DETAIL SYLLABI
OF
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
(THIRD SEMESTER TO EIGHTH SEMESTER)
DEGREE (B.E.)

TRIPURA UNIVERSITY
SURYAMANINAGAR

SYLLABI OF DEGREE IN ELECTRONICS & TELECOMMUNICATION ENGINEERING

(Third Semester to Eighth Semester)

THIRD SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Mathematics – III	BE/M-301	3	1	0	100	3
02.	Electromagnetic Theory	BE/EC – 301	3	1	0	100	3
03.	Analog Circuits – I	BE/EC– 302	4	0	0	100	4
04.	Digital Electronics	BE/EC –303	4	0	0	100	4
05.	Data Structures and Algorithms	BE/CS – 308	3	1	0	100	3
06.	Electrical Machines	BE/EE - 309	3	1	0	100	3
Practical / Sessional							
07.	Analog Circuits Laboratory – I	BE/EC – 304	0	0	3	100	2
08.	Digital Electronics Laboratory	BE/EC – 305	0	0	3	100	2
09.	Data Structures Lab	BE/CS – 309	0	0	3	100	2
10	Electrical Machines Laboratory	BE/EE – 310	0	0	3	100	2
Total			36			1000	28

(N.B. "L" for "Lecture", "T" for "Tutorial" and "P/S for "Practical / Sessional")

FOURTH SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Computer Organisation and Architecture	BE/CS– 409	3	1	0	100	3
02.	Electrical Measurements and Instrumentation	BE/EE –410	3	1	0	100	3
03.	Analog Communication System	BE/EC – 401	4	0	0	100	4
04.	Digital System Design	BE/EC – 402	3	1	0	100	3
05.	Networks Synthesis and Transmission Lines	BE/EC – 403	4	0	0	100	4
06.	Mathematics – IV	BE/M-401	3	1	0	100	3
Practical / Sessional							
07.	Electrical Measurements Laboratory	BE/EE – 411	0	0	3	100	2
08.	Analog Communication Laboratory	BE/EC – 404	0	0	3	100	2
09.	Digital System Laboratory	BE/EC – 405	0	0	3	100	2
10.	Network System and Transmission Line Laboratory	BE/EC – 406	0	0	3	100	2
Total			36			1000	28

FIFTH SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Digital Communication System	BE/EC – 501	4	0	0	100	4
02.	Antennas and Wave Propagation	BE/EC – 502	3	1	0	100	3
03.	Industrial Electronics	BE/EC – 503	3	1	0	100	3
04.	Analog Circuits – II	BE/EC – 504	3	1	0	100	3
05.	Control System Engineering-I	BE /EC – 505	3	1	0	100	3
06.	Microprocessors and Micro-controller	BE/EC – 506	4	0	0	100	4
Practical / Sessional							
07.	Digital Communication Laboratory	BE/EC –507	0	0	3	100	2
08.	Industrial Electronics Laboratory	BE/EC – 508	0	0	3	100	2
09.	Analog Circuits Laboratory – II	BE/EC– 509	0	0	3	100	2
10.	Microprocessor and Micro-Controller Laboratory	BE/EC –510	0	0	3	100	2
Total			36			1000	28

SIXTH SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Telecommunication Switching Systems	BE/EC – 601	4	0	0	100	4
02.	IC Technology and Design	BE/EC – 602	3	1	0	100	3
03.	Digital Signal Processing	BE/EC – 603	3	1	0	100	3
04.	Audio & Video Engineering	BE/EC –604	3	1	0	100	3
05.	Control System Engineering - II	BE/EC – 605	4	0	0	100	4
06.	Engineering Economics and Costing	BE/HU-601	3	1	0	100	3
Practical / Sessional							
07.	Telecommunication Switching and Antenna Engineering Laboratory	BE/EC-606	0	0	3	100	2
08.	Digital Signal Processing Laboratory	BE/EC– 607	0	0	3	100	2
09.	Audio & Video Engineering Lab	BE/EC – 608	0	0	3	100	2
10.	Control System Engineering Laboratory	BE/EC – 609	0	0	3	100	2
Total			36			1000	28

SEVENTH SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Computer Communication Networks	BE/CS – 711	3	1	0	100	3
02.	VLSI Design	BE/EC – 701	4	0	0	100	4
03.	Optical Fibre Communication	BE/EC – 702	3	1	0	100	3
04.	Microwave Engineering	BE/EC – 703	3	1	0	100	3
05.	Elective – I	BE/EC – 704	4	0	0	100	4
Practical /Sessional							
06.	Microwave Engineering Laboratory	BE/EC – 705	0	0	3	100	2
07.	Electronic Computer Aided Design and MATLAB^{TM} Programming Laboratory	BE/EC – 706	0	0	3	100	2
08.	Microelectronics and VLSI Laboratory	BE/EC – 707	0	0	3	100	2
09.	Preliminaries of Project and Thesis	BE/EC – 708	0	0	5	100	3
10.	VIVA VOCE – I	BE/EC – 709	0	0	0	50	1
11.	Professional Skill Development – I	BE/GP-2	0	0	2	50	1
Total			36			1000	28

EIGHTH SEMESTER

Sl. No.	Name of Subjects	Code No	Periods/Week			Full Marks	Credits
			L	T	P/S		
Theory							
01.	Industrial Management	BE/ME-811	3	1	0	100	3
02.	Satellite, Mobile and Personal Communication	BE/EC – 801	4	0	0	100	4
03.	Industrial Instrumentation	BE/EE – 814	3	1	0	100	3
04.	Neural Network and Fuzzy Logic	BE/EC– 802	3	1	0	100	3
05.	Elective Paper – II	BE/EC – 803	4	0	0	100	4
Practical / Sessional							
06.	Optical Fibre, Satellite and Mobile Communication Laboratory	BE/EC – 804	0	0	3	100	2
07.	Industrial Instrumentation Laboratory	BE/EE – 815	0	0	3	100	2
08.	Computer Communication Networks Laboratory	BE/CS– 812	0	0	3	100	2
09.	Project and Thesis	BE/EC – 805	0	0	6	100	3
10.	VIVA VOCE – II	BE/EC– 806	0	0	0	50	1
11.	Professional Skill Develpment - II	BE/GP - 3	0	0	2	50	1
Total			36			1000	28

Elective Paper – I

1) Information Theory and Coding
2) Integrated Services Digital Network
3) Artificial Intelligence
4) Digital Image Processing
5) Operating System
6) Robotics and Computer Vision
7) Satellite Communication

Elective Paper - II

1) Wireless Communication and Network
2) Neuro Fuzzy Control
3) Advanced Microprocessors
4) Medical Electronics
5) Radar and Navigation
6) Virtual Instrumentation
7) Advanced Mobile Communication

THIRD SEMESTER

01. MATHEMATICS –III (BE/M – 301)

FIRST HALF:-Classical & Axiomatic construction of the theory of Probability, Conditional probability and basic formulas, random variables, probability density function and probability distribution function, functions of random variable. Standard unvaried discrete and continuous distributions and their properties. Mathematical expectations, moments, moment generating function. Multivariate distributions; marginal and conditional distributions, conditional expectations.

Fourier series, Half range series, Series solution of ordinary differential equation of second order. Ordinary points and regular singular points. Method of least squares & curve fitting.

SECOND HALF:-Partial Derivatives, Chain Rule, Differentiation of implicit functions, exact differentials, Tangent planes and normal. Maximal, Minima & & saddle points. Simple problems in extrema of functions with constraints. Method of Lagrange multipliers. Multiple-double & triple integrals, Jacobians & transformation of co-ordinates. Application to areas, volumes, center of pressure. Improper Integrals. Test of convergence. Beta & Gamma functions. Vector differentiation & integration. Gradient, divergence & Curl applications.

Functions of a complex variable. Limits & Continuity Differentiations. Analytic functions. Cauchy-Reimann equations, Conjugate functions; application to two dimensional problems; Cauchy's Integral theorem; Taylor's & Laurent's expansions; Branch points Zeroes, Poles, Residues, Simple problems on contour Integration.

References:

1) Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
2) Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
3) Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall, Delhi.
4) Potter, Goldberg : Mathematical Methods, Prentice - Hall
5) Churchill R.V. : Fourier series and Boundary Value Problems - McGraw Hill
6) Irvrin Miller & Freind : Probability and statistics for Engineers , Prentice Hall of India.
7) Bowker and Lieberman : Engineering Statistics Prentice - Hall
8) Kirk - Patrick : Introductory statistics and probability for engineering science and
9) technology , Prentice -Hall
10) Parzen E : Modern Probability Theory and its Applications, Wiley estern.
11) Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.
12) Engineering Mathematics-I Rukmangadhachary, Pearson Education.

02. ELECTROMAGNETIC THEORY (BE/EC – 301).

FIRST HALF:-Fundamentals of Vector Algebra, Vector Calculus, Physical Interpretation of Differential Vector operations, Green's Theorem, Divergence & Stoke's Theorem, concept of scalar & vector Fields. Electrostatics, Gauss Law, Electric Potential, Laplaces'& Poissons' Equation, Boundary value problems, Method of Images, Energy storage in Electric Field.

Magnetostatics, Faradays Law ,Amperes Law Dielectric & Magnetic Media. Biot Savart's Law, Magnetic Vector Potential, Relationship Between ES & MS Fields.

SECOND HALF:-Equation Of Contimuity For Steady & Time Varying Currents, Maxwell's Law, Displacement Current & Displacement Current Density, Wave Equation, Pharos Concept for Time Harmonic Fields, Plane Waves in Simple Media & Lossy Media, Imhmogeneity & Anisotropy. Polarization, Poincare sphere, reflection & refraction at different Interfaces, Brewsters' Angle, Total Internal Reflection. Poynting Theorem,- General & Complex, Power & Power Density, Case studies for Power Flow Calculations. Magnetic current concept, Hertz Potentials, Equivalence of Electric & Magnetic sources.

References:

1. Electromagnetic Wave and Radiation System: Jordan and Balmain : PHI
2. Electromagnetics : Kraus : T.M.H.
3. Field & Waves, Cheng, Pearson Education (LPE)
4. Electromagnetics, Edminister, Schaum series
5. Electromagnetism, Parmanik, PHI
6. Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press.

03. ANALOG CIRCUITS-I (BE/EC – 302)

FIRST HALF:-1. DIODE CIRCUITS Ideal and piecewise linear models of diode, graphical analysis; Analysis and design of circuits-transient switching characteristics of diodes; Clippers, clampers, rectifiers, zener regulators; Power supplies, surge studies, I^2-t curve; Power supply filters.

2. BJT AMPLIFIERS Analysis and design of different biasing circuits (including stability) for BJT amplifiers, BJT biasing for integrated ckts, h-parameter model of BJT, mid frequency and low frequency analysis of CE, CB and CC amplifier, Hybrid-pi model of BJT, high-frequency analysis of BJT amplifiers, transistor as a switch; transient switching characteristics of transistors. Numerical solution for large signal amplifiers-convergence problem.

3. FET AMPLIFIERS Analysis and design of different biasing circuits for FET amplifiers, small-signal low frequency model of FET, mid-frequency and low-frequency analysis of CS,CG and CD amplifiers, small-signal high frequency model of BJT, high frequency analysis of FET amplifiers, Bode plots.

SECOND HALF:-4. FEEDBACK AMPLIFIERS General theory of feedback, Barkhausen criteria, stability of feedback amplifier, different feedback topologies, effect of different parameters of an amplifier, frequency response of 2 pole/3 pole feedback amplifiers, Bode plot, gain and phase margin, compensation, method of analysis, Design examples.

5. OPERATIONAL AMPLIFIERS Differential amplifiers using BJT and FET, Characteristics of op-amp, ideal and non ideal properties, High frequency effects on op-amp gain and phase, Bode's plot. Slew rate limitation, Linear and nonlinear circuits operations of op-amps like adder, subtract or, multiplier circuits, spice analysis of op-amp circuit, integrator differentiator, all active filters, comparators, Schmitt trigger (inv and non-inv), trigger-able and non trigger-able multi-vibrator, triangular and sinusoidal wave generator,

precision rectifier, peak detector, wein bridge oscillator, phase shift oscillator, quardrature oscillator.

References:

1) Integrated Electronics, Millman & Hailkias : TMH.
2) Electronic Devices And Circuits, Salivahanan, Kumar & Vallavaraj: TMH
3) Electronic Devices & Circuits, Boylestead & Neshelsky : PHI
4) Electronic Circuits , Discrete & Integrated, Schilling & Belove: TMH
5) Electronic Fundamentals & Applications, Chattopadhyay & Rakhshit, New Age
6) Microelectronic Circuits, Adel S. Sedra & Kennath C. Smith, OUP.
7) Op-Amps And Linear Integrated Circuits, R. A. Gayakwad, PHI

04. DIGITAL ELECTRONICS (BE/EC– 303)

FIRST HALF:- Number Systems : Decimal, Binary, Octal and Hexadecimal systems, conversion from one base to another. Codes :BCD, Excess- 3, Gray Reflected ASCII, EBCDIC. Algebra for logic circuits: Logic variables; Logic constants; Logic functions- NOT, AND, OR, NAND, NOR, Ex-OR; Boolean Algebra (including Shanon's expansion theorem and consensus theorem); Canonical representations-min-term, max-term; Karnaugh map simplification, Quin- Maclousky minimization. Families of logic circuits: Transistor inverter, RTL, Diode logic, DTL,TTL, Brief introduction to DCTL,IIL,HTL,ECL and MOS gates.

SECOND HALF:-

Combinational circuits: Analysis and synthesis of combinational circuits, Multiplexer, Demultiplexer, Encoder, Decoder, Code-converter, Adder, Sub-tractor, 2' complement Adder cum Sub tractor, Carry look-a header, Comparator, Parity generator/checker, Priority encoder. Sequential Circuits: Flip-flops- SR, JK, D and T; Registers- Buffer registers, shift registers etc.; Counters- Asynchronous and synchronous counters; Analysis and synthesis of sequential circuits: Basic models of sequential M/C, Analysis of asynchronous and synchronous circuits, Synthesis of completely and incompletely specified synchronous sequential M/Cs. Interface circuits: Digital to Analog converter (DAC) - weighted resistor method, R-2R ladder method; Analog to Digital converter (ADC) - parallel comparator method, counter method, successive approximation method, dual-slope method.

References:

1. Digital Principles and Applications, Malvino & Leach: TMH.
2. Digital Logic Design, M. Morris Mano, PHI
3. Modern Digital Design, R.P. Jain, TMH.
4. Digital Circuits and Design, S. Salivahanan & S. Arivazhagan, Vikas Publishing.
5. Digital Circuits: An Introduction Part -1 & 2, D. Roychaudhuri, Eureka Publisher.
6. Digital Systems, Principles and Applications, Ronald J Tocci , PHI
7. Digital Integrated Electronics, Taub & Schilling, TMH

05. DATA STRUCTURES AND ALGORITHMS (BE/CS-308)

FIRST HALF:-Overview of C language
Time and Space analysis of Algorithms - Order Notations.
Linear Data Structures - Sequential representations - Arrays and Lists, Stacks, Queues and Dequeues, strings, Application.
Linear Data Structures - Link Representation - Linear linked lists, Circularly linked lists. Doubly linked lists, application.
Recursion - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.
SECOND HALF:-Non-linear Data Structure : Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.
Hashing - Hashing Functions, collision Resolution Techniques.
Sorting and Searching Algorithms - Bubble sort, Selection Sort, Insertion Sort, Quicksort, Merge Sort, Heapsort and Radix Sort.
File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.

References :

1. Data Structures and Algorithms- O.G.Kadke and U.A.Deshpandey, ISTE/EXCEL
2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", Addison Wesley
3. Ajoy Agarwal.: Data Structures Through C.Cybertech.
4. Lipschutz: Data Structures TMH
5. Heileman: Data structures,algorithims &OOP Tata McGraw Hill
6. Data Structures Using C, M.Radhakrishnan and V.Srinivasan, ISTE/EXCEL BOOKS
7. Weiss Mark Allen, "Algorithms, Data Structures, and Problem Solving with C++", Addison Wesley.
8. Horowitz Ellis & Sartaj Sahni, "Fundamentals of Data Structures", Galgotria Pub.
9. Tanenbaum A. S. , "Data Structures using 'C' "

06. ELECTRICAL MACHINES (BE/EE – 309)

PART I :-
Single-Phase Transformer: Construction and basic principle of operation, Core type and shell type. Materials used for core. Winding and insulation,(E.M.F. equivalent circuit;) Equivalent circuit referred to primary -- phasor diagram, Polarity test, O.C and S.C. test Regulation. Efficiency. All ,day efficiency, Parallel operation.
Induction Motor: Three phase balanced excitation system. Development of rotating magnetic field. Frequency of the induced emf and relationship to number of poles. Construction and basic principle of operation of 3 phase induction motor, Slip, Slip speed and slip frequency, Per-phase equivalent circuit, Phasor diagram, Types of windings, Squirrel cage and slip-ring motor construction, Equations for torque, Torque-speed characteristics, Effect of change in rotor resistance in slip-ring machine, Methods of starting and speed control.

PART II :-

D.C. Machines : Construction and operating principle, Function of commutator and brush system, Armature reaction and their effects, MMF distribution, Commutation, Interlopes.

D.C. Generators: EMF equation characteristics with different excitation systems, Voltage relation. Parallel operation.

D.C. Motors: Equation for torque, characteristics with different excitation systems. method of starting. Speed control, Speed-torque characteristics.

Synchronous Machines

Alternator: Construction, EMF equation, Armature reaction with different power factor of loads, Pharos diagram, Methods of determination of voltage regulation. Parallel operation of alternators and synchronization.

Synchronous Motors : Principle of operation, Hunting, Starting method.

DC and AC Servo motors and their Characteristics & Operations,

References:

1. Electrical Machines by S. K. Bhattacharya – Tata McGrew Hill Publications
2. Electrical Machines : By F.S.Bimbra, Khanna publications.
3. Electrical machines by M. V. Deshpande – Wheeler Publication.
4. Theory & Performance of Electrical Machine by J. B. Gupta
5. D. C. Machines and Transformers by K. Mungnesh Kumar – Vikas Publication
6. A Text Book of Electrical Technology by B. L. Thereja – S. Chand publication
7. Electrical Machine by Dr. P. K. Mukherjee & S. Chakraborty
8. AC Machines by M. G. Say
9. The performance and design of D. C. machines by A. E. Clayton.
10. Fundamentals of Electric Machine by B. R. Gupta and V. Singhal

ANALOG CIRCUITS LABORATORY – I (BE/EC-304)

List of experiments :

(i) Simple BJT common emitter amplifier configuration – frequency response, gain and bandwidth.
(ii) JFET Common source amplifier- frequency response, gain and bandwidth.
(iii) Feedback amplifier circuits - Current series and voltage shunt - gain and bandwidth.
(iv) Study of an emitter follower circuit.
(v) Study of OP AMPs – IC 741functioning, parameters and Specifications.
(vi) OP AMP Applications – Adder, Subtractor, Comparator Circuits.
(vii) Integrator and Differentiator Circuits using IC 741.
(viii) IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
(ix)Design and Simulation using Multisim OR Pspice OR Equivalent Simulation Software of the above experiments.

DIGITAL ELECTRONICS LABORATORY (BE/EC – 305)

List of Experiments:

1) Study of different basic digital logic gates and verification of their Truth Table
2) Study and verification of the law of Boolean Algebra and De-Morgan's Theorem
3) Study of important TTL technologies, Verifications of important TTL Circuit Parameters.
4) Construction and verification of various combinational circuits such as Half Adder, Full Adder, Half & Full Sub tractor, Different Code Converters, Encoder, Decoder, Magnitude Comparator.
5) Study of Multiplexer, Demultiplexer
6) Construction and verification of various types of Flip-Flops using gates and IC's
7) Construction and Verification of different Shift Registers.
8) Construction and verification of different types of Counters.
9) Study of different types of ADC and DAC.

DATA STRUCTURE LAB (BE/CS-309)

Experiments should include but not limited to :
Implementation of array operations :
Stacks and Queues : adding, deleting elements Circular Queue : Adding & deleting elements Merging Problem : Evaluation of expressions operations on Multiple stacks & queues :
Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
Polynomial addition, Polynomial multiplication
Sparse Matrices: Multiplication, addition.
Recursive and Non-recursive traversal of Trees
Threaded binary tree traversal. AVL tree implementation.
Application of Trees, Application of sorting and searching algorithms
Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

ELECTRICAL MACHINES LABORATORY (BE/EE – 310)

Laboratory Experiments based on the syllabus of EE – 309

1.EMF Induced In DC Machine
2. External Characteristics of DC shunt/compound Motor- study relations between speed, field current and armature voltage.
3. Brake test of a DC series motor.
4. Coil connection of a single phase transformer.
5. OC and SC of a single phase transformer and determination of loss, efficiency and regulation.
6. Starting and load characteristics of a 3-phase Induction Motor
7,. Torque-Speed Characteristics of DC & AC Servo Motor

FOURTH SEMESTER

01. COMPUTER ORGANISATION AND ARCHITECTURE (BE/CS–409)

FIRST HALF:-Introduction, Brief history of Computers, Economic trends, underlying technologies, General organization of a digital computer, Computer functions, Interconnection Structure, Bus, Bus interconnection. Arithmetical Logic Unit: arithmetic and logic operations, arithmetic and logic operands, construction an arithmetic and logic unit, bit slice unit, IEEE standards for floating point number representation, truncation techniques. Processor organization, Register organization, the instruction cycle, Instruction Pipelining, Micro-operations, Control of the Processor, Instruction sequencing, Formats and its interpretation, Micro-program concepts, Control unit design, CPU design.

SECOND HALF:-Semiconductor, magnetic and optical memories(Primary, Secondary and tertiary storage),memory organization, virtual memory, cache memory and interleaved memory, CD ROM ,Static and Dynamic ROM Interrupt, interrupt generation, interrupt handling and interrupt service routine, exception, Concepts of I/O organization, Data transfer methods, Programmed I/O, DMA, Interrupt based transfer, I/O channels, I/O processors, Serial transmission and synchronization. Multiprogramming and time sharing, architecture classification, Parallel computers-classification Various terms associated with pipelining, pipelined data paths, pipelined control, pipeline hazards, pipeline implementations, instruction-level parallelism, Multiprocessors, Array processors, Vector processors.

References:

1. Computer Architecture & Organisation, Hayes J. P., TMH,
2. Computer Organisation, Hamacher
3. Computer Organization and System Software, EXCEL BOOKS
4. Computer Organisation & Design, Chaudhuri P. Pal, PHI
5. Computer System Architecture, Mano, M.M., PHI.
6. System Architecture, Burd- Vikas

02. ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS (BE/EE – 410)

FIRST HALF:-Classification of electrical measuring instruments, general feature of indicating instruments: controlling, damping, balancing. Galvanometer: dynamics, sensitivity, D'Arsonval galvanometer, Ballistic galvanometer, Vibration Galvanometer, PMMC instrument, temperature compensation, rectifier type instrument, Moving iron instrument, errors and compensations, electrodynamometer type instrument, power measurement, low power factor wattmeter, wattmeter connections and errors, Induction type energy meter: characteristics, errors and their compensation, extension of instrument range: shunt, multiplier, current transformer, potential transformer; testing and calibration of measuring instruments.

SECOND HALF:-Kelvin double bridge, series and shunt type ohmmeter, megger, measurement of surface resistivity. Measurement of inductances and capacitances, measurement of incremental inductances, inter-bridge transformer, residuals, errors in

bridges, detectors, dc potentiometer: Weston normal cell, Vernier type, Kelvin-Verley slide, dual range, applications, phantom loading, ac potentiometer: polar type and co-ordinate type, use of Ballistic Galvanometer in magnetic testing, ac magnetic testing: Lloyd-fisher square, transducers: RTD, thermistor, thermocouple, laws of thermocouple circuits, cold junction compensation, strain gauge and its characteristics, LVDT and its characteristics.

References:

1. Electrical and Electronic Measurements and Instrumentation, A.K. SAWHNEY, Dhanpat Rai.
2. Basic Electrical Measurements, B. Stout
3. Electronic Instrumentation and Measurement Techniques, D. Cooper
4. Electronic Instrumentation & Measurements - David A. Bell, PHI.
5. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education.
6. Measuring systems, Applications and Design - E.O. Doebelin, McGraw Hill.

03. ANALOG COMMUNICATION SYSTEMS (BE/EC – 401)

FIRST HALF:-INTRODUCTION : Types and reasons for modulation. Transmitters, transmission channels and receivers.
SPECTRAL ANALYSIS : Review of Fourier Transform theory, energy, power, parseval's theorem. Power spectral density functions (PSDF), Analog spectrum analysis. The auto correlation functions, relationship between the PSDF and the auto correlation functions, PSDF's of harmonic signals and uncorrelated (white) signals.
Review of signal transfer in linear systems, the ideal low pass filters and distortionless transmission, importance of channel bandwidth.
SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS Condition for distortion less transmission of signals through networks. Different types of distortion and their effect on the quality of output signals. Transmission of transient signals, distortion analysis.
AMPLITUDE MODULATION: Modulation principle and definitions, spectrum and power considerations, DSB,SSB, VSB and AM principles. Different type of modulator circuits, Transistorized modulation circuit, Square law modulator, collector modulator etc. Balanced modulator. Different circuits for generation of SSB and VSB.
DEMODULATOR Basic principle of coherent detections, Square law detectors, Average envelope and peak envelope detectors. Distortions Detector circuit design. Design problems.
FREQUENCY AND PHASE MODULATION Principles and definitions, Relationship between frequency and phase modulations. Phase and frequency deviations, Spectrum of FM signal, bandwidth considerations. Effect of modulation index on bandwidth, Narrow band and sideband FM and PM principles, Circuit for realization of FM and PM. Stereophonic FM Principle.
DEMODULATION Principle of demodulation: Different type of demodulator, discriminator, use of PLL etc.

SECOND HALF:-RADIO TRANSMITTER Basic block diagram of radio transmitter (AM and FM), Analysis of a practical circuit diagram used for medium power transmitter.
RADIO RECEIVER Basic block diagram of TRF, Super-heterodyne principle, its advantages. Mixer principle and circuit, AVC, Radio receiver measurement.

RANDOM VARIABLES AND PROCESSES: Statistical properties; Cumulative distribution functions. Probability density functions, Auto correlations, Stationary and ergonic processes, Poisson, Gaussian, Reyleigh functions. Some sources of noise in signals. Mathematical representation and frequency domain representation. Spectral components of noise, Power spectral density, effect of filtering of noise, Super position of noises, Mixing of noise. Quadrature component representation of noise, power spectral density Calculation of quadrature components. Noise band width.
NOISE PERFORMANCE OF ANALOG COMMUNICATION SYSTEMS: Signal-to-noise ratio in linear modulation, synchronous detection of DSB. Signal-to-noise ratio for AM and SSB, comparison of DSB, SSB and AM. Effect of noise in envelope and square law detection of AM, threshold effects in nonlinear detectors. Signal-to-noise ration for FM,SNR improvement using pre-emphasis and de-emphasis networks. FM threshold effects, noise clicks in FM system. Comparison of linear and exponential modulation system for additive white band-limited noise channels.

References:

1. Principles of Communication Systems, Taub & Schilling, TMH.
2. Modern Digital and Analog Communication Systems, B. P. Lathi, OUP
3. Communication System, Hykin, Wheeler
4. Electronic Communication System, Kenndy, TMH
5. Electronic Communication, Roody & Coolen, PHI
6. Digital Communications: Fundamental And Applications, Sklar, Pearson
7. Digital Communications, Prokias, MGH
8. Electronic Communication System Fundamentals through Advance, Wayne Tomasi, Pearson Education.

04. DIGITAL SYSTEM DESIGN (BE/EC– 402)

FIRST HALF:_MEMORY ADDRESSING**:** Read, Write and Read Only operations; MEMORY CELLS**:** ROM, PROM, EEROM, EPROM, CDROM Static and dynamic RAM – Refreshing of dynamic RAM ; Volatile and non-volatile memories.

Review of Sequential logic circuits. Flip flop excitation tables.

Introduction to state machines. Classification of State Machines. State Machine Applications. Analysis State Machine, State table, State Diagram, State Equation, State reduction and State assignment.
Design of Synchronous State Machine (including Counter) and Asynchronous state machine.

SECOND HALF:- Programmable logic Devices: Advantages of PLDs. Classification of PLDs. Concept of PROM, PAL, PLA, Registered PAL, Configurable PAL, GAL – Architecture and Comparison. CPLD and FPGA architecture. Simulation and testing, Types of FPGAs , Xilinx solutions : Xilinx CPLDs and applications areas, JTAG Development and Debugging Support.
Hardware description languages: introduction to VHDL - behavioral modeling - transport Vs inertial delay - simulation deltas - sequential processing - process statement - signal assignment Vs variable assignment - sequential statements - data types - subprograms and packages - predefined attributes - configurations - subprogram overloading - VHDL synthesis - design examples.

References:

1. Modern Digital Design, R.P. Jain, TMH.
2. Digital Logic Design, M. Morris Mano, PHI
3. Digital Technology, Virendra Kumar, New Age.
4. Digital Logic and State Machine Design, Comer, OUP
5. Modern Digital Design, R.S. Sandige, MGH.
6. VHDL for Programmable Logic, Kevin Skahill, Pearson.
7. VHDL Programming by Example, Perry, TMH.
8. The Designer's Guide to VHDL, Morgan Kaufman Publishers(Elsivier), LPE.
9. Design Warrior's Guide to FPGAs: Devices Tools and Flows, Clive "Max" Maxfield, Elsevier Publication.
10. Field-Programmable Gate Array Technology, S. Trimberger, ed., Kluwer Academic Publishers.

05. NETWORKS SYNTHESIS AND TRANSMISSION LINES (BE/EC– 403)

FIRST HALF:-

Network Synthesis:

Resonance in Series & Parallel Circuits, Locus diagram of AC Circuits, Different Tests Signals used in Circuits. Applications of test signals in circuits, application of Convolution Integral and Dhumel's Integral in circuits. Impedance and admittance parameters, transmission and inverse transmission parameters, hybrid and inverse hybrid parameters of two port networks, Series, parallel and cascade connections of two port networks.

Driving point impedance function for a passive one port and their Positive real functions and their properties. Testing procedures for PR functions. Derivations of the properties of RC and LC one port network and their synthesis procedures. Passive two port networks, different representation schemes, Image impedance parameters. Concept of symmetry, characteristic impedance and propagation constant Derivation of the synthesis procedure for LC and RC passive open circuit two ports. Design procedures for filters with resistance termination. Limitations of passive RC two port realizations.

SECOND HALF:- Concept of Active Filters. Different Types of Second Order Active Filters, State Variable representation of Electrical circuits. Active Realization of State Variable Active Filters.

Transmission Lines :

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless ness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading. Related Problems. Input Impedance Relations, SC and OC Lines, Reflection Coefficient,

VSWR. UHF Lines as Circuit Elements; λ/4, λ/2, λ/8 Lines – Impedance Transformations. Smith Chart – Configuration and Applications, Single and Double Stub Matching. Related Problems.

06. MATHEMATICS – IV (BE/M – 401)

Operation Research :-

n-tuples of real nos., addition and scalar multiplication of vectors, Convex combination, Linearly dependence & independence, basis and dimension, Linear programming, concept of Simplex method, Duality, Two-phase method, Dual-Simplex, Transportation and Assignment models. Concept of Game theory and solution.

Numerical Analysis :-

Solution of algebraic and transcendental equation by bisection method, Iteration method, Regular-Falsi (False position) method, Newton-Raphson method, complex roots by Lin-Baristow method. Solution of simultaneous linear equation by Gauss Elimination and Gauss-Seidel method.

Partial Differential Equation :-

Solution by separation variables, Wave equation, Heat equation, One and Two dimensional heat flow.

Interpolation :-

Concept of interpolation, Difference operator, Divided Difference interpolation, Newton's forward, backward interpolation, Lagrange's interpolation, Staling 7 Bessel's interpolation, Numerical interpolation (1^{st} & 2^{nd} order), numerical integration (Trapezoidal, Simpson's one-third, three-eighth, Weddle's ruler).

Numerical Solution to Ordinary Differential Equation :-

Taylor's method, Picard's method, Runge's method, Runga-Kutta method, Euler's method and Euler's modified method, Predictor-corrector method.

References:-

1. Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
2. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.
3. Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall, Delhi.
4. Churchill R.V. : Fourier series and Boundary Value Problems - McGraw Hill
5. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.
6. Engineering Mathematics-I Rukmangadhachary, Pearson Education.
7. S.S.Sastry : Introductory Method of Numerical Analysis, Prentice -Hall of India
8. Ralph G. Stanton : Numerical Methods for Science and Engg., Prentice - Hall of India
9. M.K.Jani, S.R.K Iyengar and R.K. Jain : Numerical Methods for scientific and Engineering Computations. Wiley Eastern.
10. P.Kandaswamy K.Thilagavathy : Numerical Mehtods , S.Chand & Co. K.Gunavathy
11. Hamdy A. Taha, "Operations Research", Fifth edn. , Macmillan Publishing Company, 1992.

12. V.K. Kapoor-- Operations Research
13. Kanti Swaroop-- Operations Research
14. Hillier & Lieberman—Introduction to Operations Research, 7/e (with CD),TMH
15. Operations Research – Schaum outline series, MH

07. ELECTRICAL MEASUREMENTS LABORATORY (BE/EE – 411)

Laboratory Experiments based on the syllabus of EE – 410.

i. Measurement of Unknown resistance using Precision Whetstone and Precision Kelvin's Double Bridges.
ii. Measurement of Unknown Inductance and Capacitance using different AC Bridges.
iii. Temperature measurement using Thermistor, RTD, Thermocouple, Pt-100, Semiconductor type Temperature Sensors.
iv. Study of Characteristics of LVDT and displacement measurement.
v. Study of Characteristics of Stain Gauge and Load measurement.

08. ANALOG COMMUNICATION SYSTEMS LABORATORY (BE/EC – 404)

List of Experiments:

1. Study of Amplitude Modulation & Demodulation techniques.
2. Study of Double Side Band Suppressed Carrier (DSB-SC) & Demodulation technique.
3. Study of Single Side Band Suppressed Carrier (SSB-SC) & Demodulation technique.
4. Study of Frequency Modulation & Demodulation.
5. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).
6. Study of a Superhetrodyne Receiver.
7. Study Frequency Division Multiplexing (FDM) & Demultiplexing.
8. Study of Time Division Multiplexing (TDM) & Demultiplexing.
9. Study of Noise Effect in Audio circuits & in communication system. Determination of Signal to Noise Ratio (SNR).

09. DIGITAL SYSTEM LABORATORY (BE/EC – 405)

List of Experiments:

1. Design of Synchronous Counters using ICs
2. Design of Moore's State Machine using ICs
3. Design of Mealy's State Machine using ICs

Design, Simulation and Implementation of following circuits using VHDL and ModelSim/any other simulation software on CPLD/FPGA platform.

4. Adder, Subtractor, Parallel adder, Multiplexer, Demultipelxer, Encoder, Decoder, Code converter, Magnitude Comparator, Flip-flop, registers, counters, state machine, RAM, ROM.

09. NETWORK SYSTEM AND TRANSMISSION LINES LABORATORY (BE/EC– 406).

NETWORK SYSTEM :

1) Performance of Transient Analysis Test of Electrical Circuits at different combinations.
2) Determination of different Parameters of Two Ports Networks.
3) Experiments of Signal Sampling and Reconstruction Technique.
4) Aliasing & Effect of Reconstruction of Signal due to various Sampling frequencies.
5) Analysis of Network Synthesis.
6) Characteristics of Different Active Filters.
7) Introduction to ORCAD SPICE and Design & Performance analysis of Different Circuits using Orcad Spice**.**

TRANSMISSION LINES: Preferably Using Demo Kit.

1. To study the effect of line resistance and capacitance.
2. Simulation of transmission lines. 5-mile co-axial cable and 10-mile co-axial cable.
3. Loading effects of capacitance and inductance.
4. Measurement of power loss, characteristic impedance.
5. Effect of Noise and other transmission impairments and compensation techniques.
6. Constant K Low-Pass and High-Pass Filter
7. Constant K Band-Pass and Band-Elimination Filters
8. M-Derived Low-Pass and High-Pass Filters
9. T And Π Attenuators
10. Measurement of Impedance, Admittance and Transmission Parameters
11. Measurement of Image and Iterative Impedance of Symmetrical and Asymmetrical Networks
12. Design of Constant Resistance and Bridged T-Equalisers

FIFTH SEMESTER

DIGITAL COMMUNICATION SYSTEMS (BE/EC – 501)

FIRST HALF :- INTRODUCTION : Pulse code modulation, aliasing, linear and non-linear quantization, calculation of quantization noise, Differential pulse code modulation, Delta modulation, Quantization noise in delta modulation, limitation of of delta modulation, Adaptive delta modulation, Delta signa modulation, MPEG audio coding standard. MULTIPLEXING: Introduction, Frequency division multiplexing. Time division multiplexing (TDM): Synchronous: Characteristics, TDM link control, framing, pulse stuffing, synchronization: frame bit, Early-late bit synchronizer, Inter symbol interference, Eye pattern, Equalization - Nyquist criterion, fixed equalizers and decision directed equalizer, Statistical multiplexing. Introduction to code division multiplexing. DIGITAL MODULATION TECHNIQUES: Introduction: Need for modulation, BPSK, DPSK, DEPSK, PSK, MARY PSK, QASK, FSK, MARY-FSK, Minimum shift keeping. Duo-binary shift keeping. Partial response, Signaling.

SECOND HALF:- Introduction to spread spectrum communication. DATA TRANSMISSION: A base-band signal receiver, Integrate dump type filtering, Calculation of probability of error, Optimum filtering, Matched filter, Probability of ever of matched filter, Transfer function and impulse response of matched filter, Design example, Prewriting filter, coherent reception, Probability error calculation of PSF PSK etc. DECISION THEORY Signal space, Decision region and decision boundary, Bay's likelihood ration and its interpretation, Bay's strategy for detection of single sample value. Maximum likelihood estimation, Mini-max test, Neyman-Pearson test etc. INFORMATION THEORY AND CODING: Discrete messages, measure of information, entropy, information rate, coding to increase average information rate, Shannon's theorem, channel capacity, capacity of gaussian channel, coding: Introduction, Parity check bit coding for error detection, Coding for error detection and correlation, Block codes, coding and decoding, Algebraic codes, Convolution code, Probability error calculation.

ANTENNAS AND WAVE PROPAGATION (BE/EC –502)

FIRST HALF:-
Radiation, Herzian Dipole, different field components, Antenna Fundamentals, Application of Network Theorems, Basic Terminology. Field radiated by dipole & loop antennas, monopole antenna, effect of ground. Traveling Wave Antennas. Antenna Impedance & Bandwidth.

Array Analysis & Synthesis, Special arrays like Binomical Yagi etc. Introduction to Adaptive & Retro directive Arrays, Smart Antennas. Circularly Polarized Antennas, Helical Antennas Broadband Antennas and Arrays (Log periodic & others) Secondary Source & Aperture Antenna. Microwave Antennas. Horn, Slot, Parabola-dial Reflector, Lens & Micro-strip Remote sensing application of antennas, Radar range equations.

SECOND HALF:-

PROPAGATION: Effect of Link on EM Wave propagation in Different frequency Ranges. Interference Effects of Ground, Antennas Located over Flat & Spherical Earth, Coverage Diagram, Surface wave propagation, Ionospheric propagation, Including Effects of Earths' Magnetic Fields. Troposphere Scatter, Ducts & Nonstandard Refraction, ELF propagation using Earth-Ionosphere Wave guide Model. Scattering & Absorption at Microwave Frequencies. Introduction to Propagation Modeling and Predictive studies on Propagation. Multi-path fading. Fries transmission formula. Brightness & Antenna Temperature- their role in link calculation.

INDUSTRIAL ELECTRONICS (BE/EC-503)

FIRST HALF :- Power diode : Special features of construction & v-i characteristics Turn on & turn off characteristics, reverse recovery time, reverse recovery current.
Power BJT : Construction, working principle Special features like low □, quasi saturation, primary breakdown, secondary breakdown.
Power MOSFET : Construction, working principle, special features of construction Special properties of power MOSFET with V-groove structure.
IGBT: Construction & working principle.
Comparative study of important performance parameters of power BJT, MOSFET & IGBT
Thyristors : Construction, working principle. di/dt & dv/dt protection, snubber circuit. Series & parallel operation, static & dynamic equalization network. Commutation circuits: - natural commutation & self commutation
AC voltage controllers (AC/AC) : Single phase half wave & full wave controllers
Single phase cycloconverter. Single phase PWM AC voltage controllers.
Controlled rectifiers (AC/DC): - Single phase semi converter, full converter, dual converter.

SECOND HALF:- Choppers/Switched mode converters (DC/DC) : Principle of step up/step down operation. Classifications – A.B.C.D.E. Buck, boost, buck-boost, Cuk regulators
Principle of operation (qualitative) of full bridge converter
PWM switch mode inverters (DC/AC) : Principle of operation. Harmonic profile: - harmonic factor for nth harmonic (HF_n), Total harmonic distortion (THD), Distortion factor (DF), Lowest order harmonic (LOH). Single phase bridge inverter: - operating principle & harmonic profile. Voltage control of single-phase bridge inverter: - single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation; - estimation of RMS output and harmonic factor in each case.
Power supplies: Overview of SMPS, its merits over linear regulated DC power supplies Working principle of various techniques of SMPS, - fly back, feed forward, push-pull, half bridge & full bridge.

UPS – Construction and operating principle.

ANALOG CIRCUITS – II (BE/EC – 504)

FIRST HALF:- MULTISTAGE AMPLIFIERS Frequency response of single stage R-C coupled amplifier, cascade amplifier, cascaded BJT and FET amplifiers, frequency response of R-C coupled multistage amplifier. 2. POWER AMPLIFIERS Analysis and design of class A, class B, class AB, class C, class D amplifiers, Design of heat sink, IC power amplifiers. 3. TUNED AMLPIFIERS Bandwidth consideration of tuned amplifiers, Analysis of single and double tuned amplifiers, Stagger tuning, Butter worth and Chebyshev response. 4. LINEAR WAVE SHAPING CIRCUITS RC high and low pass filter response for non sinusoidal signals, compensated attenuator, ringing circuit, measurement of L and C through circuit step response.

SECOND HALF:- 5. WAVEFORM GENERATOR oscillation criteria and oscillator circuits. Multi-vibrators, Blocking oscillator, Relaxation Oscillator, 555 timer as variable duty cycle square wave generator, Variable frequency LC and RC sine wave oscillators, Crystal oscillators. Linear time base circuits, PLL-architecture and applications, VCO architecture and applications, Synchronization and frequency division circuits. Bandwidth improvement with current feedback due to absence of Miller effect, the current mirror, current copier and current differentiating amplifier and their applications, Widler circuits. 6. SPECIALIZED LINEAR ICs Multiplier (2208) IC, VCO, PLL, Balanced Modulators, Analog switches Track and hold circuits. 7. VOLTAGE REGULATOR Voltage feedback regulation, current limiting, series voltage regulator, three terminal IC regulators, switching regulators, switch mode power supply, regulators with thermal stabilization.

CONTROL SYSTEM ENGINEERING – I (BE/EC – 505)

FIRST HALF:- Introduction to Control Systems: Classification of control systems, Examples of control systems, Block diagram development of Physical systems, block diagram reduction and signal flow graph, Feedback Control Systems, Properties of Control Systems: Stability, steady-state & transient errors, disturbance rejection, insensitivity and robustness. Errors and Error constants, System types. Control system components: Potentiometer, tacho-generator, synchros & resolver, dc & ac servomotors, Amply dyne, Actuator Specification. Time response of system: Transient & steady state response of second order system and ramp response of second order system, system response with additional poles and zeros, concept of dominant poles. Control actions: Proportional, integral, derivative, and their combinations. Case Studies: Performance analysis of remote position control system and voltage regulator.

SECOND HALF:- Design and compensation of control systems in frequency domain: Frequency Domain Specifications in open loop and closed loop and their significance. Lag compensator, lead compensator and lag-lead compensator and Actuator design.

Stability of linear systems: Routh-Hurwitz criterion, Bode' Plot, Polar Plot, Nyquist criterion. Stability margins. Root locus. Effects of system gain on stability. Nichols chart. State variable analysis: Concept of state, state variable, state model. State variable formulation of control system, diagonalization, Relating transfer function with state model. Time response of state model of linear time-invariant system. Elementary concept of controllability & Observability, Conditions of Complete State Controllability and Observability.

1. Control System Engineering by Nagrath & Gopal.

MICROPROCESSORS AND MICROCONTROLLER
(BE/EC – 506)

FIRST HALF:-

Introduction to 8085A CPU ,architecture-register organization, addressing modes and their features. Pin description and features and Reset Operation of 8085 Microprocessor. Software instruction set and Assembly Language Programming.
Instruction cycle, machine cycle, Timing diagram, Bus Idle Machine Cycle & INA Machine Cycle.
Hardware Interfacing: 8085 Microprocessor based Buffered System, Interfacing of memory, peripheral chips (IO mapped IO & Memory mapped IO).
Interrupts of 8085 Microprocessor : Software Interrupts, Hardware Interrupts & Vectored Interrupts,
Peripherals: 8255, 8155/ 8156, 8355 PPIs, 8251Usart and 8253/ 8254 Timer/ Counter.
Synchronous, Asynchronous, Interrupt driven and DMA Modes of Date Transfer Techniques.
Interfacing Techniques of A/D and D/A converters with 8085 Microprocessor and Programming.

SECOND HALF:-
Introduction to 8086 microprocessor, Internal Architecture of Intel 8086 Microprocessor Pin configuration of 8086 at minimum and maximum mode. Clock Generator for 8086 Microprocessor, Timing Diagram.
Addressing modes of 8086. Software instruction set and Simple Assembly level language Programming of 8086 Microprocessor.

Introduction to 8051 Micro-Controller, its Architecture and Pin Configurations.
Simple 8051 Micro-Controller based Assembly Level Language programming, Assembling and running an 8051 program. Addressing modes and accessing memory using various addressing modes. Instruction Set of 8051 Micro Controller and programming, Single bit instructions and programming, Timer/counter programming in the 8051Micro-Controller.

References:

1) Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
2) Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley inter science publications, 1980.
3) An introduction to micro computers Vol. 2 – some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
4) Advanced Microprocessors by Ray and Bhurchandi - TMH
5) Intel Corp. Micro Controller Handbook – Intel Publications, 1994.
6) Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
7) Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987
8) Textbook On Microprocessor Based Laboratory Experiments And Projects, A. K. Mukhopadhyaya, Wheeler Publishing
9) Fundamentals Of Microprocessors And Microcomputers, B. Ram, Dhanpat Rai
10) Advanced Microprocessors and Interfacing, B. Ram, TMH.

DIGITAL COMMUNICATION LABORATORY (BE/EC – 507)

List of Experiments:

1) Study of Pulse Amplitude Modulation and demodulation.
2) Study of Pulse Width Modulation and demodulation.
3) Study of Pulse Position Modulation and demodulation.
4) Study of Sampling Theorem – verification.
5) Study of Time division multiplexing.
6) Study of Pulse code modulation.
7) Study of Differential pulse code modulation.
8) Study of Delta modulation and adaptive delta modulation.
9) Study of Frequency shift keying.
10) Study of Phase shift keying.
11) Study of Differential phase shift keying.
12) Studies of the properties of A/D and D/A converter.
13) Studies on QPSK modulator and demodulator, connected by either physical or simulated channel

INDURTIAL ELECTRONICS LABORATORY (BE/EC-508)

List of Experiments:

1. To study the switching characteristic of Power Diode and Power BJT.
2. To study drive circuits of power BJT.
3. To study SCR characteristics.
4. To control the full wave controlled rectifier using SCR.
5. To study (the waveforms and switching delays of device) the switching characteristics of MOSFET.
6. To study (waveforms and variation of output voltage with pulse width)
7. Switching Power Supply- Buck converter and Boost converter.
8. PWM switching voltage regulator.
9. To study SMPS.
10. To study different types of UPS

ANALOG CIRCUITS LABORATORY – II (BE/EC – 509)

List of Experiments:

1) Study of frequency response of RC coupled amplifier.
2) Study of Class A Power Amplifier (Transformer less)
3) Study of Class B Complementary Symmetry Amplifier.
4) IC 555 Timer – Monostable and Astable Operation Circuit.
5) IC 565 – PLL Applications.
6) IC 566 – VCO Applications.
7) Voltage Regulator using IC 723.
8) Three Terminal Voltage Regulators – 7805, 7809, 7912.
9) Transistorized oscillators – Phase shift, Wein-bridge , Hartley, Collpit.

Design and Simulation using Multisim OR Pspice OR Equivalent Simulation Software of the above experiments.

MICROPROCESSORS AND MICROCONTROLLER LABORATORY
(BE/EC – 510)

List of Experiments:

1. Execution of Simple program in Assembly level languages of 8085 and 8086 microprocessors.
2. Study of 8255 PPI in different modes using 8085 and 8086 microprocessors.
3. Different waveforms generation using 8085 and 8086 microprocessors based DAC.
4. Study of interfacing techniques of ADC with 8085 and 8086 microprocessors and measurement of some physical parameters like voltage, temperature etc. using ADC.
5. Study of DMA mode of operation using 8085 and 8086 microprocessors.
6. Study of 8253 / 8254 timer in different modes using 8085 and 8086 microprocessors.
7. Study of 8251 USART using 8085 and 8086 microprocessors.
8. Study of interfacing and operation of stepper motor using 8085 and 8086 microprocessors.
9. study of Traffic Light Controller using 8085 and 8086 microprocessors based system.
10. All of above Experiments using 8051 Micro-controller.

SIXTH SEMESTER

TELECOMMUNICATION SWITCHING SYSTEMS (BE/EC – 601)

FIRST HALF:-Evolution of Telecommunication, Basics of Switching System, Classification of Switching System, limitation of Manual Switching System, Evolution of Automatic Switching System, Principle of Operation of Stronger & Crossbar Electromechanical Systems, pulse dialing & tone dialing, Circuit Switching & Packet Switching.

Electronic Switching:
Stored program control, centralized SPC, distributed SPC, software architecture, application software.

Traffic Engineering:
Blocking network, blocking probability, grade of service, traffic load, Erlang-B congestion formula.

Basic time division space switching, Basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, Frequency division switching, grouping.

Telephone Networks:
Subscriber loop systems, Switching hierarchy & routing, transmission systems, charging plan, signaling techniques-in channel & common channel signaling.

SECOND HALF:-

Introduction, ISDN channels & access arrangements, ISDN service capabilities, user-network interfaces, drawbacks of ISDN, introduction to B-ISDN.

Data Network concepts: Introduction to message and packet switching, advantage of packet switching, design consideration, topology, media, routing, access techniques basics, examples of data networks. Multiple access technique methodology: FDMA, TDMA, ALOHA, Slotted ALOHA, CSMA, persistent CSMA/CD, Token ring, Special access technique for mobile radio network. Spread spectrum basics, PN and FH sequence, CDMA techniques. Network protocols, 7 layers OSI architecture, Physical layer example RS232,Line coding, Data link layer ARQ techniques, Mobile communication basics.

References:

1. T. Viswanathan, " Telecommunications Switching Systems & Networks", PHI
2. Tannenbaum, " Computer Network", PHI
3. H. Taub & D.T. Schiling, " Principles of Communication System ", TMH
4. S. Rambhandran, " Telecommunication Principles, Circuits & Systems", Khanna Publishers
5. G. Kennedy, Electronic Communication System", TMH
6. D. Patranbis, "Telemetry Principles", TMH

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IC TECHNOLOGY AND DESIGN (BE/EC – 602)

FIRST HALF:- Introduction Discrete and Integrated Circuit; TTL,MOS and CMOS IC. PROCESS TECHNOLOGY Clean environment, wafer preparation, oxidation, diffusion, ion implantation, plasma etching and deposition, lithography, metallisation contact and interconnects, bipolar and CMOS processing. BASIC DEVICES Long channel MOS transistor equations; Large signal and small signal models; short channel and narrow channel effects; sub threshold region, SPICE Simulation models.

SECOND HALF:- ANALOG CMOS SUBCIRCUITS AND SYSTEMS MOS Switch, Active diode resistors and switched capacitor resistors; current sinks and sources, current mirrors and amplifiers, voltage and current references, differential amplifiers, cascade amplifiers; operational amplifiers; design of two-state and cascade op-Amp. ANALOGUE CIRCUITS Comparators; Switched capacitor Amplifiers, Integrators, Filters; DAC and ADC circuits. MOS INVERTERS Definition and properties, MOS and CMOS inverter; VTC characteristics; Noise Margining Power consumption and Power delays product. BI CMOS CIRCUIT TECHNIQUE BI CMOS device and technology ; Basic analogue sub-circuits.

DIGITAL SIGNAL PROCESSING (BE/EC – 603)

FIRST HALF:- Signal: Multi-channel and multidimensional, continuous time, discrete-time, discrete-time sinusoidal-properties. Sequences: Classification based on length, Symmetry, periodicity, energy, power, special sequences, arithmetic operations on sequences. LTI Systems: Convolution, Graphical & analytical techniques, overlap & add method, sliding tape method, numerical problems on LTI systems, properties of convolution and interconnection of LTI systems, stability of LTI systems, casual LTI systems, Recursive and Non-recursive systems, difference equation, implementation of systems, Direct form I and II structures, Moving average system. Z-Transform: Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, Z-transform on sequences, properties of Z-transform, Inverse Z-transform, numerical problems. DFT: DFT and IDFT relationship, Twiddle factor, linear transformations, basic properties, circular convolution, multiplication of DFTs, Linear filtering using DFT, filtering of long data sequences, overlap and save method, Efficient computation of DFT, FFT algorithms, Radix-2 algorithm, Decimation in-time and Decimation-in-frequency algorithms, signal flow graph, butterflies, Chirp-Z transform algorithm.

SECOND HALF:- Digital Filter Design: Design of FIR filter, linear phase, Windows-Rectangular, Berlitt, Hanning, Hamming & Blackman. Design of IIR filters from analog filters, Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Frequency transformations- in analog & digital domains, least-square methods, computer-Aided Design. MATLAB Application: Sequence generation, convolution of two finite-length sequences, impulse response computation, DFT and IDFT computations, Linear convolution via DFT, overlap and add method, computation of rational Z-transform. Typical DSP Hardware: Texas instruments family of DSP devices, TMS 320 C50 Board, Architecture, Supporting chips, Raxix-2 DIT FET Program using TMS 320CXXXX Multi-rate DSP: Decimation by a factor D, interpolation by a factor I, sampling rate conversion, filter design and implementation, digital filter banks. Applications of DSP : DTMF signal detection, Musical sound processing, Digital FM stereo generation, over sampling A/D and D/A converters.

References:

1. L.R. Rabiner & B.Gold, Theory and Application of Digital Signal Processing., PHI
2. J.G. Proakis & D.G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications.,PHI/Pearson
3. Chen, Digital Signal Processing, OUP
4. Meyer-Basse U, Digital Signal Processing with FPGA, Spriger India
5. Ingle, Digital Signal Processing using MATLAB, Vikas
6. Babu R, Digital Signal Processing , Scitech
7. S. Salivahanan et al, Digital Signal Processing, TMH
8. S.K.Mitra, Digital Signal Processing - A Computer based approach, TMH
9. Xavier, Digital Signal Processing, S. Chand
10. Emmanual C. Ifeachor et. al., Digital Signal Processing: A Practical approach, Pearson Education, 2nd edition.
11. Pradhan, Digital Signal Processing Applications, Jaico

AUDIO & VIDEO ENGINEERING (BE/EC – 604)

FIRST HALF:-

Audio:

Acoustical systems & its electrical equivalent circuits; Microphones, loud speakers, recording & reproduction of sound; high fidelity stereophonic systems; compact disc.

Video:

TV fundamentals, scanning, synchronization & blanking, composite video, video bandwidth consideration, vestigial side brand transmission, channel bandwidth including sound & colour transmission; standard channel, different TV systems, allocation of frequency bands, TV standards, Monochrome & colour camera system, vidicon & plumbicon, solid-state camera; picture tubes, characteristics of phosphor screen, persistence, roll of aluminized coating & shadow mask; gama corrections.

SECOND HALF:-

Block diagram of TV transmitter & receiver, short description of each block; characteristics of TV transmission & transmitting antenna; characteristics of receiving antenna, balun, VHF & UHF tuners, electronic tuning, video IF amplifier characteristics, trap frequencies & VSB correction, video detector & amplifier characteristics, role of AGC sync. Separation, & generation of deflecting signals, role of AFC, EHT circuits, & other receiver power supplies, FM detection, role of limiter & deemphasis circuits, fundamentals of colour signal transmission & reception, frequency interleaving, distinction between NTSC & PAL systems video recording & reproduction, cable & satellite TV.

HDTV:

Introduction, Principle, Standards, applications

References:

1) D. P. Roychowdhury, " Advanced Acoustics", The New Book Stall
2) R.R. Gultari, " Monochronic & Colour Television",
3) M. Dhake," TV & Video Engineering", TNH
4) K. Blair Benson & Donald G. Fink, " HDTV", Advanced television for 1990's, MGH

CONTROL SYSTEM ENGINEERING - II (BE/EC – 605)

LINEAR SYSTEM :- Control Law design for full state feedback. Pole placement by state feedback. Observer Systems and Design of Full order & Reduced order State Observers. Optimal Control Systems and Performance Indices. Optimal Control of linear systems with Quadratic Performance Index. Optimal State Regulator Design through Matrix Ricatti equation. Robust Control Systems and System sensitivity. Stability of systems with uncertain parameters. Structured and Unstructured uncertainty. Stability, robustness of Control Systems. Integral Control and Robust Tracking H2 and H-infinity Control.

DISCRETE DATA SYSTEM :- Introduction to Digital Control system, Pulse transfer function. Transfer function from difference equation. Transient response, characteristics of z-plane pole-locations. Damping ratio and natural frequency. Discretization and Bilinear transformation. Stability on z-plane, Jury's stability criterion, Routh-Hurwitz stability criterion. Choice of sampling rate. Frequency response of discrete functions. Sampling Spectra and Aliasing. Sampling theorem, Systems with time-delay. Specifications and Design of Discrete data of Control System. Digital compensator design in frequency domain. Lead, lag and lag-lead compensation, Single loop digital controllers. Two term (PI, PD) and three term (PID) Control algorithm design. Implementation of digital controllers. Controllability and Observability of discrete-data control system. Solution of state difference equations. Similarity transformation. Discrete-time state-space design - state variable feedback control by pole-placement method.

ENGINEERING ECONOMICS AND COSTING (BE/HU-601)

FIRST HALF:-Introduction – Engineering economy and its important, Want activity, satisfaction of wants. Resources planning and distribution in economic system – Laissez Faire and socialism. Factors of production and concept of optimum. Laws of return. Demand - Elasticity of demand, demand – estimation, market research, supply and industrial costs. Money – Value of money, quantity theory; inflation and deflection. Neural network and its applications.

SECOND HALF:- Banking - role in commercial banks credit and its importance in industrial financing, sources of finance Reserve bank of India and its functions. Business management and organization, Proprietorship, Partnership and joint stock company – their formation, finance and management. Elements of taxation, insurance, Business combinations. Basic Principals of management.

Industrial record keeping : Double entry system – Journal, lager, trail balance, cash book, preparation of final accounts, trading and profit and lose account and balance sheet. Industrial costs and their classifications – Material cost control, labor cost control and overhead cost control. Depreciation and replacement studies; Financial control ratio analysis and their interpretation for industrial control. Budgetary control.

Refereces:

1. Managerial Economics and Financial Analysis – Aryasri, TMH,2/E, 2005.
2. Managerial Economics - Varshney & Maheswari, Sultan Chand, 2003.
3. Financial Accounting for Management - Ambrish Gupta, Pearson Education.

4. Financial Accounting - Schaum's Outlines, Shim &Siegel,TMH, 2/E,2004
5. Managerial Economics In a Global Economy - Domnick Salvatore, Thomson,
6. Financial Accounting—A Managerial Perspective – Narayanaswamy, PHI, 2005
7. Managerial Economics - Peterson & Lewis, Pearson Education, 4th Edition, 2004
8. Managerial Economics& Financial Analysis - Raghunatha Reddy & Narasimhachary, Scitech.
9. Financial Accounting - S.N.Maheswari & S.K. Maheswari, Vikas.
10. Managerial Economics – Dwived, Vikas,
11. Managerial Economics - Yogesh Maheswari, PHI.
12. Jain, Narang & Dhinjra "Cost Accounting"

TELECOMMUNICATION SWITCHING AND ANTENNA ENGINEERING LABORATORY (BE/EC – 606)

List of Experiments: Telecommunication Switching Lab:

1. To study EPABX**:**
   (a) to study the electrical behaviour of different tones – dial tone, ringing tone, ring back tone and busy tone (both subscriber and exchange);
   (b) to study some extension features-redial, burgling, extension privacy, call forwarding, follow me etc.
2. To study Facsimile Technique (preferably using Demo Kit)
3. To study working of Telephone System (preferably using Demo Kit)

Antenna Lab:

1. Standing wave pattern study of RF transmission line .
2. Guide wavelength & VSWR measurement of a rectangular waveguide .
3. Radiation pattern study (gain & bandwidth measurement) of a simple dipole antenna.
4. Radiation pattern study (gain & bandwidth measurement) of a folded dipole Antenna.
5. Radiation pattern study (gain & bandwidth measurement) of a Yagi antenna .
6. Radiation pattern study (gain & bandwidth measurement) of a log periodic antenna .
   Radiation pattern study (gain & bandwidth measurement) of a horn antenna .

DIGITAL SIGNAL PROCESSING LABORATORY (BE/EC– 607)

LIST OF EXPERIMENTS: Perform at least 10 experiments (5 suing MATLAB^{TM} and 5 using DSP kit)

Perform the following exercises using MATLAB^{TM}

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. To develop program modules based on operation on sequences like signal shifting, signal folding, signal addition and signal multiplication.
3. To develop program for discrete convolution and correlation .
4. To develop program for finding response of the LTI system described by the difference equation.
5. To develop program for computing inverse Z-transform.

6. To develop program for finding magnitude and phase response of LTI system described by system function H(z).
7. To develop program for computing DFT and IDFT .
8. To develop program for computing circular convolution.
9. To develop program for conversion of direct form realisation to cascade form realisation.
10. To develop program for cascade realisation of IIR and FIR filters.
11. To develop program for designing FIR filter.
12. To develop program for designing IIR filter.

Perform the following exercises using TMS 320 C50 or Higher Board

1. To study the architecture of DSP chips – TMS 320C 50 or higher.
2. To verify linear convolution.
3. To verify the circular convolution.
4. To design FIR filter (LP/HP) using windowing technique
5) Using rectangular window
6) Using triangular window
7) Using Kaiser window
8) To Implement IIR filter (LP/HP) on DSP Processors
9) N-point FFT algorithm.

AUDIO AND VIDEO SYSTEM LABORATORY (BE/EC-608)

List of Experiments:

1. Voltage & frequency calibration of an audio function generator using a commercial function generator & a CRO.
2. Level & total harmonic distortion measurement of different audio waveforms (sine, triangular & square) from a commercial audio function generator using a level & distortion meter.
3. Output power, frequency response, and efficiency & distortion measurement of a push-pull power amplifier.
4. Directivity & frequency response measurement of a microphone.
5. Directivity & frequency response measurement of a loudspeaker.
6. Study of different components of a B/W TV receiver & measurement of different waveforms from a pattern generator.
7. Study of waveforms on a CRO for different patterns from a pattern generator applied to a B/W TV receiver & measurement of a H, V, Hsigma, Vsigma & P/S ratio.
8. Study of waveforms on a CRO for different patterns (V-bar, Yellow, Green, cyan, Magenta, Blue, Red etc.) from a color pattern generator applied to a colour TV receiver & measurement of luminosity level, color sub-carrier souting, and color burst amplitude.

CONTROL SYSTEM ENGINEERING LABORATORY (BE/EC – 609)

List of Experiments:

1. Characteristics of Synchro Transmitter-Receiver & Differential Transmitter.
2. Different Experiments on Servo Fundamental Systems (Both Analog & Digital Control).
3. Different Experiments on DC Motor based position Control system using P, PD, PI & PID Controllers (DC Servomechanism using DC Modular Servo System .
4. Different Experiments on AC Servomechanism using AC Modular Servo System.
5. Experiments Twin rotor MIMO Servo Systems.
6. Experiments on Inverted Digital Pendulum.
7. Control System performance analysis and applications of MATLAB in Control system performance analysis & design.

SEVENTH SEMESTER

COMPUTER COMMUNICATION NETWORKS (BE/CS – 711)

FIRST HALF:- Introduction of Computer Networks and Data Communication Services. Roles of Network Hardware and structured Network software. The Reference Models: OSI, TCP/IP. Mention of Physical layers and significance of circuit switching, packet switching, message switching, and ISDN services. ATM and transmission in ATM network, Advanced mobile phone system (AMPS). Concept of global system for mobile communication (GSM), satellite and fiber optic networks. Design of data link layer, data link protocol, framing, error and flow control. Error detection and correction. Example of data link protocol.

SECOND HALF:- The multi-access channel, multiple access protocols, wireless LAN protocols, IEEE standards. Network layers, its internal organization, routing algorithms, hierarchical routing, routing for mobile hosts, congestion control algorithms. The network layer in Internet, the IP protocol/addresses/header. The network layer in ATM networks. Transport layer services, Internet transport protocols, the ATM AAL layer protocols, protocols for Gigabit networks. Network security concepts. The Electronic Mail, Email gateways, the World Wide Web, Multimedia concepts.

References:

1) Andrew S. Tanenbaum, *Computer Networks* , 4/e, Pearson education, 2003
2) Uyless Black, *Computer Networks - Protocols, Standards and Interface*s, Prentice Hall India, New Delhi, 1994
3) S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education ,2002
4) Halsall, *Data Communication, Computer Networks and Open System*s, Addison Wesley, 1996
5) William A Shay, understanding communication and networks, Brooks/Cole , 2/e.
6) Behrouz A. Fourouzan ,*Data Communications and Networking,* 2/e Tat McGrawhill,2000
7) Leon-Garcia and I. Widjaja, *Communication Network*s, Tata McGraw Hill, 2000
8) Bertsekas and Gallagar , *Data Network*s, 2/e, PHI, 1992
9) Douglas Comer and David L. Stevens, *Internetworking with TCP/IP Vol. I, II, and III*,Prentice Hall, New York, 1990
10) Richard Stevens. W, *TCP/IP Utilities - Vol. I, The protocol*s, Addison Wesley, 1994
11) Sidnie Feit, *TCP/IP, Architecture, Protocols and implementatio*n, McGraw-Hill, New York, 1993
12) Miller, Data & Network Communications, Vikas Thomson

VLSI DESIGN (BE/EC – 701)

FIRST HALF:_ Review of MOSFET characteristics, scaling and small-geometry effects, MOSFET capacitances. MOS inverters, CMOS inverter, static characteristics, switching characteristics, power dissipation issues. Combinational MOS Logic Circuits: MOS logic circuits with depletion loads, CMOS logic gates, complex logic gates, CMOS transmission gates, pseudo-NMOS domino logic gates, complex logic gates, CMOS transmission gates, pseudo-NMOS, domino logic gates. Multilevel gate circuits and design. Sequential MOS Logic Circuits: The SR latch circuit, clocked latch and flip-flop, CMOS D-latch and edge

triggered circuits, Schmitt trigger circuit. Dynamic Logic Circuits: Pass transistor logic, synchronous dynamic circuit techniques, high-performance dynamic CMOS circuits.

SECOND HALF:- Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, drivers and buffers, design issues in memory and array structures. Low-Power CMOS Logic Circuits: Overview of power consumption, low-power design issues in memory and array structures. Low-Power CMOS Logic Circuits: Overview of power consumption, low-power design through voltage scaling, estimation and optimization of switching activity, quasi-adiabatic logic circuits, Multi-threshold CMOS,SOI-MOSFET design issues. BICMOS Logic Circuits: Basic BICMOS circuits, static behavior, switching characteristics in BICMOS logic circuits, BICMOS applications. Input-Output Circuits: ESD protection, input and output buffer design, on-chip clock generation and distribution, latch-up and its prevention.

Reference:

1. Douglas A Pucknell, Kamran Eshraghian , "Basic VLSI Design", PHI
2. Millman and Grabel "Microelectronics" TMH.
3. Jan M. Rabaey, A. Chandrakasan, B. Nikolic "Digital Integrated Circuits- A Design perspective", 2/e, PHI.
4. Thomas E. Dillinger , "VLSI Engineering ", PHI.
5. S M Sze, " VLSI Technology".
6. Weste and Eshraghian,"Principles of CMOS VLSI Design, A Systems Perspective", 2/e, Pearson Education.
7. Mead & Conway , "Introduction to VLSI System Design"-
8. Fabricius, " Introduction to VLSI Design".
9. Charles H Roth Jr – "Fundamentals of Logic Design" 4 Ed, Jaico Publishers, 2002
10. Allen Hollberg, "CMOS Analog Circuit Design" OUP.
11. CMOS Digital Integrated Ciruits, Analysis and Design, S. M. Kang & Y. Leblebici,TMH.

OPTICAL FIBRE COMMUNICATION (BE/EC – 702)

FIRST HALF:- Fibre optic communication principle for analog and digital signals. Passive and Active components for fibre optic communication: (a) Different optical fibre types, their wave guidance properties, alternation, dispersion and other characteristics. (b) Manufacturing principles of optical fibres, measurement of optical fibre parameters. (c) Passive fibre optic components: couplers, switches, gratings, optical connectors, optical filters, WDM filter, Bragg reflectors, optical isolators, optical circulators, Alternators etc. (d) Active components: Semiconductor LED, Laser devices, Fibre amplifiers, PIN & Avalanche photodiode.

SECOND HALF:- Fiber optic Transmitters: For short hand and long hand communications, Fiber optic receivers, Repeaters for long hand communication, High bit rate digital optical communication systems. Use of WDM technology for high capacity system design Broadband fibre optic communication systems Analog Video transmission in CATV networks. Fibre optic networks: FDDI principles, LAN,MAN,WAN,B-ISDN using fiber optic technology. New hands in Fiber optic technology and their application to Fibre optic communication.

MICROWAVE ENGINEERING (BE/EC –703)

FIRST HALF:-

MICROWAVE TRANSMISSION LINES : Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Wave guides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide.
CIRCULAR WAVEGUIDES : Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes. Impossibility of TEM mode. Microstrip Lines– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor. Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients. Related Problems.

WAVEGUIDE COMPONENTS AND APPLICATIONS - I : 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.

WAVEGUIDE COMPONENTS AND APPLICATIONS - II : Ferrites– Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator. Scattering Matrix – 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.

SECOND HALF:-

MICROWAVE TUBES – I : Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, 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 – Different Types, 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.

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of

Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

REFERENENCES:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
5. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
6. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
7. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

ELECTIVE – I (BE/EC– 704)

The Student has to choose one of the following Subject as ELECTIVE – I

1. INFORMATION THEORY AND CODING: (ETCE-704/1)

Information theory - information and entropy - properties of entropy of a binary memoryless source - extension of a binary memoryless source - source coding theorem - Shannon fano coding - Huffman coding - Lempel ziv coding - discrete memoryless source - binary symmetric channel - mutual information - properties - channel capacity - channel coding theorem.

Coding I- linear block codes - generator matrices - parity check matrices - encoder - syndrome and error correction - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding.

Introduction to algebra - groups - fields - binary field arithmetic - construction of Galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed solomon codes.

Coding II- convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - viterbi decoding - sequential decoding - interleaved convolutional codes. Turbo coding. Trellis coding.

1. References:
2. Simon Haykins, Communication Systems, John Wiley
3. Shu Lin, Costello D.J., Error Control Coding - Fundamentals and Applications, Prentice Hall Inc. Englewood Cliffs

4. Das J., Malik A.K., Chatterjee P.K., Principles of Digital Communications, New Age International
5. Simon Haykin, Digital Communications, John Wiley
6. Taub & Schilling, Principles of Communication System, Tata McGraw Hill
7. Tomasi, Electronic Communication, Fundamentals Through Advanced, Pearson education
8. Sklar, Digital Communication, Pearson Education
9. Couch, Digital and Analog Communication System, Pearson Education

2. INTEGRATED SERVICES DIGITAL NETWORK: (BE/EC-704/2)

ISDN – STANDARDS AND SERVICES: Review of switching technologies and OSI protocol architecture, ISDN channels, access interfaces, functional devices and standards, ISDN bearer services and teleservice attribute, Broadband services.

ISDN PROTOCOL ARCHITECTURE AND SIGNALING : Physical layer protocol, D-channel datalink layer and layer 3 protocols, Network signaling systems, SS7 protocol overview and services, ISDN products, Switches, Multiplexers, Terminal adapters, ISDN chip sets.

BROAD BAND ISDN: Frame Relay – concepts, protocols, applications and products, asynchronous transfer mode – concepts, protocols, application and products, switched multi megabit data service, Internet protocol over ISDN frame relay and ATM.

NETWORK TRAFFIC MANAGEMENT : ATM traffic and congestion control, Traffic management framework, control mechanism and attributes, ABR traffic management.

NETWORK PERFORMANCE MODELING AND ESTIMATION : Queueing analysis, single server and multi server queues, Networks of Queues, Estimating model parameters, Self-similar traffic – performance implication, modeling and estimation

References:

1) Gary C. Kesslar and Peter Southwick, "ISDN – concepts, facilities and services", McGraw Hill, 3rd Edition, 1997.
2) William Stallings, "High Speed Networks-TCP/IP and ATM Design Principles", Prentice Hall Inc., 1998.
3) Balaji Kumar, "Broad Band Communications" McGraw-Hill, 1995.

3. DIGITAL IMAGE PROCESSING (BE/EC-704/3)

Module I

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering - Toeplitz, Circulant and Block matrices. Review of Image transforms: 2D-DFT, FFT, Walsh , Hadamard , Haar, DCT and Wavelet transforms.

Module II

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering. Generation of spatial masks from frequency domain specifications.

Module III

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations. Fundamentals of Colour image processing:colour models - RGB, CMY, YIQ, HIS - Pseudo color image processing - intensity slicing, gray level to color transformation.

Module IV

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundame ntals of JPEG, MPEG, Fractals.

Module V

Image segmentation: Detection of discontinuities - point, line and edge and combined detection ; Edge linking and boundary description - local and global processing using Hough transform – Thresholding - Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging - Use of motion in segmentation. Fundamentals of Representation and Description.

References:

1) Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
2) Anil K. Jain “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3) Mark Nelson, Jean-Loup Gailly “The Data compression Book” 2 Ed, bpb Publications.
4) Pratt William K.,”Digital Image Processing”, John Wiley & sons
5) Chanda & Majumdar, “Digital Image Processing and Analysis” , PHI.
6) M.Sonka,V. Hlavac, R. Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publishing House

4. OPERATING SYSTEMS (BE/EC – 704/4)

INTRODUCTION: History of OS, OS concepts, processes, files, shell, virtual machine, client sewer model, memory management without swapping or paging, monoprogramming & multi programming, virtual memory, paging, Associative memory, page replacement algorithms, Belady’s Anamely, Optimum page size, segmented memory.

PROCESS MANAGEMENT: Interprocess Communications, Critical sections, Mutual Exclusions, Semaspheres, Deadlocks, Deadlock deduction and recovery, Deadlock avoidance

and prevention's, Round Robin Scheduling, Priority Scheduling, SJF Scheduling, Guaranteed Scheduling, Two level Scheduling, Classical IPC Problems.

FILE SYSTEMS:- File naming, File structure, File types, File attributes, File access, File operations, Memory mapped files, Directories, Path names, Disk space management, Security, Internet worm, User authentication, Virus, Antivirus packages, Trojan horse attack, bad block management, Optimum block size.

DISTRIBUTED OPERATING SYSTEM: Goals, Hardware & Software concepts, Design issues, Communication, Synchronization and dead locks in distributed OS, Election algorithm, Concurrency control, Andrew file system, Mobil users, Wide area networking Fault tolerance.

CASE STUDIES: History, Overview, Fundamental concepts, System calls and implementation of UNIX, MS-DOS, AMOEBA and MACH.

References:

1) Andrew. S. Tanenbanen, "Modern Operating Systems", Prentice Hall of India Ltd., May, 1996.
2) Charles Crowley, "Operating System", Tata McGraw-Hill, 1998.
3) H.M. Deited, "Operating Systems", Addison – Wesley, 2nd edition, 1990.
4) Achyut. S. Godbole, "Operating Systems", Tata McGraw-Hill, 1996.
5) M. Mileukovic, "Operating Systems concepts and design" Tata McGraw-Hill, 1992.
6) Silberschatz.A and P.B.Galvur, "Operating Systems concepts", Addison – Wesley, 1994.
7) A.Gosciuski, "Distributed operating systems the logical design", Addison – Wesley, Reading, MA, 1991.

5. ARTIFICIAL INTELLIGENCE (BE/EC – 704/5)

Introduction
Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

Intelligent Agents
Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

Problem Solving
Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Search techniques
Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies

Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

Adversarial search
Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

Knowledge & reasoning
Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

Using predicate logic
Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules
Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

Planning
Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Natural Language processing
Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning
Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Expert Systems
Representing and using domain knowledge, expert system shells, knowledge acquisition.

Basic knowledge of programming language like Prolog & Lisp

References:
1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP

5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS
7. Artificial Intelligence, Russel, Pearson

6. ROBOTICS AND COMPUTER VISION (BE/EC-704/6)

Introduction to Robotics: Evolution of Robotics, Laws of Robotics, Robot Anatomy. Human Arm Characteristic.

Coordinate Frames, Mapping and Transformation: Coordinate Frames, mapping, mapping between rotated frames, mapping between translated frames, and both. Transformation Vectors, Combined Rotation and Translation of Vectors, Composite Transformation. Inverting Homogenous Transform. Fundamental Rotation Matrix.

Symbolic Modelling of Robots: Mechanical Structure and Notation, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit-Hatenberg Notation, Kinematic Relationship between adjacent links, Manipulator Transformation Matrix.

Computer Vision: Basic steps of Image Processing, Human Sensing System, Different types of sensors used in Robotics, Components of Robotic Vision System. Image Acquisition, Image Representation, Image Processing.

Robot Application: Material Handling, Assembly Applications, Inspection Application etc.

References:

1) Robotics and Control, Mittal & Nagrath, TMH
2) Robotics and Computer Vision, Fu, Gonzalez, MGH

7. SATELLITE COMMUNICATION (BE/EC - 704/7)

Satellite orbits - solar day and sidereal day - orbital parameters - satellite trajectory - period, velocity and position of a satellite - geostationary satellites - non-geostationary constellations - launching of geostationary satellites - Hohmann transfer - effect of earths shape - other heavenly bodies - atmospheric drag and radiation pressure on the satellites orbit

Communication satellites - spacecraft subsystems - payload - repeater, antenna, attitude and control systems - telemetry, tracking and command - power sub system and thermal control Earth stations - antenna and feed systems - satellite tracking system - amplifiers - fixed and mobile satellite service earth stations.

Communication link design - frequency bands used - antenna parameters - transmission equations - noise considerations - link design - very small aperture terminals (VSAT) - VSAT design issues.
Multiple access techniques - frequency division multiple access - time division multiple access - code division multiple access - access protocols for data traffic.

References:

1) Richharia M., Satellite Communication Systems, Macmillan Press Ltd.
2) Gagliardi R.M., Satellite Communication, CBS
3) Ha T.T., Digital Satellite Communication, MGH

MICROWAVE ENGINEERING LABORATORY (BE/EC – 705)

List of Experiments:

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance and Frequency Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.

ELECTRONIC COMPUTER AIDED DESIGN AND MATLAB™ PROGRAMMING LABORATORY (BE/EC – 706)

List of Experiments:

Design following and analysis of the following circuits in any Electronics CAD Software (not limited to):

1. Frequency Response of CE Amplifier
2. Frequency Response of CS Amplifier
3. Design of Wein-Bridge Oscillator
4. Design and Verification of Class-A Power Amplifier
5. Verification of Half-wave and Full-wave rectifier
6. Verification of Amplitude Modulation and Demodulation

Design following and analysis of the following circuits in MATLAB™ (not limited to):

1. Simulation of AM
2. Simulation of FM
3. Simulation of LPF and HPF
4. Fourier Transforms
5. Simulation of M-ary PSK
6. Simulation of DPCM
7. Evaluation of DFT and IDFT of 16 Sample Sequence using DIT Algorithm
8. Evaluation of DFT and IDFT of 16 Sample Sequence using DIF Algorithm

9. Design of IIR Butterworth Filter using Impulse Invariant Method
10. Design of FIR Filter using Windowing Technique
11. Convolution of Two Signals
12. Correlation of Two Signals
13. DFT Analysis of a Noise Corrupted Signal.

MICRO-ELECTRONICS AND VLSI LABORATORY (BE/EC – 707)

List of Experiments:

1. Design layout of a two input CMOS NAND gate using LASI (Use Mead Conway design rules of any standard.
2. Using LASI, draw the layout of a simple CMOS amplifier
3. Using SPICE, simulate a CMOS inverter. Obtain the transfer characteristics for different values of β_n/β_p
4. Using SPICE, simulate a simple CMOS amplifier and obtain the transfer characteristics and frequency response
5. Using SPICE, simulate a CMOS differential amplifier with a current source. Use <.SUBCKT> command of SPICE
6. Draw a full adder using AND/OR/INVERT gates in schematic editor

PRELIMINARIES OF PROJECT & THESIS (BE/EC – 708)

Each candidate or a group will assign a problem in "Electronics and Telecommunication Engineering" on which the candidate(s) will carry out detail review/ study and/or analysis. They will submit a detail report and present his/ her/ their work in an open defend at the end of the Semester.

VIVA VOCE – I (ETCE – 709)

Viva Voce test will be based on theoretical and practical knowledge of students in their branch of Engineering.

BE/GP – 2 PROFESSIONAL SKILL DEVELOPMENT- I

- Filling up of Curricula Vitae.
- Response to a Job advertisement.
- Joining Report in a Profession.
- Report writing on issues related to your profession such as – Improvement of work culture, Improvement of Relationship with your Collogues, submission of a sum-up of annual Report, Maintaining of Environment Friendly atmosphere in the office, Basic amenities requirement to run a good Organization / Office.
- Basic requirements of Management / Managerial Jobs.
- Notice Inviting Tenders, Issuance of Supply Orders, Memo, Complaint Letter, Invitation, Notifications etc.
- Oral Communicative Skill Practice.
- Mock Interview.

EIGHTH SEMESTER

INDUSTRIAL MANAGEMENT (BE/ME-811)

FIRST HALF:- Growth of Industries, Management thoughts and scientific management, Taylorism; Factory system of production, Introduction to management problems, Types of manufacture, Planning analysis and control aspects in industries. Types of business ownership, means of finance and business combinations, organization structures, committee organization, authority and responsibility, duty and span of control. Plant location, factory buildings and physical facilities, plant layout, tools and techniques of plant layout, materials - handling arrangements. Product development, standardization, simplification and diversification.
Functions of production, planning and control, production forecasting, production scheduling and network techniques, Gantt chart, CPM, PERT etc.

SECOND HALF:- Work study, job evaluation and merit rating; purchase system and inventory control. Inspection and quality control of systems, statistical quality control, maintenance and replacement policies for machine and equipments; decision making theories, breakeven analysis cost benefit analysis, evaluation of financial and managerial efficiencies. Introduction to operational research techniques. Application of fuzzy logic in modern management concepts. Human relations in industry and labour compensation. Personnel management, provision of industrial legislations in India. Wage and salary administrations. Welfare and safety provisions, trade union acts. Study of environmental impacts and environmental laws.

SATELLITE, MOBILE AND PERSONAL COMMUNICATION (BE/EC – 801)

FIRST HALF:- SATELLITE COMMUNICATION

Historical development of satellites Indian-activities in satellite communication satellite system, Earth Station: The Antenna, High power amplifier, Low noise amplifier, VP connector, Down converters, conversion process, redundancy configuration. Satellite transponder, Transponder model, Canalization, Frequency plans, Processing. Synchronous satellite communication relay by synchronous satellite, satin keeping altitude stabilization, power generation, solar celifore, satellite earth terminal mutual interference, Communication link design & transponder. Frequency division multiple access principle, SPADE,FDM-FM-FDM. Time division multiple access principles, TDMA frame structure, super frame structure, Frame acquisition and synchronization. DSCDMA, D.S. spread spectrum system.

SECOND HALF:- MOBILE AND PERSONAL COMMUNICATION SYSTEM

Introduction : Concept of mobile and personal communication -Past present and future, System requirement, Some related network concept, Cellular concept : Basic principles and concept, Multiple access technologies, System operation and planning, System architecture, Location updating and call set up -registration, terminal authentication, Hand off and Power control. Analog Cellular System- AMPS (Advanced Mobile Phone System), TACS (Total Access Communication Systems), NMT (Nordic Mobile Telephone), NTT (Nippon Telephone and Telegraph). DIGITAL CELLULAR MOBILE SYSTEM Introduction, GSM(Global System for mobile communication)- digital standardization and services,

Architecture and function partitioning, Radio aspects, Security, Protocol model, Typical call flow sequences, DECT- (Digital enhanced cordless telecommunication), Introduction, Radio aspects, Layered architecture, Network aspect, DECT/GSM internetworking. PERSONAL MOBILITY AND UNIVERSAL PERSONAL TELECOMMUNICATION (UPT) Introduction, UPT- Concept and services, Service Profile and parameters, functional architecture for UPT, Numbering, Routing and billing aspects, Access Security requirement.

References:

1. Mobile Communication, J. Schiller, Pearson
2. Wireless and Mobile Networks Architectures, Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001
3. Mobile and Personal Communication systems and services, Raj Pandya, PHI
4. Guide to Designing and Implementing wireless LANs, Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
5. The Wireless Application Protocol, Sandeep Singhal, Pearson .
6. Third Generation Mobile Telecommunication systems, by P.Stavronlakis, Springer Publishers,
7. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications,
8. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications
9. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
10. Satellite Communication - D.C Agarwal, Khanna Publications,
11. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI
12. Satellite Communications – Dennis Roddy, McGraw Hill,

INDUSTRIAL INSTRUMENTATION (BE/EE –814)

FIRST HALF:-

Transducers: Static and dynamic specification; Transducer for Position-Potentiometers. Optical Encoders, piezoelectric, **Fluid** : Pressure, flow, level transducers. Bourdon tubes, Bellows; Pirani gauge; Optical coupling and isolation, Humidity transducers, **Digital Meters**: Readouts, LED,LCD, Display drivers, Digital frequency meters, Measurement of time period, Pulse width and frequency ratio, Digital Voltmeter, LCR meter, Measurement with CRO: Voltage, frequency and Phase, Oscilloscope probes. Displaying diode characteristic on CRO; sampling oscilloscope, Principles of Digital storage Oscilloscope.

SECOND HALF:-

Measurement of Flow and Liquid Level, Head flow meters, Area flow meters, Mass flow meters, and Magnetic flow meter, Measurement of airflow. Control Valves and its characteristics, Valve positioners.

Concept of Processes and Units: Process statics, mass and enthalpy balance. Modeling of process dynamics. Process Control terminology. Process Instrumentation diagrams. Modeling of Chemical processes. Single loop control of standard first order process plants. Controller

Implementation : Electronic, Analog, Digital, Pneumatic Controllers. P, P-I, P-D, P-I-D control, Controller tuning, Ziegler-Nichlol's method, Frequency domain design. Feed-forward control, Ratio Control, Multi-loop and Cascade control.

NEURAL NETWORK AND FUZZY LOGIC (BE/EC – 802)

FIRST HALF:-

Neural Networks characteristics: History of development in neural Networks Principles, Artificial Neural Net terminology, Model of a neuron, topology, learning types of learning supervised unsupervised, re-inforcement learning.

Basic Hopfield Model: the perceptron, linear separability, Basic learning laws : Hebb's rule, Delta rule, Widrow & Hoff LMS learning rule, correlation learning rule, instar and outstar learning rules.

Unsupervised learning: competitive learning, K-means clustering algorethm, Kohonen's feature maps.

Radial Basis: Function neural networks, basic learning Laws in RBF nets, Recurrent networks, recurrent back propagation, Real Time Recurrent learning algorithm. Introduction to counter Propagation networks, CMAC networks, ART networks.

SECOND HALF:-

Applications of neural nets such as pattern recoginition: optimization, associative memories, vector quantization, control,Applications in speech and decision making.

Fuzzy Logic : Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations of fuzzy sets, fuzzy IF-THEN rules, variable inference, techniques, defuzzication techniques, basic fuzzy inference algorithm, Applications of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

Reference:

1) Fuzzy Systems Design Principles, Building Fuzzy IF-THEN Rule Bases By Riza C. Berkin & Trubatch, JeeeBcss
2) Computational Intelligence: Principles, Techniques and Application, A. Konar, Springer Low Price Edition.
3) Y. Narayanan - Artificial Neural Networks, PHI
4) Bart Kosko - Neural Networks & Fuzzy Logic
5) Simon Haykin - Neural Networks, Pearson
6) An Introduction to Neural Networks, Anderson J.A., PHI,
7) Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, Pearson
8) "Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, PHI.
9) "Neural Networks: Algorithms, Applications and Programming Techniques", Freeman J.A. & D.M. Skapura, Addison Wesley, Reading,

ELECTIVE – II (BE/EC –803)

The Student has to choose one of the following Subjects as ELECTIVE – II

1. WIRELESS COMMUNCIATIONS AND NETWORKS (ETCE-803/1)

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION : Introduction, FDMA, TDMA, Spread Spectrum, Multiple access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.

INTRODUCTION TO WIRELESS NETWORKING : Introduction, Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks.

WIRELESS DATA SERVICES : CDPD, ARDIS, RMD, Common channel signaling, ISDN, BISDN and ATM, SS7, SS7 user part, signaling traffic in SS7.

MOBILE IP AND WIRELESS ACCESS PROTOCOL : Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol.

WIRELESS LAN TECHNOLOGY : Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE 802 protocol Architecture, IEEE802 architecture and services, 802.11 medium access control, 802.11 physical layer.

BLUE TOOTH : Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

MOBILE DATA NETWORKS : Introduction, Data oriented CDPD Network, GPRS and higher data rates, Short messaging service in GSM, Mobile application protocol.

WIRELESS ATM & HIPER LAN : Introduction, Wireless ATM, HIPERLAN, Adhoc Networking and WPAN.

References:

1) Wireless Communication and Networking – William Stallings, PHI, 2003.
2) Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn., 2002.
3) Wireless Digital Communications – Kamilo Feher, PHI, 1999.
4) Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

2. NEURO-FUZZY CONTROL (BE/EC– 803/2)

Basics of fuzzy sets: Classical set to Fuzzy Set, Operations on fuzzy Set, Membership functions, Extension principle, Fuzzy arithmetic, Fuzzy logic and approximate reasoning, Fuzzy logic based control system: its relationship to conventional control systems, fuzzifier, Fuzzy rule base, De-fuzzifier, Inference Engine, Mamdani and Sugeno scheme.

Design Methodology of Fuzzy control systems, Stability analysis and applications.
Introduction to Neural Nets, Common types of Neural nets, Feed forward, Hoffield
Learning of neural nets: Supervised and unsupervised learning, back propagation learning.
Adaptive controller using neural nets, Neuro-Fuzzy adaptive control

Introduction to optimal control
Performance measure for optimal control problems, the principle of optimality, Concept of dynamic programming, The Hamilton-Jacobin-Bellman Equation
The calculus of variation
Fundamental of a single function, Functional involving several independent functions, Constrained minimization of functional.
The variational approach to Optimal Control problems
Linear regulator problems, Potryagin's minimum principle and state inequality constraints, minimum time and minimum control-effort problems.
Estimation techniques, least mean square, Maximum likelihood.
Different types of Adaptive control systems, classifications, Design technique of different types of Adaptive Control, Identification Procedure.

Neural Networks for control : Neuron Models, Artificial Neuron, Activation function, Mathematical Model, Network Architecture, Learning in Neural Networks, System Identification with Neural Networks, Adaptive Control with Neural Networks, Fuzzy Controller, Design and analysis of controller using MATLAB and SIMULIK.

3. ADVANCED MICROPROCESSORS (BE/EC – 803/3)

Intel 8086/8088 microprocessor

1.1 Review of Intel 8086 microprocessor.
1.2 Comparison of 8086 and 8088 microprocessors.
1.3 Interfacing of 8086 with system clock 8284.
1.4 Interfacing of 8086 with bus controller 8288.
1.5 Floating point process of 8087 and its interfacing with of 8086.
1.6 Interfacing of 8086 with DMA controller 8237.
1.7 Interfacing of 8086 with interrupt controller 8259.
1.8 Interrupt vector table.
1.9 INTERRUPT TYPES**:** Software interrupt – External maskable interrupt – Non-maskable hardware interrupt.
1.10 Priority in interrupt.

MC 68000 and Z8000

Internal Architecture, register organization, Modes of operation, pin description, addressing modes, interrupts.

Intel 80286
Architecture – Real address mode – Protected virtual address mode. MEMORY MANAGEMENT SCHEME**:** Descriptors – Accessing segments – Selecting address translation register – Physical address. Protection schemes – Task switching – Gates.

Intel 80386**:**
Architecture –Special 80386 Registers –Memory management – interrupts and exceptions – management of tasks –Real, protected and virtual 8086 mode
Comparison with 80286.

Intel 80486 **:**
Architecture of 80486 – Internal cache memory support – Memory System. Comparison with 80386.

PENTIUM PROCESSOR**:** Architecture, Memory System, Concept of super scalar – Dual pipeline architecture – Comparison with 80486.

RISC PROCESSORS

RISC vs CISC, RISC properties and evaluation, Advanced RISC microprocessors, DEC ALPHA, The power PC family, The SUN SPARC family, The MIPS RX100 family, The intel 860 family, The Motorola M88000 family, HP precision architecture.

References:

1) Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
2) Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley inter science publications, 1980.
3) An introduction to micro computers Vol. 2 – some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
4) Advanced Microprocessors by Ray and Bhurchandi - TMH
5) Intel Corp. Micro Controller Handbook – Intel Publications, 1994.
6) Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
7) Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987
8) Textbook On Microprocessor Based Laboratory Experiments And Projects, A. K. Mukhopadhyaya, Wheeler Publishing
9) Fundamentals Of Microprocessors And Microcomputers, B. Ram, Dhanpat Rai
10) Advanced Microprocessors and Interfacing, B. Ram, TMH.
11) B. B Bery, “The INTEL Microprocessors 8086/8088, 80186/80188, 80286, 80386 80486, PENTIUM, and PENTIUM pro processor”, Prentice Hall, 1997.

4. MEDICAL ELECTRONICS (BE/EC-803/4)

ELECTRO-PHYSIOLOGY AND BIOPOTENTIAL RECORDING: The origin of Biopotentials; biopotential electrodes; biological amplifiers; ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENTS: pH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

ASSIST DEVICES : Cardiac pacemakers, DC Debrillators, Dialyser, Heart-Lung machine, Hearing aids.

PHYSICAL MEDICINE AND BIO-TELEMETRY: Diathermies – Short-wave, ultrasonic and microwave type and their applications, Medical stimulator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

RECENT TRENDS IN MEDICAL INSTRUMENTATION : Thermograph, endoscopy unit, Laser in medicine, Surgical diathermy, cryogenic application, Electrical safety.

References:

1) John G.Webster, "Medical Instrumentation Application and Design", John Wiley and Sons, New York, 1998.
2) Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India New Delhi, 1997.
3) Khandpur, R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.
4) Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment technology", John Wiley and Sons, New York, 1997.

5. RADAR & NAVIGATION (BE/EC –803/5)

RADAR

Basic Radar, Radar Equation, Threshold Detection, Integration of Radar Pulses, system Losses, Effects of RCS Fluctuation, Internal and External Noise. MTI and Pulse Doppler Radars, Range and Speed Ambiguities, Doppler Filter Banks, Digital MTI Processing, MTD, Limitations to MTI performance.

Tracking Radars: Sequential Lobing, Conical Scan and Monopolse, ADT.

Matcherd Filter Receiver, Detection Criteria, Automatic Detection, Detectors & Integrators, CFAR.

Target Recognition: SAR & ISAR.

NAVIGATION

Guidance and Navigation, Categories of Navigation. Navigation Equations, Co-ordinate Frame, Dead Reckoning computations, positioning, Terrain matching Navigation, Course computation, Navigation Errors.

Inertial Navigation: Instruments, Platforms, Mechanization Equations, Error Analysis & Fundamental Limits.

Satellite Navigation: Ranging Equations, Range Rate Equations and Clock Errors, NAVSTAR GPS: Principles, coverage, configuration, Control & Signal Structure, DGPS, GPS Accuracy; GLONASS, combined GPS/GLONASS. Multisensor Navigation, Flittering of Measurements, Kalman Filter.

References :

1. M.I. SKOINIK "Introduction to Radar Systems", McGraw-Hill 1981.
2. F.E.Terman "Electronics and Radio Engineering" McGraw Hill Nagaraja " Electronic Navigation"

6. VIRTUAL INSTRUMENTATION (BE/EC-803/6)

Review of Virtual Instrumentation: Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Programming Techniques: VIS & Sub VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local & global variables, string & file Input.

Data Acquisition basics: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation.

Common Instrument Interfaces: Current loop, Rs 232C/Rs 485, GPIB, System basics, interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, Motion Control.

Use of Analysis Tools: Fourier transfo+rms, Power spectrum, Correlation methods, windowing & flittering.

Application of VI: Application in Process Control projects, Major equipments-Oscilloscope, Digital Multimeter, 120 MHz Pentium Computers, Labview Software, Study of Data Acquisition & Control using Labview ® Virtual instrumentation for an Innovative Thermal Conductivity Apparatus to measure the Thermal Conductivity Apparatus- to measure the conductivity of non Newtonian fluids while they are subjected to sharing force.

References:

1. Gary Johnson, Labview Graphical Programming second edition, MC GrawHill, Newyork, 1997.
2. Lisa K.Wells & Jeffrey Travis, Labview for everyone, Prentice Hall, New Jersey, 1997.

7. ADVANCED MOBILE COMMUNICATION (BE/EC – 803/7)

INTRODUCTION

Introduction to Wireless Mobile communication

Location dependent services

Mobile and Wireless devices

History of wireless communication

A simple reference model

WIRELESS TRANSMISSION

- Frequencies for for Radio Transmission
- Regulations act
- Modulation used
- Direct Sequence Spread Spectrum
- Frequency Hopping spread spectrum

CELLULAR SYSTEMS

Cellular networks

Frequency reuse

GSM and its services

GSM Architecture

Protocol Architecture of GSM

MOBILE TRACKING

Location updates and paging

Handover

Security

Authentication/Encryption

NEW DATA SERVICES

GPRS

DECT

UMTS and IMT-2000

WIRELESS LAN

Overview

Advantages/Disadvantages

IEEE802.11

Protocol/Architecture

Roaming

MOBILE NETWORK LAYER

Mobile IP: Goals

Entities and terminology in MIP

IP Packet delivery

Agent advertisement and discovery

Registration

Tunneling: Encapsulation

Reverse Tunneling

Routing

References:

1) Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill
2) Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
3) T.S. Rappaport, "Wireless Communication, principles & practice", PHI, 2001

OPTICAL FIBRE, SATELLITE & MOBILE COMMUNICATION LABORATORY (BE/EC – 804).

List of Experiments:

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of NA.
6. Measurement of losses for Analog Optical link.

7. Laboratory experiment to understand the basic principles of digital mobile communication system using Trainer kit.
8. To set up a active and passive satellite communication link and study their difference.
9. To measure the base-band analog (voice) signal parameters in the satellite link.
10. To measure C/N ratio.
11. To transmit and receive the function generator waveforms through a Sat.Com. link.
12. To measure the digital baseband signal parameters in Sat.Com. link.
13. To send telecommand and receive the telemetry data.
14. To set a PC to PC Sat. Com. Link using RS-232 ports.
15. To measure the propagation delay of signal in a Sat. Com. Link.
16. To measure fading of a received signal.
17. To measure the parameters in an analog FM/FDM TV Sat.Com. link.
18. To measure the S/N ratio.
19. To calculate the figure of merit and FM deviation.
20. Experiment on Satellite Digital Receiver.

INDUSTRIAL INSTRUMENTATION LABORATORY (BE/EE – 815).

The laboratory Experiments based on the syllabus of EE – 814.

a. Measurement of fluid flow and Level of an Industrial Process.
b. Characteristics of different types of flow and Level meters used for different Industrial process control.
c. Measurement of Pressure of an Industrial Process.
d. Study of Characteristics of Control Valve used for Industrial Process Control.
e. Flow Control of an Industrial process using P, P-I, P-D and P-I-D Controllers.
f. Level Control of an Industrial process using P, P-I, P-D and P-I-D Controllers
g. Temperature Control of an Industrial process using P, P-I, P-D and P-I-D Controllers
h. Cascade Control of an Industrial process using P, P-I, P-D and P-I-D Controllers

COMPUTER COMMUNICATION NETWORKS LABORATORY (BE/CS-812)

List of Experiments:

The laboratory works will be performed on the following areas:—

1. LAN card (MB and GB range) installation and cabling, demonstration on Hub, Switches and wireless LAN card.
2. Optical fibre based LAN- Transceiver, commissioning of optical fibre tools.
3. Hands on exposure of Client Server and Peer to Peer Network.
4. Maintenance of Network.
5. Network Security and Firewall Configuration.

PROJECT AND THESIS (BE/EC – 805).

Each candidate or a group assigned problem (Preliminaries of Project & Thesis) in "Electronics and Telecommunication Engineering" in 7th Semester on which the candidate(s) will carry out detail review/ study and /or analysis. They will submit a detail Project report and present his/ her/ their work in an open defend at the end of the Semester.

VIVA VOCE – II (BE/EC – 806)

Viva Voce test will be based on theoretical and practical knowledge of students in their branch of Engineering.

BE/GP-3 PROFESSIONAL SKILL DEVELOPMENT- II

- Group Discussion
- SEMINERS (Power Point Presentation)
- Extempore Speech Practice
- Details of Future Profession of the Student Concerned – to be prepared / presented in the practice shop.
- General aptitude Test.