capacity of discrete & continuous channels,Shannon Hartley Theorem Huffmann Coding[upto 3rd Order], Advancement in signals and systems.

Text Books:

1. Roberts M. J, Signals and Systems - Analysis using Transform methods and MATLAB, IInd Edition, Tata McGraw Hill Edition, 2003
2. Oppenhein, Wilsky, Nawab, Signals and Systems, IInd Edition, Pearson Education, 2006
3. Nagrath I. J., Sharan S. N., Ranjan R., Kumar S, Signals and Systems', IInd Edition, Tata McGraw Hill Edition, 2001
4. Haykin Simon, Barry van Veen, Signals and Systems', IInd Edition, John Wiley and Sons [Asia], 1998
5. J.S.Chitode, 'Digital Communication', Technical Publication Pune, 2013

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:

1. Understand the fundamental concepts of television transmitter and receiver systems.
2. Understand different color transmission and reception systems used worldwide and its compatibility
3. Trouble-shoot, test & Align television systems.

Course Content:

Unit I: (12 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: (10 Hrs)

Monochrome TV camera tubes: image Orthicon, Vidicon and Plumbicon tubes, Monochrome TV transmitter block diagram, and TV transmitting and receving antenna.

Unit III: (10 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: (10 Hrs)

Essential of color TV, Compatibility, Three – colors theory, chromaticity diagram, color TV camera, production of luminance and color – difference signals color TV picture tubes: Delta gun, P.I.L. and Trinitron tubes.

Unit V: (10 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:

(08 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

Text Books:

1. R.R. Gulati, Monochrome & Color TV, 3rd Edition, PHI Learning, 2014
2. A M. Dhake, TV and Video Engineering, 2nd Edition, Tata McGraw-Hill Education, 2001

Reference Books:

1. R G Gupta, Television Engineering and Video Systems, 2nd Edition, Tata McGraw-Hill Education, 2011
2. Jerry Whitaker, Blair Benson, Standard Handbook of Video and Television, Engineering, 4th Edition, Tata McGraw-Hill Education, 2003

BECP 401: TV ENGINEERING

Total Hrs.: 20

LIST OF EXPERIMENTS :

1. Introduction to Monochrome Picture tube.
2. To demonstrate RF Tuner Section and perform analysis of faults in the tuner section
3. Testing of Sound IF section and perform analysis of faults in the audio section
4. Testing of Video IF Section and perform analysis of faults in the Video section
5. To demonstrate circuit description of Sync & Horizontal oscillator section and perform analysis of faults in color & Monochrome TV.
6. To demonstrate circuit description of Vertical oscillator section and perform analysis of faults in color & Monochrome TV.

7 To demonstrate circuit description of Video and Chroma section and perform analysis of faults.

8 To demonstrate circuit description of system control section & perform analysis of faults in color & Monochrome TV.

9 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:

1. Apply knowledge of mathematics, science and engineering in the design of digital communication circuits and systems.
2. Analyze the different coding technique for design and modeling of digital communication
3. Design digital communication systems to meet predefined specifications.
4. Design and conduct experiments for testing digital communication circuits and systems.

Course Content:

Unit I
(12Hrs)

Digital base band modulation techniques :Bandwidth of digital Data, Base band system, Formatting 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
(10Hrs)

Digital data transmission systems and transmission media: Digital Communication system, Line coding, Pulse shaping, Scrambling, Regenerative repeater, Detection- Error Probability, M-ary communication, Digital carrier systems, Digital multiplexing, Transmission media, Inter symbol Interference.

Unit III :
(10Hrs) 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
(10Hrs)

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 :
(10Hrs)

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, Orthogonality between codes Multiple access techniques Commercial Applications, Cellular Systems. Advance topics on Digital Communication

Text Books:

1. Bernard Sklar, 'Digital Communications (Fundamentals and applications)', Second Edition, Pearson Education Asia, 2013
2. B. P. Lathi, 'Modern Digital and Analog Communication Systems', Third edition, Oxford University press, 1998
3. Simon Haykin, ' Digital Communication', Student Edition, Wiley Eastern, 2004

Reference Books:

1. J. S. Chitode, 'Digital Communication', Fifth Edition, Technical Publication, 2006
2. Sanjay Agarwal, ' Digital Communication', Third edition, S.K.Kataria & Sons, 2013

BECP 403 DIGITAL COMMUNICATION
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
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 :

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 networks.

Course Outcomes : student shall be able to:

1. Understand fundamental principles and the functionality of Layered Network Architecture of Computer Networking.
2. Analyze and implement computer network algorithms.

Course Content:

Unit-I:
(12 Hrs)

Introduction: The use of computer networks, networks for companies, network for people, social issues. Network hardware. LAN's, Man's, WAN's, wireless networks, 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, critique of OSI model & protocols, critique of TCP/IP reference model. Example networks - novel! Netware, RPANET, NSFNET, the internet, SMDS, X.25 network, frame relay, network standardization - who's who in the telecommunication world, who's who in international standards world, who's who in the internet standards world.

Unit-lI:
(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. Wireless 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-Ill:
(10Hrs)

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. CSI\IA, 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:
(12Hrs)

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:

1. Andrew Tanenbaum, Computer Networks, 5th Edition, Pearson Education, Limited, 2013
2. Behrouz A. Forouzan, Data Communication & Networking, 4th Edition, McGraw Hill, 2007

Reference Books:

1. William Stallings, Data. & Computer Communication, 8 Edition, Pearson Education, Limited, 2009

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:

1. Identify and test the electronic components used in systems.
2. Implement, design and test PCB manually and using CAD tool

LIST OF EXPERIMENTS :

1. To identify electronics and Surface Mounting Devices (SMD) components.
2. To perform Component testing using Measuring Instruments.
3. To perform testing of electronics components using CRO, Multi-meter, & LCR-Q meter..
4. To identify different type of Transformers, Switches, Relays, Cables, & Connectors.
5. To design Printed Circuit Board (PCB) Layout & preparation of PCB artwork using graph & OrCAD Software.
6. To perform PCB Exposing & Etching by various methods.
7. To perform soldering and de-soldering on dot printed circuit board.
8. To study 8051 Microcontroller & downloading program using Power lab.
9. Mini Project
10. To design Printed Circuit Board using wave Soldering (single wave) Machine.

BECP311- SELF STUDY [0-0-2-2]

Course Objectives:

1. To use advanced communication tools for analysis and modeling the communication based techniques
2. 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:

1. Use various software simulation tools for design and modeling the electronics circuit based on Advanced engineering.
2. Analyze recent trend and advanced topics in electronics & Telecommunication Engineering to meet predefined specifications

MBL104: General Proficiency-IV (Advanced Communication Skill)

SEMESTER-V [2L]

Teaching Scheme:

Lectures: 2Hrs /Week

Audit course

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.

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:

1. Understand concepts of wired and wireless communication systems.
2. Apply and analyze the principles of GPS,GSM,EPABX etc. technologies to applications.
3. Use various types of Switching System & to learn switching standard.
4. Understand working principle of switching mechanism of Relay & DTMF receiver.

Course Content:

Unit I: INTRODUCTION (08 Hrs)

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: ELECTRONIC SWITCHING (07 Hrs)

Time Multiplexed Time Switch, Time Multiplex Space Switch, Time Division Space Switch, Time Slot Interchanging; Dual Processor Configuration, Reliability and Availability Criteria.

Unit III: TRAFFIC ENGINEERING (06 Hrs)

Overview of TRAFFIC Engineering, Numbering Plan and Charging Plan.

Unit IV: COMPUTER COMMUNICATION (08 Hrs)

Computer Communication Over Telephone Line, Low, Medium and High Speed MODEM with Standard Bit Rates.

Unit V: ISDN AND BISDN (08 Hrs)

Overview, ISDN Channels, User Access, ISDN Protocol, EPBAX Systems, DTMF, GSM, CDMA.

Unit VI: ASYNCHRSONOUS TRANSFER MODE (08 Hrs)

Protocol Architecture, ATM Logic Connections & Cells, Transmission of ATM Cells, ATM Adoption Layer, Traffic Control ATM in ISDN.

Text Books:

1. Viswanathan Thyagarajan, Telecommunication Switching Systems and Networks, 3rd Edition, 24th reprint, PHI Learning, 1992
2. Flood J. E., Telecommunications, Switching, Traffic and Networks, 2nd Edition, 12th Indian Reprint, Pearson Education, 1999
3. Ross John, Telecommunication Technologies, 2nd Edition, Thomson, Delmar Learning, 2003

Reference Books:

1. Stallings William, ISDN And Broadband ISDN With Frame Relay And ATM, 4th Edition, Prentice Hall, 1st Reprint, 2000
2. Anurag Kumar, Communication Networking: An Analytical Approach, 1st Edition, McGraw-Hill, 2005

BECP 315 TELEMATICS Total Hrs. 20

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 :

1. Apply theoretical and practical approach of modern signal processing in digital environment
2. Apply appropriate technique for application areas with particular stress on speech and image data
3. Apply the techniques, skills, and modern engineering tools such as MATLAB

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 discrete signals, sampling theorem & sampling process.

Unit II: (08 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: (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)

Discrete Fourier Transform: Discrete Fourier series, properties of discrete fourier series, Discrete fourier transform, properties of DFT, Inverse DFT, circular convolution using DFT-IDFT method. Fast fourier transform, Decimation in time FFT algorithm, decimation in frequency FFT algorithm, FFT of long sequences using overlap add and overlap save method.

Unit VI: (07 Hrs)

Digital signal processors: Introduction, DSP Processor Memory Architecture, Some examples of DSP processors, Overview of TMS320 Family DSP processors. Applications of Digital Signal Processing: Introduction, Application of DSP in Biomedical Engineering, voice processing, Applications to radar, Introduction to wavelets, advancement in digital signal processing.

Text Books:

1. Alan V Oppenheim, Ronald W. Schafer & Buch, Discrete time signal processing, 2nd Edition, Pearson, 1998
2. Sanjit K. Mitra, Digital Signal Processing – A Computer based approach, 4th Edition, paperback, 2013

Reference Books:

1. Proakis and Manolakis, Digital signal Processing Theory and application, 3rd Edition, PHI Ltd, 1996
2. S. salivahanan, A Vallavaraj, C. Gnanapriya, Digital Signal Processing, 2nd Edition, McGraw Hill

BECP 405: DIGITAL SIGNAL PROCESSING
Total Hrs: 20

LIST OF EXPERIMENTS:

1. Study of basic discrete time signals such as Unit impulse, step, ramp, real and complex exponential and its representations using MATLAB functions.
2. Use of MATLAB functions to obtain linear convolution of discrete signals.
3. Write a program for computing cross-correlation and auto-correlation of the given sequences.
4. Write a program to test stability of given discrete- time system.

5. 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.
9. Digital FIR filter design using Kaiser window, Hamming window.
10. Digital FIR filter design using GUI tool box for Kaiser window, Hamming window.
11. Study of DSP Processor using TMS 5416 and TMS 6713 starter kits.
12. Perform linear convolution and circular convolution using Processor kit.
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 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 Outcomes :

At the end of the course the 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

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]

Meaning, Nature and scope of financial management, Brief outline of profit and loss account, Balance sheet, Budget and their importance, Ratio Analysis, Principles of costing.

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
3. Prasanna Chandra, Financial Management: Theory and Practice, 8th Edition, Tata McGraw Hill, 2012

Reference Books:

1. L M Prasad, Principles and Practice of Management, 4th Edition, Sultan Chand & Co, 2009
2. Namakumari, Ramaswamy, Marketing Management, 6th Edition, McGraw-Hill, 2006

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:

1. Develop the mathematical models from a given physical system and study it for obtaining time response and frequency response.
2. Learn the stability of a physical system using graphical tools such as Bode plots, Nyquist plot, Root locus etc.
3. Perform experiment on real-time systems with an objective of studying its performance, stability, controllability and observability.

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., 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 (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:

1. B. C. Kuo, Automatic Control Systems, 7th Edition, P.H.I., 2009
2. Nagrath /Gopal, Control System Analysis, 5 th Edition, New Age International, 2010

Reference Books:

1. Norman S. Nise, Control System Engineering, 6 th Edition, Wiley, 2011

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 :

1. To impart basic fundamentals of computer graphics
2. To aim at developing fundamental data structures and algorithm for modeling.
3. To provide carrier opportunities in developing Video Games, Virtual Reality Applications, Computer Simulations, Computer Aided Design and web design.
4. 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:

1. Understand basics of 2 D and 3 D computer graphics and pixel classification.
2. Understand concept of animation and visual effects with reference to workflow and technology.
3. Understand algorithms and theories that form the basis of computer graphics and visualization.

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:

1. Rogers, Procedural Elements of Computer Graphics, 2nd Edition, Mc Graw Hill, 1997
2. Newman & Sproull, Principles of Interactive Computer Graphics, 2nd Edition, Mc Graw Hill

Reference Books:

1. Hearn & Baker, Computer Graphics, 4th Edition, PHI India, 2010
2. Peter Shirley, Fundamentals of Computer Graphics, 3rd Edition, CRC Press, 2009

BECL 427 COMMUNICATION PROTOCOL DESIGN [3-0-0-3] Total Hr.:[45Hrs.

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:

1. Understand network topology.
2. Understand architectures of network security and principle of Public Key Cryptography.

3. Analyze and solve the network problems.

Course Content:

Unit I: (8 Hrs)

Communication Protocol Introduction and technical issues, CSP description & proof rules: Process and process synchronization, channel history semantics, Failure Semantics.

Unit II: (8 Hrs)

Protocols and services: Providing a service, service features, OSI and other layered architecture. Protocol design: Introduction, Service Specification, Assumptions about the Channel, Protocol Vocabulary, Message Format, Procedure Rules

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)

Multi-peer Consensus: Reliable broadcast, Election, commitment, Byzantine Agreement, Clock synchronization, finding a global state.

Security: cryptographic methods, Digital signatures, Entity authentication.

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:
(6Hrs)

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:

1. Sharp, Robin, Principles of Protocol Design, Springer, 2008
2. Gerard J. Holzmann, Design And Validation Of Computer Protocols, 1st Edition, Prentice Hall, 1990
3. Venkataram, Pallapa, Manvi, Sunilkumar S., Babu, B. Sathish, Communication Protocol Engineering, 2nd Edition, PHI, 2008

Reference Books:

1. König, Hartmut, Protocol Engineering, Springer
2. Miroslav Popovic, Communication Protocol Engineering, 1st Edition, CRC Press, 2006

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:

1. Understand knowledge required to design, implement and test VLSI circuits through CMOS technology.
2. Integrate the VLSI circuits for complex systems

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 ckts ,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:

1. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis & Design-3, 3rd Edition, McGraw Hill, 2003
2. J.M.Rabaey A Chandrakasan, B.Nikolic, Digital Integrated Circuit'A design perspective, 2nd Edition, Springer, 2009

Reference Books:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuits, 2nd Edition, CRC Press, 2013

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:

1. Do error analysis associated with measurement.
2. Analyze and use the functions of various instrumentation systems.
3. Identify and Measure the sensors output for various applications.

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, Pirani 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, Magnetostrictive, 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 like4-20mA 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)

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, recent advancement in sensors and transducer.technology.

Text Books:

1. A.K. Sawhney, Electrical & Electronic Measurements and Instrumentation, Second Edition, Dhanpat Rai & Sons

Reference Books:

1. Patranabis D, Sensors and Transducers, Prentice Hall of India
2. E.D.doeblin, Measurement system, application and design, McGraw Hill

BECP307: MINOR PROJECT :[0-0-2-2]

Course Objectives : -

1. To provide opportUnity for selection of a project
2. Search related literature, identify appropriate components
3. Design, fabricate and test a real time system by working in a group.

Course Outcomes:

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

1. Search correct literature, select and propose a system, design, fabricate and test to develop conclusions
2. Work in a group of students of socially different backgrounds.
3. Analyze results, make conclusions and deliver by power point presentation before teachers and colleagues.

MBL105- GENERAL PROFICIENCY –V :

SEMESTER-VI [2L]

Teaching Scheme:

Lectures: 2Hrs /Week

Audit course

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 :

At the end of the course the 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.

MBL106 : GENERAL PROFICIENCY -VI

SEMESTER-VI [2L]

Teaching Scheme:

Lectures: 2Hrs /Week

Audit course

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 :

the 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.

OPEN ELECTIVES

For syllabus of open elective subjects, please refer syllabus provided in B.E. (Electronics Engineering) programme - Sixth Semester

SEVENTH SEMESTER

BECL 306: MICROWAVE ENGINEERING [3-0-2-4]
TotalHr.:[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:

Student shall be able to

1. Understand and make use of microwave devices.
2. Design and implement microwave systems.
3. Analyze the designed microwave systems.
4. Analyze the S-parameter of microwave component

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)

Limitations and Losses of conventional tubes at microwave frequencies. O-type tubes : 2 Cavity Klystrons, Reflex Klystrons, Electronic and Mechanical Tuning. Related Problems. HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process [qualitative treatment], Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations.M-type Tubes Introduction, Cross-field effects, Magnetrons 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

Unit 3: WAVEGUIDE COMPONENTS AND APPLICATIONS
(08 Hrs)

Coupling mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide attenuators - Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2 Hole, Bethe Hole types. Ferrites [3] – Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator. Scattering Matrix [3] – Significance, Formulation and Properties. S Matrix Calculations for – 2 port Junction, E plane and H plane Tees, Magic Tee, Directional Coupler, Circulator and Isolator. Related Problems.

Unit IV: MICROWAVE SOLID STATE DEVICES (06 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 5: 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)

Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements, Recent development in microwave engineering.

Text Books:

1. Rizzi Peter A., Microwave Engineering: Passive Circuits, 2nd Edition, Prentice-Hall, 1998

2. David M. Pozar, Microwave Engineering, 4th Edition, Wiley, 1997

Reference Books:

1. Annapurna Das , Sisir Das, Microwave Engineering, 4th Edition, Tata Mc Graw Hill, 2000
2. M.L. Sisodia and G.S.Raghuvanshi, Microwave Circuits and Passive Devices', 4th Edition, Wiley, 1987

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 tunning range.
3. To determine the frequency and wavelength in a rectangular wave guide working on TE10 mode.
4. To determine the standing wave ratio and reflection coefficient.
5. To measure an unknown impendence 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 wave guide horn antenna.
11. To study the function of multi hole directional coupler by measuring the parameters.
12. Study of Magic Tee.
13. To study the Attenuators.
14. To verify characteristics of Microstrip Components.
15. Open ended experiement.

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: Student shall be able to

1. To understand structure and programming of microcontrollers.
2. To design & implement microcontroller based embedded systems.
3. To use software and hardware tools for embedded system design.

Course Content:

Unit I: (8Hrs)

Microcontrollers : 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: (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:
(7Hrs)

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:

1. Muhammad Ali Mazidi, The 8051 Micro-controller & Embedded System using assembly & C, Second Edition, Pearson Education, 2008

2. Kenneth J. Ayala, The 8051 Micro-controller – Architecture, Programming & Applications, Second Edition, Penram International & Thomson Asia, 1996

Reference Books:

1. Shibu K. V., Introduction to Embedded System, The McGraw Hill, 2011
2. Ajay V. Deshmukh, Micro-controllers - Theory and Applications, Tata McGraw Hill
3. John B. Peatman, Design with PIC Micro-controllers, Low Price Edition, Pearson Education Asia, 1998
4. Data sheet of respective microcontrollers and RISC Controllers.

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:
Student shall be able to

1. Understand the basic concept of wireless communication
2. Analyze the GSM /TDMA techniques and systems
3. Conceptualize different wireless LAN technologies

Course Content:

Unit I (07 Hrs)

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks.

Unit II (07 Hrs)

Characteristics of air interface, Path loss and fading models, Area Coverage, Coding and Modulation techniques, Diversity techniques, Diversity Combining Techniques, 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, Cal 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, 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:

1. Mullet, Wireless Telecom System and Networks, 1st Edition, Thomas Learning, 2006
2. Lee W.C.Y., Mobile Cellular Telecommunication, 2nd Edition, MGH, 2004
3. D.P. Agrawal, Wireless Communication, 2nd Edition, Thomas Learning, 2007

Reference Books:

1. David Tse, Pramod Vishwanath, Fundamentals of Wireless Communication, 1st Edition, Cambridge, 2005

2. Theodore S. Rappaport, Wireless Communication Principles & Practice, 2nd Edition, Pearson, 2001

BECL 414 OPTICAL COMMUNICATION [3-0-2-4] Tot. Hrs.[45 hrs]

Course-Prerequisite :Digital Communication (BECL 403), Communication Electronics (BECL 202)

Course Objectives

1. To understand the basic concepts of fiber optical Communication.
2. To understand photonic systems, modulation formats and multiplexing technologies for OFC
3. To study and understand optical switching and fiber optical measurement.

Course Outcomes:
Student shall be able to

1. Analyze and Understand Terabit per second optical communication systems and associated technologies
2. Select, design and implement appropriate technologies for the implementation of optical fiber systems.
3. Perform experiments on optical communication set Ups and interpret results of experimentation

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)
Signal degradation in fibers – Attenuation, material dispersion, wave guide dispersion, pulse broadening, mode coupling. Dispersion shifted and dispersion flattened fibers. Attenuation and dispersion limits in fibers.

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: (08Hrs)
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, Recent development in optical communication.

Text Books:

1. John M Senior, Optical fiber communication principles and practice, 4th Edition, PH International Service, 2010
2. B Keiser, Optical fiber communication, McGraw Hill, 2000
3. J Gower, Optical communication system, 2nd Edition, Prentice Hall of India, 2001
4. Kao, Optical fiber system, 2nd Edition, Tata McGraw Hill, 1982

Reference Books:

1. Govind P.Agrawal, Fiber-Optic Communication Systems, 4th Edition,Wiley, 2010
2. V.S.Bagad, Optical Fiber Communications, 3rd Edition, Technical Publications, 2009

BECP 414 OPTICAL COMMUNICATION Total Hrs: 20

List of Experiments

1. To Set up Fiber optic analog link & Measure power in optical fiber.
2. To study of pulse amplitude modulation.

3. Study of Time division multiplexing [Analog]
4. Study of losses in Optical fiber.
5. Measurement of Numerical aperture in optical fiber.
6. Study of Time division multiplexing
7. Study of framing in Time division multiplexing.
8. Study of Marker in Time division multiplexing.
9. Study of Manchester coding & decoding.
10. Study of Voice coding & coder chip.
11. Setting up a Fiber optic digital link.
12. Study of pulse position modulation.
13. RS 232 interface using optical fiber.
14. Study of pulse width modulation.
15. To study characteristics of fiber optic LED & photodetector.
16. Study of OTDR.
17. Study of attenuation loss using OTDR.
18. Detect location of Fault in Optical Fiber.
19. Set up optical video link & measure power.
20. Design an optical Communication link.
21. 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.
4. To understand MATLAB tool boxes and their uses for applications of image processing

Course Outcomes:
Student shall be able to

1. Understand the basics of digital image processing
2. Understand and analyze algorithms for digital image processing
3. Design and implement algorithms for applications of digital image processing

Course Content:

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:

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:

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, latest development in digital image processing.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital image processing', 3rd Edition, Pearson PHI Publication, August 31, 2007
2. A K. Jain, Fundamental of Digital Image Processing', 4th edition, P. H. I. Publication. 1989
3. S. Jayaraman, S. Esakkirajan, T. Virakumar, Digital image processing, 1st edition, McGraw Hill, 2011

Reference Books:

1. J.C. Russ, The Image Processing Handbook, 5th Edition, CRC, 2006
2. Rafael C. Gonzalez, Richard E. Woods , Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd edition, Pearson PHI Publication, January 1, 2009

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:
Student shall be able to

1. Evaluate the need for application specific integrated circuits
2. Distinguish different techniques of design of application specific integrated circuits.

Course Content:

Unit I:TYPES OF ASICS
(12 Hrs)

Design flow – Economics of ASICs – ASIC cell libraries – CMOS logic cell data path logic cells – I/O cells – cell compilers.

Unit II: ASIC LIBRARY DESIGN (12 Hrs)

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.

Text Books:

1. J.S. Smith, Application specific Integrated Circuits, 1st Edition, Addison Weslay, 1997
2. Bakoglu, H. B. Circuits, Interconnections, and Packaging for VLSI. Reading, MA, 1st Edition,: Addison-Wesley, 1990
3. Einspruch N. G., and J. L. Hilbert (Eds.), Application Specific Integrated Circuit (ASIC) Technology, CA:, 1st Edition, Academic Press, 1991

Reference Books:

1. Sung mo kang, CMOS Digital integrated circuits analysis and design, 2nd Edition, Prentice Hall, 2003

BMEL 403
MECHATRONICS [3-0-0-3] Total Hr.:[45 Hrs

Course-Prerequisite : Engg. Mechanics (BCEL106)

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: Student shall be able to

1. Select suitable actuators, sensors and transducer and integrate them with embedded systems.
2. Implement a continuous-time control design using software
3. Demonstrate how Mechatronics integrates knowledge from different disciplines in

order to realize engineering and consumer products that are useful in everyday life.

Course Content:

Unit I: INTRODUCTION TO MECHATRONICS (08 Hrs)

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: OVERVIEW OF SENSORS AND TRANSDUCER & THEIR CHARACTERISTICS, SPECIFICATIONS (09 Hrs)

Specifications related to selection criterion for force pressure temperature & motion [Rotary or linear] Force: Load Cell, Cantilever beam [Design aspect Example] Pressure: Strain Gauge, Piezoelectric, LVDT Motion: Rotary & Linear motions, Proximity sensors, Inductive, Capacitive & Magnetic. Temperature Fiber optic temperature sensors. Ultrasonic Transducers applications as position, Level, flow.

Unit III: SIGNAL CONDITIONING & DATA ACQUISITION & CONTROLLER (08 Hrs)

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: DATA PRESENTATION & DATA LOGGING SYSTEM (07 Hrs)

Magnetic recorder, Strip- Chart recorder in mechatronics. Block Diagram of typical interface IEEE 488 standard bus, Rs232 slandered, Multichannel data logger[Block Diagram] ,I^2C bus, HART Protocols, Computer based data acquisition system.

Unit V: ACTUATORS (08 Hrs)

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 , Electrical actuation System: Selection criteria & Specifications of Stepper motors, Solenoid Valves, Relays & Servomotors Cables: Power Cable & Signal Cables, emerging trends in mechatronics.

Unit VI: STUDY DIFFERENT APPLICATIONS OF MECHATRONICS AS CASE STUDY (5 Hrs)

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:

1. S. Jayaraman, S. Esakkirajan, T. Virakumar, Mechatronics Electronic control system in Mechanical & Electrical Engineering, 3rd Edition, Pearson Education, 2007
2. Rangan Sarma, Mani, Instrumentation devices & Systems, 2nd Edition, Tata McGraw Hill, 2009
3. David Alcitore, Michael B. Histand, Introduction to mechatronics & Measurement systems, 2nd Edition, Tata McGraw Hill, 2010

Reference Books:

1. Gary Dunning, Introduction to Programmable logic Controllers, 3rd Edition, Delmar Publisher, 2006
2. Webb & Reis, Programmable logic Controllers, 3rd Edition, Prentice Hall of India, 2003
3. Jose A. Romagnoli, Introduction to process Control, 2nd Edition, CRC Tylor and Francis group, 2005

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: Student shall be able to

1. Analyze and explain the concept of ad-hoc and sensor networks, their applications and typical node and network architectures.
2. Design and explain protocols for wireless sensor networks.

3. Designs set up and evaluate measurements of protocol performance in wireless sensor networks

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, EnviroTrack, new APIsSecurity and Privacy – problems, attacks, solutions.

Unit VI:
(07 Hrs)

Case Study: A Complete System – surveillance and tracking application, Latest developments in wireless sensor networks.

Text Books:

1. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati, Wireless sensor networks, 2nd Edition, Springer, 2004
2. Morgan Kaufmann F. Zhao and L. Guibas, Wireless Sensor Networks, 3rd Edition, 2004

Reference Books:

1. Kazem sohraby, Daniel Minoli, Taieb, znati, Wireless sensor networks technology, protocol, and application, 2nd Edition, Wiley, 2014

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: Student shall be able to

1. Acquire the expertise in specialized areas of RADAR Engineering
2. Acquire the technical competence in specialized areas Satellite Communication.
3. Understand the spacecraft subsystems and satellite earth station technologies.

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:

1. Skolnik, Introduction of RADAR system, 1st Edition, McGraw Hill, 1997
2. T. Pratt., Satellite Communication, 2nd Edition, Wiley, 2003

Reference Books:

1. G .S. N Raju, Radar Engineering and fundamentals of navigationals aid., 1st Edition, I. K. International Pvt Ltd, 2008

ELECTIVE – III Robotics[3-0-0-3] Total Hr.:[45 Hrs.

Course-Prerequisite :Control System Engineering (BEEL 312)

Course Objectives

1. To understand various advanced microcontrollers.
2. To understand basic electronic components used in robotics
3. To study motion actuators and with sensors.
4. To understand electric ladder diagrams and their design methods.

Course Outcomes:
Student shall be able to

1. Analyze and implement design of electric ladder diagrams and methods of robots.
2. Design robot with electronics components like Motion actuators and with sensors.

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 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 : (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:

1. M.P. Groover , M. Weiss, R.N. Nagel, N.G. Odrey, 'INDUSTRIAL ROBOTICS', MCGRA, 1st Edition, HILL INTERNATIONAL, 1986
2. Koren, 'Robotics for Engineers', 1st Edition**,** Mc Graw Hill, 1985

Reference Books:

1. Saeed B Niku, Introduction to robotics, 2nd Edition, Willy, 2007

BECL 422
MICROELECTROMECHANICAL SYSTEMS (MEMS) [3-0-0-3] Total Hr.:[45 Hrs

Course-Prerequisite :CMOS VLSI DESIGN (BECL406)

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 Outcomes:
Student shall be able to

1. Use materials for common micro-components and devices.
2. Choose a micromachining techniques for designing of MEMS,
3. Get introduced to RF based MEMS modules are used in automobiles, aerospace technology, biomedical applications, ink jet printers, wireless and optical communications.

Course Content:

Unit I: (10 Hrs)

An introduction to Micro-sensors and MEMS, Evolution of Microsensors & MEMS, Microsensors & MEMS applications.

Unit II: (08 Hrs)

Microelectronic technologies for MEMS, Micromachining Technology, Surface and Bulk Micromachining, Micromachined.

Unit III:
(08 Hrs)

MEMS sensors and actuators, Micro sensors, Mechanical, Inertial, Biological, Chemical, Acoustic.

Unit IV:
(08 Hrs)

Microsystems Technology, Integrated Smart Sensors and MEMS, Interface Electronics for MEMS.

Unit V: (06 Hrs)

MEMS Simulators, MEMS for RF Applications.

Unit VI:
(05 Hrs)

Bonding & Packaging of MEMS, RF MEMS, and Optical MEMS, Recent development in MEMS technology.

1. Gregory T.A. Kovacs, 'Micromachined Transducers Sourecbook', 1st Edition, The McGraw-Hill, Inc, 1998
2. Stephen D. Senturia, 'Microsystem Design', 1st Edition, Kluar Publishers, 2001

Reference Books:

1. Nadim Maluf, 'An Introduction to Micro electro mechanical Systems Engineering', 1st Edition, Artech House, 2000

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:
Student shall be able to

1. Identify the functions of operating system
2. Evaluate the need for real-time operating system and Distinguish a real-time system from other systems
3. Implement the real-time operating system principles

Course Content:

Unit I: (10 Hrs)

INTRODUCTION: Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues.

SOFTWARE ARCHITECTURES: Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency, Systems Objects and Object-

Oriented Structures, Abstract Data Types, General Object Classes.

Unit II: **(08 Hrs)**

REQUIREMENTS AND DESIGN SPECIFICATIONS: Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, State charts-Concepts and Graphical Syntax, Semantics and Tools.

Unit III:
(08 Hrs)

DECLARATIVE SPECIFICATIONS: Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic.

DETERMINISTIC SCHEDULING: Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance.

Unit IV: **(08 Hrs)**

EXECUTION TIME PREDICTION : 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: **(06 Hrs)**

PROGRAMMING LANGUAGES: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam.

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:

1. Alan C. Shaw, Real – Time Systems and software, 2nd Edition, John Wiley & Sons Inc, 2001
2. Jane W.S. Liu, Real-Time Systems, 1st Edition, Prentice Hall, 2000

Reference Books:

1. Jonathan Valvano, Real-Time Operating Systems for Arm Cortex Microcontrollers, 2nd Edition, Paperback, 2014

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

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 the cellular systems
2. Analyze the concept of switching systems and base station subsystem

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 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:

1. T. S. Rappaport, 'Wireless Communication – rinciples and practice', 2nd Edition, Prentice all PTR, upper saddle river, New Jersey, 1996

Reference Books:

1. William C. Y. Lee, Mobile Communication – Design fundamentals, 2nd Edition, John Willey
2. Kamilo Feher, 'Wireless digital communication', 2nd Edition, Prentice all PTR, upper saddle river, New Jersey

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
3. Demonstrate and apply knowledge of PLC hardware/software concepts

Course Outcomes:

Student shall be able to

1. Understand PLC controllers and SCADA systems
2. Develop application skills for programming of PLCs.

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**: V**arious 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.

hb

Text Books:

1. Gary Dunning, Introduction to Programmable logic Controllers, 3rd Edition, Delmar Publisher, 2006
2. Webb & Reis, Programmable logic Controllers, 3rd Edition, Prentice Hall of India, 2003
3. Jose A. Romagnoli, Introduction to process Control, 2nd Edition, CRC Tylor and Francis group, 2005

Reference Books:

1. S. Jayaraman, S. Esakkirajan, T. Virakumar, Mechatronics Electronic control system in Mechanical & Electrical Engineering, 3 rd Edition, Pearson Education, 2007

2. Rangan Sarma, Mani, Instrumentation devices & Systems, 2nd Edition, Tata McGraw Hill, 2009

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:
Student shall be able to

1. Effective use, interpret the literature and data for the cause of project execution
2. Use the acquired technical knowledge to solve any problem.
3. Present, prepare and deliver the seminar as team member

EIGHTH SEMESTER

BECP 411 : Industry Project Internship [0-0-30-20]

BECP411

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
Student shall be 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
4. Work as a member of diverse technical team and to develop project/product
5. Use software , hardware, testing and simulation tools and platforms used in industry for project/product design and development
6. Interpret the literature and data for project execution
7. Understand cost effectiveness while designing and implementing project / product
8. Present, prepare and deliver seminar as a member of project team and Interpret results to present conclusions