POST GRADUATE PROGRAMME

Details of P.G. Programme Courses offered for the award of M.Tech. in Communication Systems

.

Course No.	Subject	Credits
	I SEMESTER	
EC511	Signal Theory & Applications (Core Course)	3+1
EC512	Advanced Optical Communication	3+1
EC513	Advanced Digital Communication Systems (Core Course)	2+1
EC514	Major Elective –I	2+0
EC515	Major Elective –II	2+0
	Total credits for semester	15
	II SEMESTER	
EC 521	Antenna Theory & Techniques	3+1
EC 522	Satellite Communication (Core Course)	2+1
EC 523	Telecommunication Switching & Networks	3+1
EC 524	Major Elective –III	2+0
EC 525	Major Elective –IV	2+0
	Total credits for semester	15
	III SEMESTER	
EC 531	Mobile Communication (Core Course)	3+0
EC 532	Minor Elective- I	3+0
EC 533	Seminar	0+1
EC 534	Comprehensive Examination	NC
EC 535	Thesis	
	Total credits for semester	7
	IV SEMESTER	
	Thesis (Contd. From III Semester)	20
	Total credits for the programme	**57**

List of Major Electives

EC 514 (A)	Microwave Circuits
EC 514 (B)	High Frequency Electronics
EC 514 (C)	Digital Communication Receivers
BS 514 (D)	Optimization Techniques
EC 515 (A)	Microwave Communication and Remote Sensing
EC 515 (B)	Smart Antennas
EC 515 (C)	WDM Optical Networks
EC 515 (D)	Digital Signal Processing Structures for VLSI
EC 524 (A)	MIMO Theory & Applications
EC 524 (B)	Advanced Techniques for Wireless Reception
EC 524 (C)	Adaptive Signal Processing
EC 524 (D)	Analysis & Design of Planar Transmission Lines
EC 525 (A)	High Speed Communication Networks
EC 525 (B)	Ad hoc Networks
EC 525 (C)	RF Micro-Electro-Mechanical Systems
EC 525 (D)	Broadband Wireless Technologies

List of Minor Electives

EC 532 (A)	Information Theory & Coding
EC 532 (B)	FPGA – based System Design
EC 532 (C)	Embedded System Programming
EC 532 (D)	Analog CMOS IC Design

SEMESTER – I

EC 511 Signal Theory & Applications (Core Course)
Credits : 3+1

Representation of deterministic signals: Orthogonal representation of signals. Dimensionality of signal spaces. Construction of orthogonal basis functions.
Random Processes: Definition and classification, stochastic integrals, Fourier transforms of random processes, stationary and non-stationary processes, correlation functions. Ergodicity, power spectral density, transformations of random processes by linear systems.

Representation of random processes (via sampling, K-L expansion and narrow band representations), special random processes :white Gaussian noise, Wiener-Levy process, Poisson process, shot-noise process, Markov process.
Optimum Filtering: Matched filters for deterministic signals in white and colored Gaussian noise. Wiener filters for random signals in white and colored Gaussian noise.

Reference Books:
1. J.G.Proakis et al, Advanced Digital Signal Processing, McGraw –Hill
2. S.Haykin, Adaptive Filter Theory (3/e), Prentice- Hall

EC 512 Advanced Optical Communication
Credits : 3+1

Optical fibers: review of fundamentals, Signal distortion and attenuation, Intermodal and intramodal dispersion, dispersion flattened and dispersion compensated fibers, Profile dispersion, study of PMD.
Laser diode and photodiode, Photodetector noise analysis, Analog and Digital communication link design. WDM, DWDM, optical couplers, Mach-Zehnder interferometer multiplexer, optical add/drop multiplexers, isolators, circulators, optical filters, tunable sources and tunable filters, arrayed waveguide grating, diffraction grating, optical amplifiers, optical integrated circuits .Characterization of optical fibers, OTDR

SONET: frame format, overhead channels, payload pointer, Virtual tributaries, multiplexing hierarchy.
SDH: Standards ,frame structure and features.
Optical switching, WDM networks,

Classification of optical sensors: Intensity modulated, phase modulated and spectrally modulated sensors.

Reference Books:

1. G. Keiser, " Optical Fiber Communication (3rd Edition) ", McGraw Hill International
2. C.S.Murthy & M.Gurusamy, WDM Optical Networks, PHI
3. G.P.Agrawal, Non linear Fiber Optics, (3/e), Elsevier

EC 513 Advanced Digital Communication Systems (Core Course)
Credits : 2+1

Characterization of communication signals, signal space representation, equalisation, matched filtering, binary PSK, QPSK, FSK, QAM & M-Ary modulation techniques and their representation. Coherent & non coherent detection, carrier & symbol synchronization, bits vs symbol error probability, bandwidth efficiency, Spread spectrum modulation: Pseudo noise sequences, DS & FH spread spectrum.

Reference Books:

1. S.Haykin, Communication Systems (4/e), Wiley
2. R.E.Zimer & R.L.Peterson : Introduction to Digital Communication, PHI
3. J.G.Proakis, Digital Communication (4/e), McGraw- Hill

EC 514 Major Elective – I
Credits : 2+0

EC 514 (A) Microwave Circuits

Two-port network characterization. Scattering matrix representation of microwave components.
Planar transmission lines; characteristics, properties ; design parameters and applications. Design of mixers.
MIC filters. Kuroda transformation, K inverter, J inverter. Resonator filters.Realization using microstrip lines and strip lines.

Microwave amplifier design. Power gain equations. Maximum gain design. Low noise design. High power design. Stability considerations.
Microwave oscillator design. One port and two port negative resistance oscillators. Oscillator design using large – signal measurements.

Reference Books:

1. G.Gonzalez, Microwave Transistors and Amplifiers, Prentice- Hall, Englewoo Cliffs
2. S.Y.Liao, Microwave Amplifier and Oscillator Design, Pearson Education
3. Soohoo, Microwave Electronics, Addison Wesley.

EC 514 (B) High Frequency Electronics

Analysis of planar transmission lines: Variational method. losses in microstrip lines, analysis & design of devices; passive circuits, impedance transformers, couplers, power dividers, filters, oscillators, mixers, switches, amplifiers (narrow band /broad band) oscillators, active & passive phase shifters.

Microstrip lines on ferrite and garnet substrate; Isolators and circulators; lumped elements in MICs

Analysis of basic transmission lines for millimeter wave frequencies. Integrated finline, image guide and its variants, non-radiative guide, H-guide and groove guide. Millimetre wave devices for generation and detection. Transitions, bends and discontinuities.

Monolithic circuit components planar transmission lines, lumped and distributed passive elements.

EC 514 (C) Digital Communication Receivers

Baseband PAM. Clock recovery circuits. Error tracking and spectral – line generating synchronizers. Squaring and Mueller and Muller synchronizers.Channel models. Receivers for PAM. Optimum ML receivers. Synchronized detection. Digital matched filter.

ML synchronization algorithms – DD and NDA. Timing parameter and carrier phase estimation – DD and NDA.

Performance analysis of carrier and symbol synchronizers. Feedback and feedforward synchronizers. Cycle slipping Acquisition of carrier phase and symbol timing.

Fading channels. Statistical characterization. Flat and frequency selective fading channels. Optimal receivers for data detection and synchronization parameter estimation. Realizable receiver structures for synchronized detection.

Reference Books:

1. N.Benuveruto & G.Cherubini, Algorithms for Communication Systems and their Applications, Wiley
2. H.Meyr & G.Ascheid, Synchronization in Digital Communications, John Wiley

BS 514 (D) Optimization Techniques

Introduction: Historical development, application to engineering problems, statement of optimization, classification of optimization, examples of optimization problems.

Linear Programming: Graphical method, simplex method, revised simplex method, Big-M method, 2- phase method, alternate optimal solutions, unbounded LPs, degeneracy and convergence, duality in linear programming, sensitivity analysis, dual simplex method, Transportation, assignment and other applications.

Non-Linear Programming: Unconstrained optimization techniques, descent methods, constrained optimization, direct and indirect methods, optimization with calculm, kuhn-tucker conditions.

Dynamic Programming: Multistage decision process, principles of optimality, computational procedures in dynamic programming.

EC 515 Major Elective – II
Credits : 2+0

EC 515 (A) Microwave Communication & Remote Sensing

Line of sight & troposcatter communications. Channel characterization, Propagation Studies, Performance requirement, Impairments and evolutions of digital and analog communications using Los & troposcatter systems. Design of Los communication Systems, Link calculation.

Characterization of sub systems of line of sight communication system. Theory and system design of troposcatter communication system.

Introduction to Microwave remote sensing. Theory and principle of microwave remote sensing.
Microwave Sensors both Passive and Active Microwave, Receivers, Radiometers, Real Aperture Radar, Synthetic Aperture Radar, Scatterometers, Altimeters, Antenna System for Microwave Sensors, Characterizationn of Microwave Sensors.
Data Processing of Microwave, Data Applications of Passive and Active Microwave sensors for ocean land and atmosphere from tower aircraft and space craft.

EC 515 (B) Smart Antennas

Spatial processing for wireless systems. Adaptive antennas. Beam forming networks. Digital radio receiver techniques and software radios.
Coherent and non-coherent CDMA spatial processors. Dynamic re-sectoring. Range and capacity extension – multi-cell systems.
Spatio – temporal channel models. Environment and signal parameters. Geometrically based single bounce elliptical model.
Optimal spatial filtering – adaptive algorithms for CDMA. Multitarget decision – directed algorithm.
DOA estimation – conventional and subspace methods. ML estimation techniques. Estimation of the number of sources using eigen decomposition. Direction finding and true ranging PL systems. Elliptic and hyperbolic PL systems. TDOA estimation techniques.

Reference Book:
1. M.J. Bronzel, Smart Antennas, John Wiley

EC 515 (C) WDM Optical Networks

First generation optical networks. SONET/SDH. Computer interconnects. Metropolitan area networks. Layered architecture.
WDM optical network evolution. Enabling technologies. WDM optical network architecture. Wavelength routed networks.
Wavelength routing networks. Optical layer. Node designs. Network design and operations. Routing and wavelength assignment.

Wavelength convertible networks, performance evaluation. Networks with sparse

wavelength conversion. Converter placement and allocation problems.

Virtual topology design problem, light path routes, implementation in broadcast and select networks.

Reference Books:

1. K.M.Sivalingam & S.Subramanium, Optical WDM Networks- Principles & Practice,
2. B.Mukherjee, Optical Communication Networks, (1/e), McGraw Hill

EC 515 (D) Digital Signal Processing structures for VLSI

VLSI Architectures for DSP algorithms – Data flow representations, pipelining and parallel processing, retiming, unfolding, register minimization techniques, systolic architectures, algorithms for fast implementation of convolution, FIR, IIR and adaptive filters, DCT, analysis of finite word length effects, Low power design strategies; Architecture, programming and applications of general purpose digital signal processors (Emphasis on TI & AD processors); Application case studies: Speech coding, image and video compression, Viterbi decoding, wireless communication.

Reference Books:

1. K.K. Parhi, VLSI Digital signal processing systems: Design and implementation, John Wiley
2. Lars Wanhammar, DSP Integrated Circuits, Academic Press
3. S.M. Kuo, B.H.Lee, Real-Time Digital Signal Processing: Implementations, Applications, and Experiments
with the TMS320C55X, Wiley

SEMESTER – II

EC 521 Antenna Theory and Techniques
Credits : 3+1

Review of the theory of electromagnetic radiation. Introduction to various antenna types wire, loop and helical antennas, analysis using assumed current distribution.
Aperture antennas: slot, wave guide, horn, and reflector antennas. Analysis using field equivalence principle and Fourier transform methods. Linear arrays. Traveling wave & broadband antennas. Antenna measurements.
Printed antennas: Feeding methods, transmission line & cavity models, analysis and design of rectangular & circular microstrip antenna. Arrays: pattern synthesis, planar arrays, phased arrays. Active antennas and arrays.
Paraboloidal reflector antenna, different feed configurations, shaped beam antennas, lens antenna.
Antennas for biomedical applications, Smart antennas for mobile communications. Antenna for infrared detectors.

Reference Books:
1. C. A. Balanis, Antenna Theory and Design, John Wiley & Sons
2. J.D. Kraus, Antennas, McGraw-Hill

EC 522 Satellite Communication (Core Course)
Credits : 2+1

Evolution of Satellite Technology, Communication Satellites, Satellite frequency Bands.
Satellite Channel analysis, cross-links, Carrier to Noise ratios, Frequency reuse with spot beams. Multiple beams.
Satellite front end, Front-end noise. Noise temperature, Front end filters.
Satellite multiple access methods. FDMA, TDMA, CDMA Systems, DS-CDMA and frequency hopped CDMA, Satellite jamming, Code acquisition and tracking.
Satellite applications. Data Communication and VSAT network. Mobile satellite services (GEO and NON GEO).

Reference Books:
1. The Satellite Communication applications handbook. By Brauce. R. Elbert Artech House, Inc.
2. Satellite Communication by Robert M. Gagliardi, CBS Publisher
3. Digital Satellite Comm By Tri T. Ha, Mc Graw Hill

EC 523 Telecommunication Switching & Networks
Credits : 3+1

Principles of circuit switching & signaling schemes, space time & space time division switching, single stage & multi stage switching network. Traffic engineering and teletraffic theory.

Markov processes representing traffic, calculation of blocking probability.

Modeling and analysis of important media access control protocols: ALOHA, slotted ALOHA, CSMA, CSMA/CD.

LAN: Ethernet, token ring, FDDI.
B-ISDN architecture, B-ISDN protocols, ATM traffic & congestion control, signaling, routing and
addressing, Internetworking: switches, bridges, routers, gateways. ATM switching.

EC 524 Major Elective – III
Credits : 2+0

EC 524 (A) MIMO Theory & Applications

Overview of fundamentals of Digital Communications, The Wireless Channel, Detection, Diversity and Channel Uncertainty, Capacity of Wireless channels, Spatial Multiplexing and Channel modeling, Capacity and Multiplexing architectures, Diversity-Multiplexing tradeoff and Universal Space Time Codes, Multi-user Communication.

Reference Books:
1. David Tse, Pramod Viswanath, Fundamentals of Wireless Communications, Cambridge University Press
2. E. Biglieri, Coding for Wireless Channels, Springer
3. E. Biglieri et al., MIMO Wireless Communications, Cambridge University Press

EC 524(B) Advanced Techniques for Wireless Reception

Wireless signaling environment. Basic signal processing for wireless reception. Linear receivers for synchronous CDMA. Blind and group-blind multiuser detection methods. Performance issues.

Robust multiuser detection for non Gaussian channels; asymptotic performance ,

implementation aspects.

Adaptive array processing in TDMA systems. Optimum space-time multiuser detection. Turbo multiuser detection for synchronous and turbo coded CDMA.
Narrowband interface suppression. Linear and nonlinear predictive techniques. Code-

aided techniques. Performance comparison.

Signal Processing for wireless reception: Bayesian and sequential Montecarlo signal processing. Blind adaptive equalization of MIMO channels .Signal processing for fading channels. Coherent detection based on the EM algorithm. Decision-feedback differential detection. Signal processing for coded OFDM systems.

Reference Books:
1. Mohamed Ibnkahla, Signal Processing for Mobile Communications, CRC Press
2. A.V.H. Sheikh, Wireless Communications Theory & Techniques, Kluwer Academic Publications
3. A.Paulraj etal, Introduction to Space-time Wireless Communications, CambridgeUniversity Press

EC 524 (C) Adaptive Signal Processing

Adaptive filtering: Wiener filters, linear prediction, methods of steepest descent and least-squares, least mean square adaptive filters, recursive least-squares adaptive filters, frequency domain & sub-band adaptive filters, kalman filters, square root adaptive filters, order recursive adaptive filters, finite precision effects, IIR adaptive

filters. Adaptive algorithms: adaptive equalization and echo cancellation. Applications of adaptive filters.

Reference Book :

1. Bernard Widrow, Adaptive Signal Processing, Pearson Education

EC 524 (D) Analysis & Design of Planar Transmission Lines

Parameters of planar transmission line variants. Static and dynamic analysis methods for microstrip line, coplanar waveguide, coplanar strips, striplines and slot line.
Spectral domain methods. Formulation of quasistatic and dynamic spectral domain analysis.Galekin's method.
Hybrid mode analysis. Formulation. Application in planar transmission lines. Characteristic equation. Evaluation of parameters.
Coplanar lines , quasi-static and full wave analysis. Design equations. Comparison with microstrip and slot lines.
General analysis of coupled lines. Design considerations for microstrip lines and coplanar waveguides.

Reference Books:
1. C. Nquyen, Analysis Methods for RF, Microwave, and Millimeter-Wave Planar Transmission Line
Structures, Wiley Interscience
2. T.Itoh, Numerical Techniques for Microwave and Millimeter Wave Passive Structures, John Wiley & Sons

EC 525 Major Elective – IV
Credits : 2+0

EC 525 (A) High Speed Communication Networks

Broadband ISDN. Protocol reference model. SDH- basic features. ATM standard. Multistage networks.
Traffic models; delay and loss performance. Cell switching. Cell scale and burst scale queuing.
Protocol layers, their service and models.Internet protocol stack, link layer and local area networks. Network layer and routing.
Transport layer. Congestion control. Application layer protocols. Web and HTTP.FTP and email.
Mobile adhoc networking. Routing approaches.
Mobile ad hoc networking. Protocol performance and open issues. Clustering and hierarchial routing. Ad hoc network security.

Reference Books:
1. S.Basagni, Mobile Ad Hoc Networking, Wiley

2. J.M.Pitts & J.A.Schormans, Introduction to IP and ATM Design and Performance (2/e), Wiley
3. C.Siva Ram Murthy & B.S.Manoj, Adhoc Wireless Networks (2/e), Pearson Education

EC 525 (B) Ad Hoc Networks

Mobile ad hoc networking; imperatives, challenges and characteristics. Bluetooth networks.

Routing approaches. Proactive and reactive protocols. Clustering and hierarchial routing. Multipath routing. Security aware routing.
Energy efficient communication in ad hoc networks. Measuring energy consumption. Power save protocols. Maximum life time routing.
Secure routing protocols. Intrusion detection. Security considerations in ad hoc sensor networks. Key management.
Characterization of IP traffic. QOS classification. Self similar processes. Statistical analysis of non – real time traffic and real – time services.

Reference Books:
1. C.S. Murthy & B.S. Manoj, AdHoc Wireless Networks, Pearson
2. T.Janevski, Traffic Analysis and Design of Wireless IP Networks, Artech House
3. Ozan K. Tonguz & Gianluigi, Adhoc Wireless Networks, Wiley

EC 525 (C) RF Micro-Electro-Mechanical Systems

RF MEMS relays and switches. Switch parameters. Actuation mechanisms. Bistable relays and micro actuators. Dynamics of switching operation.
MEMS inductors and capacitors. Micromachined inductor. Effect of inductor layout.
Modeling and design issues of planar inductor. Gap tuning and area tuning capacitors.
Dielectric tunable capacitors.
Micromachined RF filters. Modeling of mechanical filters. Electrostatic comb drive.
Micromechanical filters using comb drives. Electrostatic coupled beam structures.
MEMS phase shifters. Types. Limitations. Switched delay lines. Micromachined transmission lines. Coplanar lines. Micromachined directional coupler and mixer.
Micromachined antennas. Microstrip antennas – design parameters. Micromachining to improve performance. Reconfigurable antennas.

Reference Book:
1. V.K.Varadan etal, RF MEMS and their Applications, Wiley

EC 525 (D) Broadband Wireless Technologies

The Cellular concept, System design, Capacity improvement in cellular systems, Co channel interference reduction. Intelligent cell concept and applications
Mobile radio propagation, fading, diversity techniques, design parameters at the base station, smart antenna systems, Practical link budget design using path loss models
CDMA- Principle, Network design, Link capacity, Power control, RAKE receiver,

Channel modeling. WCDMA-Network planning

MC-CDMA, Orthogonal frequency division multiplexing, OFDM with code division multiplexing, Cellular mobile communication beyond 3G
GSM, IS-95, GPRS, UMTS, WLAN, Bluetooth, beyond 4G

Reference Books:
1. K.Fazel & S. Kaiser, Multi-carrier and Spread Spectrum Systems, Wiley
2. S.G. Glisic, Advanced Wireless Communications, 4G Technologies, Wiley
3. W.C.Y.Lee, Mobile Communication Engineering. (2/e), McGraw- Hill

SEMESTER – III

EC 531 Mobile Communication (Core Course)
Credits : 3+0

Cellular concept. Mobile radio propagation. Co-channel interference. Diversity. Multiple access. Cellular coverage planning. Wireless networking. Wireless systems and standards. Fading channels, spreading codes, power control. WAP and other protocols for internet access. Data transmission in GSM and UMTS, TCP in wireless environment, multi-user detection and its performance analysis. Blue-tooth and other wireless networks, system comparison.

Spread spectrum concept. Basics of CDMA. Properties and generation of PN sequences. Applications of CDMA to cellular communication systems. Second and third generation CDMA systems/standards. Multicarrier CDMA. Synchronization and demodulation .Diversity techniques and rake receiver.

Reference Books :

1. Wireless Digital Communication- Feher, PHI.
2. Principles & applications of GSM – Vijay K. Garg, and J.E. Wilkes – Prentice hall PTR.
3. Mobile Cellular Telecomm. Lee Mc Graw Hill Inc.

EC 532 Minor Elective – I
Credits : 3+0

EC 532 (A) Information Theory and Coding

Shannon's fundamental coding theorems, Differential entropy & mutual information for discrete & continuous ensembles, source coding, Rate distortion theory.
Introduction to Algebra: Groups, fields, Binary field arithmatic, Basic properties of Galois field GF (2m) and vector spaces.
Channel coding & decoding: Run length limited codes, LBC, cyclic code, BCH code, convolutional code, Trellis coded modulation, Reed-Solomon code.

Reference Books:

1. Information theory : F.M Reza, McGraw Hill
2. Digital and Analog Communication Systems: K.Sam Shanmugam, John Wiley
3. Digital Communication: B. Sklar, Pearson Education Asia.

EC 532 (B) FPGA – based System Design

Digital system design options and trade offs, Design methodology and technology overview, High Level System Architecture and Specification: Behavioral modeling and simulation, Hardware description languages, combinational and sequential design, state machine design, synthesis issues, test benches, Overview of FPGA architectures and technologies: FPGA Architectural options, granularity of function and wiring resources, coarse vs fine grained, vendor specific issues (emphasis on Xilinx and Altera), Logic block architecture: FPGA logic cells, timing models, power dissipation I/O block architecture: Input and Output cell characteristics, clock input, Timing, Power dissipation, Programmable interconnect - Partitioning and Placement, Routing resources, delays; Applications - Embedded system design using FPGAs, DSP using FPGAs, Dynamic architecture using FPGAs, reconfigurable systems, application case studies. Simulation / implementation exercises of combinational, sequential and DSP kernels on Xilinx / Altera boards.

Reference Books:

1. M.J.S. Smith, Application Specific Integrated Circuits, Pearson
2. Peter Ashenden, Digital Design using VHDL, Elsevier
3. Peter Ashenden, Digital Design using Verilog, Elsevier
4. W.Wolf, FPGA based system design, Pearson

EC 532 (C) Embedded System Programming

Introduction: Overview of embedded systems, embedded system design challenges, common design metrics and optimizing. Survey of different embedded system design technologies & trade-offs. Embedded microcontroller cores, embedded memories, Examples of embedded systems. Architecture for embedded system, High performance processors – strong ARM processors, programming, interrupt structure, I/O architecture, Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, Digital signal processing, Sub-system interfacing, interfacing with external systems. Software aspects of embedded systems: real time programming languages and operating systems for embedded systems – RTOS requirements, kernel types, scheduling, context switching, latency, inter-task communication and synchronization, Case studies

Reference Books:

1. Jack Ganssle, The Art of Designing Embedded Systems, Elsevier
2. J.W. Valvano, Embedded Microcomputer System: Real Time Interfacing, Brooks/Cole
3. David Simon, An Embedded Software Primer, Addison Wesley

EC 532 (D) Analog CMOS IC Design

Current mirrors – basic current mirror, Widlar, Wilson biasing, Cascoded current mirrors; Noise – Types, Representation of noise in circuits; Basic Single-stage amplifiers - CS, CD and CG amplifier; noise analysis; Differential amplifiers – current mirror load, current source load, CMR, CMRR, folded cascode amplifier, noise analysis, common-mode feedback circuits; Two-stage amplifiers – analysis, frequency response, stability, compensation; Band gap references; Constant–Gm biasing; Distortion in amplifiers; Introduction to switched capacitor circuits – MOSFET as a switch, charge injection and its cancellation, switched capacitor amplifiers.

Reference Books:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw-Hill International Edition
2. David A. Johns and Ken Martin, Analog Integrated Circuit Design, John Wiley
3. Phillip E. Allen and Douglas R. Holberg, CMOS Analog Circuit Design, Oxford University Press

EC 533 Seminar
Credits : 0+1
EC 534 Comprehensive Examination
Credits : NC
EC 535 Thesis

SEMESTER – IV

Thesis (Contd. From III Semester)
Credits : 20

ACADEMIC REGULATIONS
(UNDER-GRADUATE COURSES)

These rules shall be applicable to the students admitted in the undergraduate programmes of the faculties of Agriculture, Dairy and Food Technology, Engineering, Home Science and Horticulture & Forestry of the university.

1.0 DEFINITIONS

1.1 'Academic Year' or 'Academic Session' of the University shall ordinarily be between July to June and shall consist of two semesters.

1.2 'Semester' is an academic term of normally 18-20 weeks including examinations.

1.3 'Course' means a unit of instruction or a segment of a subject matter to be covered in a semester. Each course is assigned a specific number, title and credit.

1.4 'Credit Hour' also written as 'Credit' means the numerical weight allotted to the course, including its theory and practical parts. One credit will represent one hour of lecture and two to three hours of laboratory/field practical in each week.

1.5 'Grade point' is a numerical number which denotes student's performance in a course. It is obtained by dividing the percentage marks obtained by ten.

1.6 'Credit point' is the product of credit and grade point obtained by the student in a course.

1.7 'SGPA' (Semester Grade Point Average) is the average of the credit points of a semester.

1.8 'OGPA' (Overall Grade Point Average) is the overall cumulative grade point average obtained by the student in the courses taken in all the semesters completed
by him/her.

1.9 'Year' means an academic session consisting of two semesters. First year means the first academic session of the prescribed course of a degree programme. Second year, third year, and fourth year mean second, third and fourth academic sessions, respectively.

1.10 'Odd Semesters' means all the first semesters of each academic year, i.e., first, third, fifth and seventh semesters.

1.11 'Even Semesters' means all the second semesters of each academic year, i.e. second, fourth, sixth and eighth semesters.

1.12 'Equivalent percentage' is the percentage obtained by multiplying grade point, SGPA and OGPA respectively by ten.

2.0 THE PROGRAMME AND GRADUATION REQUIREMENTS

2.1 The students admitted to degree programmes of the various faculties of the university shall have to complete a fixed programme of study distributed over four academic sessions comprising of eight semesters.

2.2 Under each degree programme the courses to be taught /examined in each of the eight semesters shall be prescribed by the academic council. The prescribed courses, including title, credit, maximum marks, etc. will be given in the 'Course Description' of the faculty/department concerned.

2.3 Minimum residential requirement and maximum period for all the programmes shall be as under :

Minimum residential requirement	8 semesters
Maximum period for which a student	12 semesters

can remain on the college roll	

Note - *In case a student does not complete his/her course work satisfactorily (5.0 OGPA out of 10) within the maximum prescribed period he/she shall no longer be a student of the university and the respective Dean of the college shall drop him from the college roll.*

3.0 EXAMINATION

There shall be main theory and/or practical examination conducted by the university at the end of each semester. The theory and practical examinations shall be of three hours duration except otherwise specified. Besides this, there will be a mid-term examination.

3.1 Mid-Term Examination (MT)

A mid-term examination of 20 maximum marks shall be held after completion of about 50% syllabus in each course. The mid-term examination shall be of one hour duration.

3.2 Distribution of maximum marks for the mid-term examination, final theory examination and practical examination shall be as follows :

Courses	**Mid-Term Examination (MT)**	**Final Examination (University)**		**Total**
		Theory (Th)	**Practical (P)**	
Both theory and practical	20	50	30	100
Theory only	20	80	-	100
Practical only	20	-	80	100

3.3 Distribution of maximum marks for the final practical examination shall be as under :

Particulars / Maximum Marks	**Course with both theory and practical (30)**	**Course with practical only (80)**
(a) Practical record, attendence and day-to-day assessment (Sessional work done)	12	32
(b) Practical exercises as decided by the external examiner	12	32
(c) Viva-voce	6	16

3.4 Grading System

(a) A numerical grading system is followed for evaluation. Each course has a numerical weightage known as credit. The total marks obtained in each course (including its mid-term, theory and practical) are converted into percentage and divided by 10 to obtain the grade point for that course. The grade point when multiplied by the total course credit, gives credit points for the course.

(b) Semester Grade Point Average (SGPA) is simply average of the credit points for a semester. The Overall Grade Point Average (OGPA) is the average for all courses upto the current semester.

If C_i and G_i are the credit and grade points for a course, then SGPA and OGPA are given by the following formulae.

$$\text{SGPA} = \frac{\sum C_i G_i}{\sum C_i}$$ where the summation is for all courses in the semester

$$\text{OGPA} = \frac{\sum C_i G_i}{\sum C_i}$$ where the summation is for all courses of preceding semester including the current one

(c) The percentage equivalent of OGPA shall be determined by multiplying OGPA by ten.

3.5 **Pass Requirements**

(a) Candidates are required to pass separately in final theory and/or practical examinations in each course.

(b) To pass a candidate is required to obtain at least 40% marks in each theory final examination as well as in each practical final examination and 4.00 grade point in the course.

(c) The minimum OGPA required for the degree is 5.00

3.6 **Provision for Carrying Over of Backlogs**

A student can carry over maximum six failed courses irrespective of even/odd semester in a year as backlog to higher class subject to the conditions prescribed in regulation 3.7, provided he/she is otherwise qualified for promotion to higher class.

3.7 **Promotion to Higher Classes**

(a) The promotion to the next class shall be decided only at the end of an academic year.

(b) A student will be promoted to higher class if he/she secures an OGPA as mentioned in the table below and the total number of backlog courses do not exceed as specified in Rule 3.6.

Year to which promotion is being considered	Minimum OGPA required for promotion
Second	4.00
Third	4.50

Fourth	4.75 (with no backlog of I year)

(c) A student, who has been promoted to the first semester of a class as a result of above rule, shall be automatically promoted to the second semester of that class regardless of the result of that year's first semester examination.

(d) If a student is not promoted to a higher class, he/she shall become an ex-student of the failed class and has to clear the backlogs and/or improve his/her OGPA to be eligible for promotion.

3.8 **Clearing of Backlogs and Repeating of Courses for Improvement of OGPA**

(a) All students with backlog (whether promoted or ex-students) shall have to appear in the examination of backlog courses in the main examination of the semester in which such courses are regularly offered. A student getting less than 40% marks (Grade Point less than 4.0) in a course will be permitted to appear in backlog examination in failed part only whether it is theory or practical or both. He/she shall not be required to attend regular classes for such course(s).

However, if the backlog course is as a result of being detained on account of shortage of attendance, the student has to appear in both the theory and practical examinations in the subsequent semester as regular course or as a contact course, if time table adjustment is not possible. The mid-term marks awarded (if any) for the detained course(s) shall be carried over whenever the student clears the backlog.

(b) Carry-over of Mid Term marks.

1. Mid term marks obtained by a student will not be carried over for backlog examination and the student will be awarded proportionate marks.

(c) The students can repeat course(s) in the main examination(s) of semester(s) in which such course(s) are regularly offered so as to improve their OGPA, subject to the conditions that only such course(s) will be permitted to repeat in which the grade point obtained is less than 5.00 and the total/additional number of courses in the semester examination (including any backlog courses from previous odd or even semesters, as the case may be) do not exceed nine/three for ex-student/regular students respectively. The student shall have to appear in both the theory and practical of the course. No course of first year will be allowed to be repeated for improvement of OGPA in final year of the degree programme.

He/she shall not be required to attend regular classes for such course(s). The mid-term marks from the previous examination shall be carried over.

Note - *The students have to make a written requisition to the Dean within one month of the commencement of the semester in which the facility is to be availed and also deposit the prescribed fee.*

(d) The grade point obtained as a result of the examination shall replace the original grade point in the course. Such courses will be designated by a letter R.

3.9 **Special Backlog Examination**

1. **In case student has completed VIII semester and has backlog in only one course of either of VII or VIII semester and no backlog of I to VI semester.**

   (a) Special examination will be conducted in the month of September/October of First Semester of the academic year for only one course of either of VII or VIII semester.

   (b) Student will be charged fee of Rs. 1000/- (Rs. One Thousand only).

   (c) Student has to apply for special examination within 11 (eleven) days of declaration of result of VIII semester, failing which his/her application will not be considered.

   (d) In case if a student chooses for re-evaluation the examination will be conducted along with regular examination of next semester only, i.e. once in a semester.

   (e) If a student fails in a special paper examination, he/she would be allowed to re-appear with regular examination of next semester only, i.e. once in a semester.

2. **In case a student has completed VIII semester and has got backlog of up to six courses irrespective of semester :**

   (a) Backlog examination will be conducted along with regular examination of
   the semester.

   (b) If regular examination is being conducted for a particular paper, he/she would have to pay normal fee for that papers and special fee of Rs. 1000/- per paper will be charged for the courses which are not listed for conducting the examination in that semester.

   (c) If a student does not clear one or more backlog courses, he/she will have to appear as Ex-Student along with regular examination in the next semester and fee will be charged at regular rate, if the courses are listed for conducting the examinations in that semester, otherwise, special fee of Rs. 1000/- will be charged.

3.10 **Scrutiny of Marks/Re-Checking of Results**

A student can apply for scrutiny of marks/re-checking of results along with the prescribed fee within a specified period. This facility will be restricted only to (a) re-totalling of marks obtained, and (b) re-marking of any question(s) left

unchecked by the examiner. A student of final year of a degree programme, applying for this facility will be required to give an undertaking that he/she has not applied for migration/provisional degree certificate.

3.11 Re-evaluation

a. (i) Re-evaluation is permissible only in theory papers of semester's final examination.

(ii) Re-evaluation is NOT permissible in the answer books of unfairmeans case(s).

(iii) Re-evaluation shall be permissible in maximum 2 out of the total theory papers of final examination of the semester.

b. The candidate may apply for re-evaluation within 11 days of the issue of the marks-sheet on the prescribed form through Head of the Institution depositing required fee and original mark-sheet. Incomplete and late submitted application shall not be considered.

c. The re-evaluation fee per paper shall be Rs.500/- and will not be refundable on any pretext.

d. Fee deposited for the purpose of re-evaluation shall not be refunded in any case.

e. Re-evaluation shall be done by an examiner of the subject to be appointed by the vice-chancellor.

f. The marks obtained after re-evaluation of the paper shall be final and awarded.

g. Marks obtained after re-evaluation shall not be considered for award of merit.

h. (i) No one shall be admitted in the next higher class and considered for any beneficial claim only on account of submission of application of the re-evaluation of answer book(s) in the office.

(ii) A student becoming eligible for admission on account of result of re-evaluation may be admitted in next higher class without late fee. He will be required to pay full fees for the year within 7 days of declaration of the result. Attendance in such case shall be counted from the date of admission.

4.0 PRACTICAL WORK EXPERIENCE REQUIREMENTS

After successful completion of all the courses including practical trainings with minimum OGPA of 5.0, a student will become eligible for the degree.

Details of practical training (Training in factory, workshop, mine, engineering works/design, office etc.) which students are to undertake in different degree programmes are given below:

	Branch of Engineering	Duration	Year
(a)	Agriculture*	30 + 30 = 60 days	At the end of II & III year
(b)	Mechanical	30 + 30 = 60 days	- do -
(c)	Mining**	30 + 30 = 60 days	- do -
(d)	Electrical	30 + 30 = 60	- do -

		days	
(e)	Computer Science & Engg.	30 + 30 = 60 days	- do -
(f)	Electronics & Communication	30 + 30 = 60 days	- do -
(g)	Information Technology	30 + 30 = 60 days	- do-
(h)	Civil Engineering	30 + 30 = 60 days	- do-

* *In addition to the above 2 months training programme, the agricultural engineering graduates have to under go in plant training (4 months or 2 months each) or for experiential learning (4 month) in the second semester of final year BE.(Ag.).*

In order to take policy decision and to solve the operational and administrative bottleneck, if any, there shall be a college level committee consisting of the followings. The committee will guide in selection of cafeteria courses and in-plant training / experiential learning/project.

Senior most Head of the Department	-	*Convenor*
Heads of concerned Department	-	*Member*
Training Officer	-	*Member*
Class Advisor of IV year	-	*Member*

Procedure for evaluating the students on all the above practical trainings will be followed as prescribed.

** *The Mining Engineering students shall have to undergo 12 days mining camp at the end of I semester of II year and 12 days survey camp at the end of I semester of III year, in addition to 60 days practical training.*

5.0 GENERAL RULES PERTAINING TO EXAMINATIONS

5.1 A student can take advantage of proportionate marks based on the final semester examination if he/she misses the mid semester test(s) subject to the condition given below :

(i) The students who are deputed by the university.

(ii) The students, if he/she is hospitalized on the day of examination.

5.2 A student who has been deputed by College/University authorities to represent at a national/International meet/championship/tournament/extra curricular activities, does not appear in the final examination due to such participation, may be permitted to take missing paper(s) at next main examination, when such course(s) are regularly offered as a special case. He/she, however, will be required to seek prior permission from the Vice-Chancellor.

5.3 The question paper in the university main semester examination shall have four units having two questions each. The students shall have to attempt five questions in all and at least one question from each unit.

5.4 No special examination shall be held for students who miss the examination on account of police custody, court attendance or fail to attend for other reason, whatsoever.

5.5 Examinations will not be postponed due to failure of electricity.

5.6 The boycotted and walked out papers shall not be recounted. This authority rests only with the Chancellor of the university.

6.0 ATTENDANCE REQUIREMENTS

6.1 The student shall be permitted to appear in the university main examination only if a minimum attendance of 75% is maintained separately in theory and practical in each course from the date of registration in that course. However, in NCC/NSS/NSO the minimum attendance requirement would be 65%. In case of sickness or any other valid reasons, the vice-chancellor may condone the attendance to an extent of 10%.

6.2 A student who is short of attendance in one or more courses will be detained form appearing in the final semester examination of all such course(s) and will be awarded zero grade point. Such courses shall be denoted by letter ‘‘DE’’ in the mark sheet.

6.3 En-mass absence shall be treated as absent in the attendance record of the students and will be charged a fine of Rs. 2000/- on en-mass cutting of the classes for more than 3 days.

6.4 If a student absents continuously for 7 working days in a semester in any subject, his/her registration in the semester will be cancelled and parents informed accordingly. Such students will be provided an option for re-

admission in the course/programme within 7 days of the cancellation of their registration by paying a fee of Rs. 500/-.

6.5 If a student who has been admitted to the 1st semester of a programme and fails to attend the classes continuously for a period of 30 days without the permission of the Dean of the college, the name of such a student will be removed from the college roll. No petition is permitted in this case. He/she may have to seek re-admission as a fresh candidate.

6.6 If a regular student of the college in subsequent semester fails to register on schedule time or fails to attend the class after registration continuously for 30 days without the permission of the Dean of the college, the student will be removed from the college roll and parents informed accordingly. A student so removed may apply to the Dean within 15 days of his/her removal for reconsideration for re-registration in the next academic session, giving valid and strong reasons for failing to take permission. His removal may be revoked, provided that, his/her advisor is satisfied with the performance of the student and the same is approved by the Dean. The period of removal shall be counted towards the number of semester, though no grade/marks would be awarded for this semester.

7.0 ADVISORY SYSTEM

Student will be required to report to the respective class advisors for getting registration form and examination form for the purpose of registration. Class advisors will also be responsible for distribution of marksheet obtained from the university.

8.0 SYMBOLS AND THEIR MEANING

Following symbols would be used to designate the status of the student :

Symbol	Significance
F	Fail
DE	Detained
UM	Unfairmeans
R	Repeat

Note - *All such courses which are cleared by repeating the same or repeated for improvement of OGPA to bring it to the minimum required level shall be marked by letter 'R' in the transcript.*

9.0 WITHDRAWAL FROM SEMESTER

(a) A student shall be permitted to withdraw from a semester only two times in the degree programme, on the grounds of ill-health and personal exigencies subject to the condition that the reasons for withdrawal are convincing. For this the student has to submit a written request at least one week prior to the commencement of the main examination of the semester from which the student wants to withdraw.

(b) A student who has withdrawn from a semester has to join the same semester during next year.

(c) The period lost due to withdrawal (one year for one withdrawal) shall not be counted towards maximum permissible period for which a student can remain on the college roll.

10.0 EXAMINATION OF PRACTICAL TRAINING, PROJECT AND SEMINAR

(a) For the examination of practical training (including educational tour, mining camp, survey camp, etc.) there will be an internal board appointed by the Dean. The board will comprise of concerned Head of the Department as chairman and one or two teachers of the concerned department(s) as members. The marks will be awarded on the basis of work report, practical record, quiz. viva-voce, etc. and added to the marks list in the Final year's examination.

(b) For project viva-voce examination there shall be a Board of examiners consisting of project committee and one/two external examiners. The concerned Head of the Department will be the Chairman of the committee. However, in Agriculture Engineering discipline, the Chairman will be the Project Chairman. The Chairman will then nominate two teachers as members. The Board may meet in one or two meetings according to the availability of external examiner(s). A candidate will be assessed for the work done during semester by the Project Advisor and the Project Committee.

As the project is assigned in the first semester of the final year and the student works on it during both the semesters the assessment of the project shall be done in both the semesters. The internal viva-voce of first semester and both the seminars shall be assessed by the Project Committee. However the marks shall be counted in the second semester only. The distribution of marks shall be as follows :

Particulars	**I Semester**	**II Semester**	**Total**
Day-to-day assessment by the major advisor	15	20	35
Seminar	10	15	25
Viva-voce	10 (Internal)	30 (External)	40
TOTAL	35	65	100

(c) For seminar, wherever prescribed as a course of study, there shall be a board of examiners consisting of the Head of the Department as chairman and two teachers of the department.

11.0 CHANGE OF BRANCH OF STUDY IN SECOND YEAR B.E.

The students, in the second year, can avail one opportunity to change their branch of study on merit basis in accordance with rules framed by the university from time to time.

12.0 ADMISSION OF DIPLOMA STUDENTS IN SECOND YEAR B.E.

The diploma holders from the Board of Technical Education, Rajasthan with 10+2 qualification can seek direct admission in second year B.E. The number of seats, admission procedure, educational and other requirement would be as specified by the Government and/or approved by the university from time to time.

13.0 GRADUATION REQUIREMENT AND AWARD OF DIVISION

(a) A student shall be awarded degree only if he has passed all the courses and completed other requirements prescribed for the programme and secured an OGPA of 5.00 or above.

(b) The division of the student shall be determined by the OGPA at the end of successful completion of the program as follows :

Division	OGPA
First	6.00 and above
Second	5.00 and above

SCHEME OF TEACHING AND EXAMINATION

(Electronics and Communication Engineering)

First Year B.E. (Common for All Branches)

I-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th	P	L	T	P	Th	P	MT
BS 111	Mathematics - I	3	0	3	0	0	80	-	20
ME 113	Mechanical Engineering - I	3	0	3	0	0	80	-	20
ME 114	Workshop Practice	0	1	0	0	3	0	80	20
CE 115	Engineering Drawing	0	1	0	0	3	0	80	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
GROUP I									
BS 100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engineering - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	1	2	0	2	50	30	20
GROUP II									
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	3	1	3	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill[2]	2	0	2	0	0	80	-	20
	Total	15/16	6/5	15/16	0	16/14	-	-	-
Total Credits/Hours/Marks		21		31/30			800		

[1] NCC/NSS/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

[2] The examination (Theory and Lab) shall be conducted internally by the college.

Note: *The courses BS 100P, CE 100, EE 100, ENVS 100, BS100C, EC 100, CS 100 and BS 100E shall be offered in both the semesters. The students will be divided in two groups in I semester itself and shall remain in the same group in II semester as well. However, they have to offer all the eight courses in first year.*

II-SEMESTER

Course No.	Title	Credit		Hours/Week			Marks		
		Th	P	L	T	P	Th	P	MT
BS 121	Mathematics - II	3	0	3	0	0	80	-	20
CE 122	Civil Engineering	1	1	1	0	2	50	30	20
ME 123	Machine Drawing - I	0	1	0	0	3	0	80	20
ME 124	Workshop Technology	2	1	2	0	3	50	30	20
	NCC/NSS/NSO[1]	-	-	0	0	2	-	-	-
GROUP I									
BS 100C	Engineering Chemistry	2	1	2	0	2	50	30	20
EC 100	Electronics and Instrumentation	3	1	3	0	2	50	30	20
CS 100	Introduction to Computer Programming and Data Structure	3	1	3	0	2	50	30	20
BS 100E	English and Communication Skill[2]	2	0	2	0	0	80	-	20
GROUP II									
BS100P	Engineering Physics	2	1	2	0	2	50	30	20
CE 100	Engineering Mechanics	2	1	2	0	2	50	30	20
EE 100	Electrical Engineering - I	3	1	3	0	2	50	30	20
ENVS 100	Environmental Studies	2	1	2	0	2	50	30	20
	Total	16/15	6/7	16/15	0	16/18	-	-	-
Total Credits/Hours/Marks		22		32/33			800		

[1] NCC/NSS/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

[2] The examination (Theory and Lab) shall be conducted internally by the college.

SECOND YEAR B.E.

II-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 211 (All branches)	Mathematics-III	3	0	3	0	0	80	0	20
EC 212	Electronic Devices & Circuits	3	1	3	0	2	50	30	20
CS 213 (EC)	Object Oriented Programming with C++	2	1	2	0	2	50	30	20
EE 214 (EC)	Network Analysis	2	0	2	1	0	80	0	20
EC 215	Analog Communication Engineering	3	1	3	0	2	50	30	20
EC 216 (EC, EE)	Digital Electronics	3	1	3	0	2	50	30	20
EC 217	Electronic Measurement & Instrumentation	3	1	3	0	2	50	30	20
	NSS/NCC/NSO[1]	-	-	0	0	2	-	-	-
Total		19	5	19	1	12	-	-	-
Total (Credits/ Hours/ Marks)		24		32			700		

T-Tutorials do not carry any credit

IV-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
BS 221 (EC, EE, ME, MI)	Mathematics-IV	3	0	3	0	0	80	0	20
CS 222 (EC)	Data Structure	3	0	3	0	0	80	0	20
EC 223	Applied Electronic Circuits	3	1	3	0	2	50	30	20
EC 224	Microprocessor Architecture & Applications	3	1	3	0	2	50	30	20
EC 225	Telecommunication Engineering	3	1	3	0	2	50	30	20
EC 226	Electromagnetic Field Theory	2	0	2	1	0	80	0	20
EC 227	Electronic Workshop Practices	0	1	0	0	2	0	100	0
	NSS/NCC/NSO	-	-	0	0	2	-	-	-
	Total	17	4	17	1	10	-	-	-
Total (Credits/ Hours/ Marks)		21		28			700		

T-Tutorials do not carry any credit

[1] NSS/NCC/NSO is compulsory and the student will be assessed as satisfactory/ unsatisfactory at the end of second year IV semester.

Note:

Students have to undergo a practical training of 30 days at the end of IV semester for which assessment will be made at the beginning of the next semester.

THIRD YEAR B.E.

V-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 311	Digital Signal Processing	3	1	3	1	2	50	30	20
EC312	Theory & Applications of Integrated Circuits	3	1	3	0	2	50	30	20
EC 313	Communication Theory	3	1	3	0	2	50	30	20
CS 314 (CS,EC)	Computer Architecture	3	0	3	0	0	80	0	20
EE 315 (EC)	Control System Engineering	2	0	2	1	0	80	0	20
EC 316	Microwave Engineering-I	3	1	3	0	2	50	30	20
	Total	17	4	17	2	8	-	-	-
Total (Credits/ Hours/ Marks)		21		27			600		

T-Tutorials do not carry any credit

VI- SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 321	Microwave Engineering-II	3	1	3	0	2	50	30	20
EC 322	Industrial Electronics	3	0	3	0	0	80	0	20
EC 323	Digital Communication Engineering	3	1	3	0	2	50	30	20
EC 324	Antenna & Wave Propagation	3	0	3	0	0	80	0	20
CS 325 (EC)	Operating systems	3	0	3	0	0	80	0	20
EC 326	Pulse & Wave Shaping Circuits	3	1	3	0	2	50	30	20
EC 327	System Design Lab	0	1	0	1	2	0	100	0
	Total	18	4	18	1	8	-	-	-
Total (Credits/ Hours/ Marks)		22		27			700		

T-Tutorials do not have any credit

Note:

Students have to undergo a practical training of 30 days at the end of VI semester for which assessment will be made at the beginning of the next semester.

FOURTH YEAR B.E.

VII-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 411	VLSI Technology	3	1	3	0	2	50	30	20
EC 412	Microwave & Satellite Communication	3	1	3	0	2	50	30	20
EC 413	Wireless & Mobile Communication Engineering	3	0	3	0	0	80	0	20
EC 414	Radar & TV Engineering	3	1	3	0	2	50	30	20
EC 415	Medical Electronics	3	0	3	0	0	80	0	20
EC 416	Elective-I	3	0	3	0	0	80	0	20
EC 425	Project[1]	0	-	0	0	4	-	-	-
	Total	18	3	18	0	10	390	90	120
Total (Credits/ Hours/ Marks)		21		28			600		

[1] The topic for the project (EC425) will be allotted in the VII semester but assessed in both the semesters. The total credits will however be counted in the VIII semester.

ELECTIVE – I

EC 416(a)	IC Technology	EC 416(b)	Advance Data Structure
EC 416(c)	Audio Video Systems	EC 416(d)	Advance Microprocessor
EC 416(e)	AI & Expert Systems		

VIII-SEMESTER

Course No.	Title	Credit		Hours per week			Marks		
		Th.	P	L	T	P	Th.	P	MT
EC 421	Computer Networks & Internet Technology	3	0	3	0	0	80	0	20
EC 422	Optical Communication	3	1	3	0	2	50	30	20
EC 423	VHDL	3	1	3	0	2	50	30	20
EC 424	Elective - II	3	0	3	0	0	80	0	20
EC 425	Project[1]	0	8	0	0	12	0	100	-
EC 426	Practical Training & Educational Tour[2]	0	4	0	0	0	0	100	-
EC 427	Seminar	0	2	0	0	4	0	100	-
	Total	12	16	12	0	20	260	360	80
Total (Credits/ Hours/ Marks)		28		32			700		

[2] The marks of the practical trainings conducted during summer breaks (at the end of IV and VI semester) will be considered in VIII semester out of 90 marks. The educational tour will be assessed out of 10 marks. If the tour does not undergo, the trainings will be assessed out of 100 marks.

ELECTIVE – II

EC 424 (a)	Micro Controllers and Embedded systems	EC 424 (b)	Image Processing & Pattern Recognition
EC 424 (c)	Remote Sensing	EC 424 (d)	Neural Networks
EC 424 (e)	Multimedia Systems		

Note: *The students have to take one elective each out of the lists (Electives I & II) given. However, the elective may not be offered if faculty expertise is not available or a minimum of 10 students do not opt for a particular elective.*

COURSE CONTENTS

FIRST YEAR B.E. (I SEMESTER)

BS 111 MATHEMATICS – I

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Taylor's and Maclaurin's expansions; Asymptotes, Curvatures, Simple curve tracing.

Unit-II

Partial differentiation; Homogeneous functions and Euler's theorem; Composite functions and total differential coefficient; Jacobians; Error and Approximations.

Unit-III

Double and Triple integrals; Change of order of integration; Rectification of standard curves; Volumes and surfaces of revolution of curves.

Unit-IV

Differential equations of higher order with constant coefficients: Methods of finding complementary functions and particular integrals; Homogeneous equations with constant and variable coefficient.

Text Books/References

1. Y.N. Guar and C.L. Koul. (2005). Engineering Mathematics, (Vols.-I, II), Jaipur Publishing House, Jaipur.
2. N.P. Bali and N.Ch.S.N. Iyengar. (2003). A text book of Engineering Mathematics,
   Laxmi Publications (P) Ltd, New Delhi.

ME 113 MECHANICAL ENGINEERING – I

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of First Law in heating and expansion of gases in non-flow processes. First Law applied to steady flow processes.

Second law of thermodynamics: Kelvin-Planck and Claussius statements. Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamic processes.

Unit-II

Properties of Steam: Difference between gas and vapour, change of phase during constant pressure process. Generation of Steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes, measurement of dryness fraction.

Unit-III

Vapour Power Cycles: Introduction, Carnot Cycle. Desirable properties of working fluid used for power plants. Rankine cycle. Expansive and non expansive working.

Steam Generators : Classification of steam boilers. Cochran, Lancashire, locomotive and Babcock-Wilcox boilers. Boiler mountings and accessories.

Steam Engines: Introduction to simple and compound steam engines, saturation curve and missing quantity, governing.

Unit-IV

Gas Power Cycles: Introduction. Air Standard efficiency, other engine efficiencies and terms. Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison.

Internal Combustion Engines: Introduction. Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Valve timing diagrams. Comparison of petrol and diesel engines. Simple carburettor. Ignition system of SI engine, diesel fuel pump and injectors.

Text Books/References

1. M. L. Mathur and F. S. Mehta. Thermal Engineering, (Vol. I, SI Edition), Jain Brothers, New Delhi.
2. R. K. Purohit. Thermal Engineering. 2nd Ed., Scientific Publishers, Jodhpur.

ME 114 WORKSHOP PRACTICE

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**3**

Carpentry Shop: Acquaintance with types of wood, tools and their uses. Simple exercises involving basic operations like sawing, planning, chiselling, etc. Preparation of simple joints, cross half lap joint, dovetail joint, bridle joint, tennon and mortise joint.

Smithy Shop: Acquaintance with types of tools and their uses. Simple exercises involving basic operations like bending, drawing, punching, shaping, upsetting, and riveting.

Fitting Shop: Acquaintance with tools, measuring and marking tools, precision measuring tools and their uses. Simple exercises involving basic operations like sawing, chipping, filling, drilling, reaming, threading with taps and dies.

Sheet Metal and Plumbing Shop: Demonstration of basic tools, pipe fittings and operations.

Texts/References

1. S. K. Hajra Choudhury and AK Hajra Choudhury. Elements of Workshop Technology (Vol. I), Media Promoters & Publishers Pvt. Ltd., Bombay.

CE 115 ENGINEERING DRAWING

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**3**

Introduction and letter writing. Construction and use of plain, diagonal and vernier scale. Methods of drawing ellipse, parabola and hyperbola. Methods of drawing cycloids, spirals. Orthographic projection and projection of points.

Projection of lines, projection of planes, projection of solids. Introduction of prism, pyramid, cylinder and cone.

Section of solids, introduction of intersection of surfaces. Development of plane and curved surface. Isometric projection.

Text/Reference

1. N.D. Bhatt. Elementary Engineering Drawing, Rupalee publication, Anand.
2. Lakshmi Narayan and Vaishwanar. A Text Book of Practical Geometry, Jain Brother, New Delhi.
3. R.B. Gupta. A Text Book of Engineering Drawing, Satry Prakashan, New Delhi.
4. Fundamentals of Technical Drawing, Parkinson.

BS 100P ENGINEERING PHYSICS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Unit-I

Electric Field: Line integral of electric field, Potential difference, Field as gradient of potential, Divergence of a vector function, Differential form of Gauss's law, Laplacian, Laplace equations, Curl of a vector function. Gauss's divergence theorem.

Magnetic Field: Curl and Divergence of a magnetic field, Magnetic scalar and vector potential.

Unit-II

Varying Field: Faraday's law-integral and differential form, Self and mutual inductance, Neumann's equation, Charge and discharge of a capacitor through register, Growth and decay of current in LR circuit, Energy stored in electric and magnetic field, Displacement current, Maxwell's equations.

Unit-III

Laser: Coherence, Einstein's coefficient, Spontaneous and stimulated emission, Population inversion, Laser gain (pumping), Spectral narrowing in laser, Coherence length, Ruby and He-Ne laser.

Interference: Division of amplitude, colour of thin films, Newton's ring, Febry-Perot interferometer-principle, operation, determination of wave length and difference in wave length.

Unit-IV

Diffraction: Double slit Fraunhofer diffraction pattern, Fraunhofer diffraction by a plane transmission grating, Formation of spectra.

Polarization: **A**nalysis of linearly, circularly and elliptically polarized light (Half wave and quarter wave plates), Optical activity, specific rotations, Laurent's half shade and its use for determination of specific rotation of sugar solution.

Practicals

1. To find refractive index and dispersive power of material of prism by spectrometer.
2. To find wave length of light by Newton's ring.
3. To find wave length of light by diffraction grating.

4. To find specific rotation of sugar solution by polarimeter.
5. To find wave length of light by Fresnel Biprism.
6. To find frequency of A.C. mains.
7. To determine dielectric constant of liquid using series resonance method.
8. To study charge and discharge of condenser through a resistor (C.R. Circuit).
9. To study LCR resonant circuit, resonance, quality factor and sharpness in (i) series circuit (ii) parallel circuit.

Text Books/References

1. K.K. Tiwari. (1995). Electricity and Magnetism, S. Chand and Company, New Delhi.
2. N. Subrahmanyam and Brijlal. (1993). A Text Book of Optics, S. Chand and Company, New Delhi.
3. Ahmed and Lal. (1966). Electricity, Magnetism and Electronics, Unitech House, Lucknow.
4. D.S. Mathur. (1993). Mechanics, S. Chand and Company, New Delhi.
5. Gupta and Kumar. (1995). Practical Physics, Pragati Prakashan, Meerut.

CE 100 ENGINEERING MECHANICS

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

(A) STATICS

Unit-I

Introduction of condition of equilibrium: Force, system of force, coplanar forces.

Moment and couples: Moment and parallel forces, Couples, General conditions of equilibrium

Practical Applications: Levers, Cracked levers, Steel yards. Sagging chains and toggle joints.

Centre of Gravity: Centre of parallel forces, C.G. in some simple cases, C.G. of Solids.

Moment of Inertia: Moment of inertia, Radius of gyration and perpendicular axis. Determination of moment of inertia of simple sections. Mass of moment of inertia.

Unit-II

Friction: Introduction, Critical angle of friction, Friction on horizontal planes, Friction on inclined planes, Wedge and block, Screw jacks, Rolling friction.

Machines: Introduction, Effects of friction, Loss of work, Reversible and irreversible machine, Law of machine, Wheel and axle, Differential wheel and axle, Pulley block, Screw jack, Single and double purchase crab, Worm and Worm wheel, System of pulleys.

Frames: Statically determinate plane frames, Method of joints, Method of sections, Graphical method.

(B) DYNAMICS

Unit-III

Rectilinear Motion, Motion under gravity, Projectiles equation of the path, Maximum height attained, Time of flight, Horizontal range. Angle of projection, Projectile from a given height, Projectile on an inclined plane, Problems.

Work, Power and Energy: Work, Power, Work done by torque, Energy, Law of conservation.

Unit-IV

Centripetal and centrifugal forces, Laws of motion: Newton's Law of motion and their explanation, Collision of elastic bodies; Impulse and impulsive force, Principle of conservation of momentum, Loss of kinetic energy during impact.

Practicals

1. Verification of law of polygon of forces.
2. Verification of principle of moment in case of compound level.
3. Verification of principle of moment in case of bell crack level.
4. Determination of reaction in case simply supported beam with or without overhang.
5. To determine coefficient of friction between different surfaces on horizontal plane.
6. To determine coefficient of friction between different surfaces in inclined plane.
7. Study of different wheel and Axle.
8. Study of single purchase crab.
9. Study of worm and worm wheel.
10. Study of Weston's pulley block.
11. Determination of mechanical advantage, velocity ratio and efficiency of single purchase crab.
12. Determination of mechanical advantage, velocity ratio and efficiency of double purchase crab.
13. Determination of mechanical advantage, velocity ratio and efficiency of first system
    of pulley.
14. Determination of mechanical advantage, velocity ratio and efficiency of second system of pulleys.
15. Determination of mechanical advantage, velocity ratio and efficiency of third system of pulleys Flywheel.

Text Books/References

1. I.B. Prasad. Engineering Mechanics, Khanna Publisher, New Delhi.
2. R.S. Khurmi. Applied Mechanics, S. Chand & Company Ltd., New Delhi
3. S.B. Junnarkar. Applied Mechanics, Charotar Publishing House, New Delhi.
4. Saluja. Applied Mechanics, Satya Prakashan, New Delhi.

EE 100 ELECTRICAL ENGINEERING – I

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

D.C. Networks: Kirchoff's law, node voltage and mesh current methods, delta-star and star delta transformation, source conversion; solution of DC circuits by network theorems: Thevenin's, Norton's, superposition, Reciprocity and Maximum Power Transfer theorem.

Unit-II

Single Phase A.C.Ciruits : Single Phase EMF generation, average and effective values of sinusoidal and linear periodic wave forms, instantaneous and average power, power factor, reactive & apparent power, solution of R-L-C, series, parallel, series-parallel circuits, complex representation of impedances, phasor diagram, series and parallel resonance.

Unit-III

Three Phase A.C., Circuits : Three phase EMF generation, delta and star-connection, line and phase quantities, solution of the 3- phase balanced circuits, Phasor diagram, measurement of power in three phase balanced circuits.

Transformer: Faraday's laws of Electromagnetic induction, construction and principle operation of single phase transformer, EMF equation, voltage and current relationship and Phasor diagram for ideal transformer.

Unit-IV

Electrical Measuring Instruments : Introduction; type of measuring Instruments, Deflecting controlling & Damping Torque, D.C. PMMC instruments, shunts and multipliers, Moving iron ammeters and voltmeter, Dynamometers wattmeter, Induction type energy meter.

Practicals :

Based on theory

Text Books/References

1. B. L. Therja. Electrical Technology, S. Chand
2. M.E.Van Valkenberg. Network analysis, PHI

3. Soni and Gupta. Introduction to Electrical Network Theory, Dhanpat Rai Publisher
4. R.A. Gupta and Nikhal Gupta. (2002). Fundamentals of electrical & Electronics Engineering, JPH, Ist Edition,
5. H.P. Tiwari. (2002). Electrical & Electronics Engineering, College Book Centre, Jaipur.
6. J.B. Gupta. (2002). Fundamentals of Electrical & Electronics. S.K. Kataria and Sons. Dehli.

ENVS 100 ENVIRONMENTAL STUDIES

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Unit–I

The Multidisciplinary nature of environmental studies:

Definition, scope and need for public awareness. Environmental problems and their consequences

Natural Resources:

Renewable and non-renewable resources
Natural resources and associated problems

a) Forest resources: Use over-exploitation, deforestation, and case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams, benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land and a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources, Equitable use resources for sustainable lifestyles.

Unit-II

Ecosystems

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem.

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rovers, oceans, estuaries)

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity, Biogeographically classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-III

Environmental Pollution

Definition, Causes, effects and control measures of: -

Air pollution

Water pollution

Soil pollution

Marine pollution

Noise pollution

Thermal pollution

Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

Unit-IV

Social Issues and the Environment - From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Human Population and the Environment

Population growth, variation among nations, Population explosion- Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies

Practicals

Visit to river, forest, hill, mountain, local polluted plant, pond ecosystem

Text Books/References

1. K. C. Agarwal. (2001). Environmental Biology, Nidi Publications, Bikaner.
2. B. L. Chaudhary and Jitendra Pandey. (2005). Environmental Studies, Apex Publishing House, Udaipur.
3. H Jhadav & V. M. Bhosale. Environmental Protection & Laws, Himalaya Pub. House, Delhi
4. M. N. Rao and A. K. Datta. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
5. B. K. Sharma. Environmental Chemistry. Goel Publishing House, Meerut
6. Pratap Singh, N. S. Rathore and A. N. Mathur. (2004). Environmental Studies, Himanshu Publications, Udaipur.
7. R. K. Trivedi and P. K. Goel. Introduction to Air Pollution, Techno Science Publications.

BS 100C ENGINEERING CHEMISTRY

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Unit-I

Sources of water, common impurities, requisites of drinking water in municipal water supply. Purification of water, sedimentation, sterilization, break point chlorination. Hardness, determination of hardness by Complixemetric (EDTA) method, degree of hardness, chloride, dissolved oxygen, carbon dioxide and sulphate, control of pH of water used in industry, Boiler troubles, carry over corrosion, Sludge and scale formation. Caustic embrittlement, cause of boiler troubles and their prevention.

Unit-II

Classification of fuels, solid fuels, coal origin and its classification, Proximate and ultimate analysis of coal, significance of constituents, Gross and net calorific values. Liquid fuels- advantages, Petroleum origin, classification, Refining of Petroleum, Gasoline, knocking, octane number, anti knock agents . Flue gas analysis by Orsat Apparatus, Calculations based on combustion.

Unit-III

Corrosion: Definition and its significance, theories of corrosion, protection of corrosion use of inhibitors and passavasion, Alloying protective coatings -Metallic, inorganic and Organic.

Refractories: Definition, Properties, Classification. Properties of Silica and Fireclay refractories.

Unit-IV

Chemical Kinetics- Order and Molecularity of reaction, first and second order reaction, Derivation of equations for first and second order reaction, determination of order of reaction, Energy of activation and Arrhenius equations, Numericals of first and second order reactions.

Practicals

1. Determination of viscosity of a liquid.

2. Determination Surface Tension of a liquid by Stalagmometer method.
3. Determination of carbonate and non carbonate hardness by soda reagent method.
4. Determination of temporary and permanent hardness by EDTA method.
5. Estimation of free chlorine in a water sample.
6. Determination of copper sulphate iodometrically.
7. Estimation of potassium dichromate iodometrically
8. Determination of purity of Ferrous Ammonium Sulphate (Mohr's Salt) using Potassium Permanganate.
9. Determination of Potassium Dichromate using Potassium Ferrycyanide as an external indicator.
10. Estimation of available chlorine in bleaching powder sample
11. Analysis of Brass
12. Analysis of Iron ore
13. Analysis of Pyrolusite
14. Analysis of common salt.

Text Books/References

1. Jain and Jain. Engineering Chemistry, Dhanpat Rai & Sons, Nai Sarak, Delhi.
2. Jain and Gupta. A Text Book of Engineering Chemistry, Jaipur Publishing House.
3. B.K. Sharma. Engg. Chemistry, Krishna Prakashan Media (P) Ltd., Merrut.
4. S.S. Dara. A Text Book of Engineering Chemistry, S.Chand & Co., New Delhi.
5. M.A. Uppal. A Text Book of Engineering Chemistry, Khanna Publishers, Delhi.
6. S.S. Dara. A Text Book on Experiments and Calculations Engg. Chem. Ram Nagar, Delhi.
7. S.K. Banerji and S.K. Jain. Hand Book of Technical Analysis, Jain Brothers, New Delhi.

EC 100 ELECTRONICS AND INSTRUMENTATION

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Passive Components: Construction and characteristics of carbon composition , wire wound and film resistors. Potentiometer, color codes and rating of resistors. Characteristics and rating of capacitors for electronics circuits.

Semi conductor: Basic electrical characteristics of semi conductors. Theory of p-n junction. Characteristics and ratings of junction diodes.basics of zener diode, photo diode and LED.

Unit-II

Bipolar Junction Transistor: npn and pnp transistors,, Various configurations (CB, CC,CE) of BJT. Transistor biasing (Fixed, self, potential dividers) Basic classification

of amplifier (Voltage and power amplifier). Basic concept of Class A, B , AB and C amplifiers.

Unit-III

Generation of waveforms: Concept of positive and negative feed back. Introduction of oscillators like R-C , L-C and Crystal oscillators.
Power supply: Circuit configuration and analysis of Half wave , Full wave and Bridge rectifier .Basic concept of regulation, Zener diode voltage regulator.,Transistor serier regulator.

Unit-IV

Transducers: Definition, classification : Active and passive transducer, primary and secondary transducers, Analog and digital transducers. Measurement of displacement, temperature, velocity, force and pressure using potentiometer, resistance thermometer, thermocouples , bourden tube, LVDT, strain gauge and techogenerator.

Practicals
Based on theory

Text Books/References

1. Millman and Halkias. Integrated elecronics: Mc Graw Hill
2. W.D Cooper. Electronics Instrumentation and Measurement : PHI
3. M.L.Gupta. Electrical Engineering Materials
4. Malvino. Principles of Electronics
5. Jhon D. Ryder. Electronics Fundamentals

CS 100 INTRODUCTION TO COMPUTER PROGRAMMING AND DATA STRUCTURE

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit–I

Computer Fundamentals: History of Computers; Organization of Computers: input unit, output unit, Storage Unit, Arithmetic Logic Unit, Central Processing Unit; CPU Operation; Memory Subsystem: RAM, ROM, Cache Memory & memory Hierarchy; Instruction Format and Instruction Execution Cycle; Number System & Codes: Binary, Decimal, Octal & Hexadecimal Number System, Conversion from one number system to another, sign magnitude, 1's Complement & 2's Complement representation of numbers; Numerical & Character codes: BCD, Excess – 3, Gray, ASCII & EBCDIC Codes.

Unit-II

Basics of Programming in C: Constants, Variables and Data Types, Operators and Expressions, Input and Output operations, Decision making & Branching: if-else, switch statement; Decision making and looping; Arrays.

Unit-III

Character Arrays & strings, User defined function, Structures & Unions, Pointer Management, Dynamic Memory allocation & linked lists.

Unit–IV

Introduction to Data Structures : Introduction to Linear Arrays & Representation of Linear Array in Memory, Traversing, Insertion & Deletion in Linear arrays, Bubble Sort, Linear & Binary search; Introduction to linked list – Representation of linked list in memory, Traversing, Searching, Insertion & Deletion in a linked list.

Practicals
Based on Theory

Text Books/References

1. E. Balagurusamy. "Programming in ANSI C", Tata McGraw Hill.
2. Kernighan and Ritchie. "The C Programming language", Printice Hall
3. P.M. Jat. "Programming with C", Apex Publishing House, Jaipur.
4. Dharm Singh. "Fundamentals of Compute Organization", Paragon International Publishers, New Delhi.
5. P.K. Sinha & P. Sinha. "Computer Fundamentals", BPB Publication.
6. Seymour Lipschutz. "Data Structure", Schaum's outline series, McGraw Hill.

BS 100E ENGLISH AND COMMUNICATION SKILL

Cr. Hrs. 2 (2 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

(A) ENGLISH

Grammar and Usage – Tenses, Agreement of Subject and verb, Passive Voice, Basic Sentence Patterns, Prepositions, Phrasal verbs, Common Grammatical Errors, Use of articles, Punctuations, Modals, Gerund, Participle, Infinitive, Word Formation (affixes, prefixes, suffixes, synonyms and antonyms), Idioms, Synthesis & Transformation of sentences, Sentence Linkers.

Comprehension – Unseen Passage

Composition – Precise writing, Personal Letters, Business letters, Job Applications, Writing of technical Report, Essay writing

Introduction to sounds – Vowels, Diphthong, Consonants Phonetics Transcriptions. Word stress and exercises on pronunciation, Group discussion on current topics and Presentation of Technical report.
Practice in Language Laboratory

(B) COMMUNICATION SKILL

Communication Skills: Meaning and process of communication, Verbal and non-verbal communication; Quality of good communicator; Writing skills, Group discussion; Organizing seminars and conferences.

Text Books/ References

1. Thomson and Martinet. (1997). A Practical English Grammar Exercise Book, Vol. I and II, O.U.P. Publication.
2. Michal Swan. (1995). Practical English Grammar, O.U.P. Publication.
3. David Green. (1990). Contemporary English Grammar Structure Composition, Macmillan Publication.
4. S. Allen. (1997). Living English Structures, Orient Longmans.
5. Daniel Jones, Drills and Tests in English Sound, ELBS.
6. Hornby. (1990). Advanced Learners Dictionary, O.U.P. Publication.
7. Kirshan Mohan. Speaking English Effectively; Macmillan Publication.
8. Audio-Video Tapes prepared by the British Council, New Delhi and Central Institute of English and Foreign Language, Hyderabad to be used in a Language Laboratory.
9. A. Adivi Reddy. Extension Education, Sree Lakshmi Press, Bapatla (A.P.)
10. G.L. Ray. (2005). Extension Communication and Management, Kalyani Publishers.

FIRST YEAR B.E. (II SEMESTER)

BS 121 MATHEMATICS – II

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Differentiation of Vectors: scalar and vector point functions, vector differential operator Del, Gradient of a scalar point function, Divergence and Curl of vector point functions; Directional derivatives; Line, Surface and Volume integrals; Gauss, Stoke's and Green theorems (Statement only) and their applications.

Unit-II

Ordinary Differential Equations: Second order differential equations with variable coefficients; Exact form; Part of complimentary function is known; Change of dependent and independent variables; Method of variation of parameters.

Unit-III

Partial Differential Equations: Formation of partial differential equations; Lagrange's linear equations; Higher order linear partial differential equations with constant coefficients. Standard forms of partial differential equations.

Unit-IV

Matrices: Elementary transformations; Rank of a matrix; Reduction to normal form; Gauss Jordan method to find inverse of a matrix; Consistency and solutions of linear equations; Eigen values and Eigen vectors**;** Cayley-Hamilton theorem.

Text Books/References

1. Y.N. Guar and C.L. Koul. (2005). Engineering Mathematics, (Vols.-I, II), Jaipur Publishing House, Jaipur.
2. J.L. Bansal and H.S. Dhami. (2005). Differential Equation, (Vols.-I), Jaipur Publishing House, Jaipur.
3. N.P. Bali and N.Ch.S.N. Iyengar. (2003). A text book of Engineering Mathematics, Laxmi Publications (P) Ltd, New Delhi.

CE 122 CIVIL ENGINEERING

Cr. Hrs. 2 (1 + 1)

	L	T	P
Credit	**1**	**0**	**1**
Hours	**1**	**0**	**2**

(A) SURVEYING AND LEVELING

Unit-I

Principle and purpose of plane surveying.

Chain Surveying : Instrument for chaining, Direct & indirect ranging. Methods of chain along plane & sloping ground, Base line, check line, Tie line, Offset, Chain angle & recording in field book.

Compass Surveying : True & Magnetic meridian, whole circle bearing & quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction.

Unit-II

Level and leveling : Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy and Tilting levels, Leveling staves. Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. Level book and record keeping, leveling difficulties and errors in leveling.

(B) BUILDING MATERIAL

Unit-III

Stones: Different types, properties of good building stones, common testing of stones, Dressing of stones and use of stones in construction.

Bricks: Types, raw materials, identification, composition. Properties and uses of ordinary bricks, fire resistant and chemical resistant bricks.

Limes: Definition, sources of lime, slaking of lime, ISI classification of lime.

Unit-IV

Cement: Chemical composition, types of cement, properties, uses and tests on cement.

Mortars: Proportioning, properties of ingredients and use of lime, cement and gauge mortars.

Cement Concrete: Ingredients, common proportions, properties of fresh hardened concrete,Water cement ratio, curing and consolidation of concrete.

Practicals

1. Study of accessories used in measurement of distances.
2. Ranging Direct and indirect and use of chain and tape.
3. Chining along sloping ground.
4. Chain surveying, field book recording and taking offsets for location details
5. Study of prismatic and surveying compass and taking bearings..
6. Study of Dumpy level, temporary adjustment and R.L. calculations.
7. Study of Tilting level, temporary adjustment and R.L. calculations

8. Simply and differential leveling operation, record in level book, practice for staff reading line of collimation and Rise and fall method calculations.
9. L-section and cross sectioning, fly leveling operation.
10. Plotting of working profile.

Text Books/References

1. S.C. Rangwala. Engineering Materials, Charotar Book Stall, Anand.
2. B.C. Punmiya. Surveying & Field Work (Vol. I), Laxmi Publications, New Delhi.

ME 123 MACHINE DRAWING – I

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**3**

Introduction, conventional representation of different materials used in machine drawing, Introduction to BIS codes.

Orthographic Projection: First and third angle methods of projection. Preparation of working drawing from models and isometric views. Drawing of missing views.

Dimensioning: Different methods of dimensioning.

Sectional Views: Concept of sectioning. Revolved and oblique section. Sectional drawing of simple machine parts

Riveted and Welded Joints: Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.

Screw Fastenings: Nomenclature, thread profiles, multistart threads, left and right hand threads. Square headed and hexagonal nuts and bolts. Conventional representation of threads. Different types of lock nuts, studs, machine screws, cap screws and wood screws. Foundation bolts.

Different types of joints: Knuckle joint, cotter joint and universal joint.

Text Books/References

1. N. D. Bhatt. Machine Drawing, Charotar Book Stall, Anand.
2. V. Laxminarayan and ML Mathur. A Text Book of Machine Drawing, Jain Brothers, New Delhi.
3. P. S. Gill. Machine Drawing: S. K. Kataria & Sons, New Delhi.

ME 124 WORKSHOP TECHNOLOGY

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**3**

Unit-I

Welding: Introduction to welding, types of welding. Oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Soldering and Brazing.

Unit-II

Lathes: Classification, constructional details of centre lathe. Main operations and tools used on centre lathes.

Shaper: Types of shapers. Constructional details of standard shaper, shaper tools and main operations.

Unit-III

Drilling Machines: Types of drilling machines. Constructional details of pillar type, and radial drilling machines. Main operations. Twist drills, drill angles and sizes.

Measurement and Inspection: Classification of measuring instruments, linear and angular measurement, comparators.

Unit-IV

Forming: Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations.

Foundry: Moulding tools and equipments. Moulding sands, properties of moulding sand, sand mould making process.

Practicals

Practical exercises on welding, pattern making, foundry and machining operations.

Text Books/References

1. S.K. Hajra Choudhury and A.K. Hajra Choudhury. Elements of Workshop Technology (Vol. I and II), Media promoters & Publishers Pvt. Ltd., Bombay.

SECOND YEAR B.E. (III SEMESTER)

BS 211 (All Branches) MATHEMATICS – III

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Interpolation: Finite differences, various difference operators and their relationships, factorial notation. Interpolation with equal intervals; Newton's forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals.

Unit-II

Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae.

Numerical Differentiation: Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.

Unit-III

Numerical Integration: Numerical integration by Trapezoidal, Simpson's rule.

*Numerical Solutions of Ordinary Differential Equations***:** Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods.

Unit-IV

Laplace Transform: Laplace transforms of elementary functions; Basic properties of Laplace transform; Initial value theorem, final value theorem and convolution property of Laplace transform; Inverse Laplace transforms. Applications of Laplace transform to solve ordinary differential equations.

Text Books/References

1. H.C. Saxena. Text Book of Finite Differences and Numerical Analysis, S. Chand and Co.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain. Numerical Methods for Scientific and Engineering computation, New Age International (P) Ltd.
3. **N.**P. Bali and Manish Goyal. A Text book of Engineering Mathematics, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition).
4. S.P. Goyal and A.K. Goyal. Integral Transforms, Jaipur Publishing House, Jaipur.

EC 212 ELECTRONIC DEVICES& CIRCUITS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Semiconductor physics: Mobility and conductivity, charge densities in a semiconductor. Fermi dirac distribution, carrier concentration of fermi level in semiconductor Generation and recombination of charges diffusion and continuity equation Mass action Law, Hall effect.

Diode circuits:Diode as a ckt element, load line concept, clipping and clamping circuits, voltage multipliers.

Unit-II

Diodes and Transistor characteristics: Junction transistor, Transistor current components, The transistor as an Amplifier, Transistor construction, The common base configuration, The common emitter configuration, The CE cutoff Region, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter current gain, The Common-Collector configuration, Analytical Expressions for Transistors Characteristics, Maximum Voltage rating.

Transistor Biasing and Thermal Stabilization: The operating point, Bias stability, Self-Bias, or Emitter Bias, Stabilization against variations in ICO, VBE, and β, Bias compensation, Biasing techniques for Linear Integrated Circuits, Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability.

Unit-III

The Transistor at low frequencies : Graphical Analysis of the CE configuration, Two-Port devices and the hybrid Model, Transistor hybrid model, The h-parameter, Conversion formulas for the parameters of the three transistor Configuration, Analysis of a transistor Amplifier Circuit using h parameters, The Emitter follower, Comparison of transistor amplifier configurations, Linear Analysis of a Transistor Circuit, Cascading Transistor Amplifiers, Simplified Common-Emitter Hybrid Model, Simplified calculations for the Common-Collector Configuration, The Common-Emitter Amplifier with an emitter resistance, High input resistance transistor circuits.

Unit-IV

Field Effect Transistors : The Junction Field Effect Transistor, The Pinch-off voltage, The JFET Volt-Ampere characteristics, The FET Small-Signal model, The Metal-Oxide-Semiconductor FET (MOSFET), The Low-Frequency Common-Source and Common-Drain Amplifiers, The FET as a Voltage-variable Resistor (VVR).Working and characteristics of Photo Transistor, diode, LDR, UJT, SCR, DIAC and TRIAC.

Practicals: Based on Theory

Text Books/References

1. J Millman & C.C. Halkias. Integrated Electornics; Tata Mc-Graw Hill. Pearson Education.
2. Rebert Boylestad & L. Nashelsky. Electronic Devices and Circuit Theory.
3. Sedra Smith. Micro Electronic Circuits. Oxford Press, India.
4. Floyd. Electronic Devices, Pearson Education.
5. Shur. Physics of Semiconductor Devices. Prentice Hall of India.
6. D. Nagchoudhuri. Microelectronics devices, Pearson education.
7. G. Streetman Ben. Solid state devices, PHI/Pearson.

CS 213 (EC) OBJECT ORIENTED PROGRAMMING WITH C++

Cr. Hrs. 3 (2 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Unit -I

Concept of Object Oriented Programming, Objects Classes, Encapsulation, Inheritance, Polymorphism. C/C++. C++ core language. Program structure, Functions. Primitive Data types, Variables, Header and Pre-Processor Directives, cin, cout, iomanip.h. for, while, do-while loops, if, if-else, nested if-else, switch, logical and, or and not operators, break, continue, goto and exit statements, functions, declarations, definitions, returns, Parameters by values by reference, default arguments, Inline functions, Automatic, external, static, variables. const function arguments. Structures, Defining, Accessing Members, Structure within Structure, Class, Classes and Objects, Objects as Data Types.

Unit - II

Constructors, Overloading, Copy Constructors, Objects and Memory allocations, const and Classes, Objects as Arguments to functions. Arrays and Strings, Arrays as parameters to functions, C++ String class, Operator Overloading: Arithmetic, Logical, Assignment. Pointers, pointer to void, pointers and arrays, pointers and functions, new and delete operators, pointers to objects, Array of pointers to objects, A Linked List example, Pointers to pointers.

Unit - III

Inheritance, Derived class and base classes, Derived class constructors, Overriding member functions, Class Hierarchies, Multiple Inheritances. Virtual Functions, Friend Functions, Static functions, Dynamic Type Information,

Unit - IV

ios, istream, ostream, iostream classes, stream errors, Disk I./O with streams, file pointers, overloading cin, cout operators, multi file programs and projects, Exceptions, Exceptions with arguments, Templates, Linked List using templates.

Practicals: Based on theory.

Text Books/References

1. Bjarne Stroustrup. The C++ Programming Language, Addison-Wesley, Third Edition.

2. Robert Lafore. Object Oriented Programming with C++, Techmedia Publications.

EE 214 (EC) NETWORK ANALYSIS

Cr. Hrs. 2 (2 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

Unit-I

Network Theorems: Thevenin's, Norton's, reciprocity, Superposition, Compensation, Miller's Tellegen's and maximum power transfer theorems. Network with dependent sources.

Transient Analysis: Impulse, step, ramp and sinsuoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems.

Unit-II

Linear Network Response To Non-Sinusoidal Inputs: Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in circuit.

Coupling Elements & Coupled Circuits: Conductively coupled circuits. Inductively coupled circuits-mutual inductance, coefficient of coupling and mutual. Inductance between portions of same circuits and between parallel branches. Transformer equivalent. inductively and conductively coupled circuits.

Unit-III

Two Port Networks: Two port; parameters and their interrelations - z-parameters y-parameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port network. Image parameters Attenuation & phase shift in symmetrical T and networks.

Unit-IV

Network Functions: Terminals and terminal pair, driving point impedance transfer functions, poles and zeros. Procedure of Finding network functions for general two terminal pair networks. Stability & causality.

Network Synthesis: Hurwitz polynomial, positive real function, RL & RC networks synthesis, Foster First & Second form, Cauer forms.

Text Books/References

1. Kuo, F Franklin. Netwrok analysis and sysnthesis, II Ed, 1999, Jhon Wiley & sons.
2. C. Desoer and E.S.E.S. Duh. Basic circuit theory, Mc Graw Hill.
3. M.E Van Valkenburg. Network Analysi, Prentice Hall, India.
4. Schaum's Outling series on circuit analysis.
5. W. Hayt and Kinmmerly. Engineering circuit analysis, Mc Graw Hill, Inc.
6. A. Sudhakar and Mohan S.P. Chyam. Circuits and Networks, Tata Mc Graw Hill. India.
7. K. Lata Parag. Practical Digital Logic Design and Testing – PHI
8. Sandise. Modern Digital Design – MGH.
9. Kohavi. Switching and Auomata Theory.

EC 215 ANALOG COMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Amplitude Modulation: Theory of piece wise linear and gradual non-linear analog modulators. Analysis of standard AM waves and signal power distribution. Different circuits for amplitude modulation and their comparison. Methods of generating DSBSC, SSB and vestigial side band AM and their characteristics. Envelop and coherent demodulation methods for standard AM, DSB-SC, SSB signals. Frequency Division Multiplexing.

Unit-II

Angle Modulation: Theory of frequency and phase modulations. Spectrum and BW of FM and PM signals. Direct and In direct methods of generating narrow band and wide band FM. Discriminators and PLL de-modulators for FM and PM . Pre-emphasis and De-emphasis.

Unit-III

Radio Receivers: TRF and Super-heterodyne receivers . Selection of frequency converters, mixers and local oscillators, Characteristics of IF and RF amplifiers, Double spotting. Electrical and electronics tuning and tracking. Automatic gain and frequency control. Tune control. Band speed ,Receiver sensitivity, selectivity, fidelity and noise performance. Diversity reception, Receiver testing. Special considerations in communication receivers .Double conversion, Delayed AGC, noise limiter and squelch Operation of FM receivers and their comparison with AM receivers, AM / FM receivers. Introduction to stereo FM receivers.

Unit-IV

Radio Broad Cast Transmitters: Characteristics of master oscillators, buffers and frequency multipliers for AM and FM broad transmitter..

Pulse Modulation: Uniform sampling theorem, Generation of PAM, PDM and PPM signal and methods of reconstruction of original signals. Bandwidth requirements and comparison. Time division multiplexing.

Practicals: Based on Theory

Text Books/References

1. H.Taub & D.L. Schilling. "Principles of Communication Systems", Tata Mc-Graw Hill.
2. G..Kennedy. "Electronic Communication Systems:, John Wiely & Sons.

EC 216 (EC, EE) DIGITAL ELECTRONICS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Number System & Codes:- Radix and Radix conversion, Sign, magnitude and complement notation, Arithmetic shift weighted codes,Excess-3 code, Gray code, ASCII & EBCDIC codes, Fixed and floating point arithmetic, BCD addition and subtraction.

Unit-II

Boolean Algebra And Digital Logic Gates:- features of logic algebra, postulates of Boolean algebra, Theorems of Boolean algebra, Boolean function drive logic gates, Exclusive- OR, NAND, NOR gates, their block diagrams and truth tables, logic diagrams from Boolean expressions and vice –versa, converting logic diagrams to universal logic, positive, negative and mixed logic, logic gate conversion.

Minimizing Techniques:- Minterm, Maxterm, Karnaugh Map, K map up to 4 variables, simplification of logic function with K map, conversion of truth table of POS and SOP form, Incomplete specified functions, Variable mapping, Quinn-Mc Klusky minimization techniques.

Unit-III

Combinational Systems: Combinational logic circuit design, half and full adder, subtractor, Binary serial and parallel adders, BCD adder, BCD to 7-segment decoder, multiplexer, De-multiplexer, encoder, octal to binary, BCD to excess-3 encoder, Diode switching matrix, Design of logic circuits by multiplexers, encoder, decoders, and de-multiplexer.

Unit-IV

Sequential Systems: Latches, flip flops, R-S, D, J-K, Master Slave flip flops, Conversion of flip- flops, Asynchronous (ripple), Synchronous decade counter, Modulus counter, skipping state counter, counter design, Ring counter, Counter applications, Registers, buffer registers, shift register.

Practicals: Based on Theory

Text Books/References

1. A.P. Malvino & D.P. Leach. Digital Principles & Applications, Tata Mc-graw Hill, Delhi.
2. Morris Mano. Digital Circuit & Logic Design; Prentice Hll of India.
3. Tocci. Digital Systems, Pearson Education .
4. Gree. Digital electronics, Pearson Education .
5. Msno. Digital Desigh, Pearson Education .
6. Bartee. Digital Computer Fundamentals, Tata Mc-Graw Hill.
7. Dharam Singh. Digital electronics and Logic Design.

EC 217 ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Theory of error & uncertainty analysis: Accuracy & precision limits of errors, systematic & random errors and modeling of errors, probable error combination of error.

Unit-II

Electronic instruments for measuring basic parameters: Transistor voltmeter- with transistor balanced bridge TVM. Digital voltmeter ramp type, integrating type, DVM. Measurement of time, phase frequency using digital instruments, Q meter.

Unit-III

Signal generation & analysis: The sine wave generator, pulse, square and function generators, wave analyzer, harmonic distortion analyzer and spectrum analyzer. Instrumentation amplifier.

Transducers as input elements to instrumentation systems: Classification constructional & operational features, strain gauges, displacement, velocity, force, torque and pressure transducers and photosensitive devices.

Unit-IV

Display devices and recorders: Classification of display devices and systems. Cathode ray tube, light emitting diodes. Incandescent, electro luminescent and liquid-crystal displays, plasma LCD displays, Recorders.

Signal Transmission and telemetry: Modulation and encoding methods, transmission media; time and frequency division multiplexing.

Practicals: Based on Theory

Text Books/References

1. H.S. Kalsi. "Electronic Inst. & Measurement, Tata Me. Hill.
2. W.D. Cooper. "Electronic Inst. & Measurement Techniques, Prentice Hall of India.
3. A.K. Sawhney . "Electrical & Electronic Measurement & Inst., Dhanpat Raj & Sons.
4. F.E. Terman & J.M. Pettit. "Electronic Measurements McGraw Hill Book Co.
5. S. Talbar & Upadhyay. Electronic Instrumentation, Dhanpat Rai Sons.
6. H. E. Thomas and C. A. Clark. “Handbook of Electronic Instruments and Measurement Techniques”. Prentice Hall, Inc.

SECOND YEAR B.E. (IV SEMESTER)

BS 221 (EC, EE, ME, MI) MATHEMATICS-IV

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Fourier Series: Fourier series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis.

Unit-II

Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method; Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow's method.

Unit-III

Partial Differential Equations: Classifications of partial differential equations; Method of separation of variables to solve Heat equation, Wave equation and Laplace's equations.

Unit-IV

Statistics: Correlation and regression; Principle of least square method and curve fitting.

Probability Distribution Functions: Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions; Binomial, Poisson and Normal distributions.

Text Books/References

1. J.L. Bansal and H.S. Dhami. (2005). Differential Equations (Vols.-II), Jaipur Publishing House, Jaipur.
2. N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics (VII Edition), Laxmi Publication Pvt. Ltd., New Delhi.
3. S.C. Gupta and V.K. Kapoor. Mathematical Statistics, Sultan Chand & Sons, New Delhi.

CS 222 (EC) DATA STRUCTURES

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit – I

Concepts. Data Representation: Linear Lists, Formula based representation, Linked List Representations, Circular and Doubly Linked Lists, Indirect Addressing.

Unit - II

Stacks: Abstract Data Type, Derived Classes and Inheritance, Formula based Representation, Linked Representation. Applications. Queues: Abstract Data type, Formula based Representation, Linked List Representation.

Unit - III

Trees: Introduction, Binary Trees, Formula based and Linked Representation of Binary Trees, Common Operation and Traversal, Abstract Data Type BinaryTree. Priority Queues and Tournament Trees. Search Trees: Binary Search Tree, ADT (abstract Data Type)'s BSTree and IndexedBSTree. AVL Trees. B-Trees, m-way tree search, B-Tree order of m, Height, Searching, Insertion and deletion in B-Tree.Node Structure in B-Tree.

Unit - IV

Graphs: Definitions and Applications. ADTs Graph and Disgraph. Graphs Iterators, Graph Search Methods. Skip Lists and hashing. Linear List Representation, Skip List Representation.

Text Books/References

1. Sartaj Sahni. Data Structure, Algorithms and Applications in C++, WCB McGraw- Hill.

EC 223 APPLIED ELECTRONIC CIRCUITS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Feedback Amplifiers: General Feedback structure, Properties of negative Feedback, Four basic Feedback Topologies, Voltage series, Voltage shunt, Current series, Current Shunt, Effect of Feedback connection on various parameters.

Unit-II

Oscillators: Basic principle of sinusoidal oscillator (Hartley & Colpitts), Crystal Oscillator.

Waveform Generators: Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator. Schmitt trigger.

Unit-III

Power Amplifiers: Power Amplifier Circuits. Class A, Class B and Class AB output stages Class A, Class B Push pull amplifiers with and without Transformers.

Unit-IV

High Frequency Amplifier: Hybrid-II model of BJT and FET, High frequency analysis of BJT and FET, Cascode Configuration, Tuned amplifiers

Practicals: Based on Theory

Text Books/References

1. Sedra/Smith. Microelectronic Circuits, Oxford University Press.
2. D. L. Schilling and C. Beloe. Electronic Circuits, McGraw-Hill.
3. S. Soclof. Applications & Design with analog IC's PH1
4. Jacob. Applications & Design with analog IC's, PH1
5. Coughlin Drisocol. Operational Amplifiers & Linear IC's Pearson Education.

EC 224 MICROPROCESSOR ARCHITECTURE & APPLICATIONS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

The 8085 Microprocessor: Block diagram, pins & their description, demultiplexing of buses, control signals & flags. Introduction to 8085 based microcomputer system.

Instruction & Timings: Instruction classification, instruction formats, addressing modes, Instruction timings and status. Interrupts.

Unit-II

Programming & Programming Techniques of the 8085: 8085 instruction set, data transfer instructions, arithmetic, logic & branch operations. Rotate & compare. Instructions related to stack operations. Looping, countings and indexing, counters & time delays. Subroutines.

Unit-III

Interfacing Concepts & Peripherals: Basic interfacing concepts. Memory mapped and peripheral mapped I/O. Description, programming & interfacing of 8155, 8255, 8279 with 8085. Description of simple systems using above chips.

Direct memory Access: Basic concepts FDMA techniques. Description, Programming and interfacing of DMA controller 8257.

Unit-IV

Description, programming and interfacing of 8253 and 8259A with 8085 microprocessor.

A/D and D/A converters, Serial I/O & Bus stands: Interfacing of AD558, AD7522, ADC0801, 0808 with 8085. Basic concepts in serial I/O, Software controlled serial I/O. RS232C and standared parallel port of PC.

Practicals: Based on Theory

Text Books/References

1. R. Gaonkar. Microprocessor Architecture, Programming and Applications, Wiely Eastern Ltd.
2. D. V. Hall. Microprocessor & Interfacing
3. P. Mathur. Introduction to Microprocessors.

EC 225 TELECOMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Transmission Lines: Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, reflection on a line, SWR of line with different type of terminations. Distortionless and dissipationless lines. Coaxial cables, Transmission lines at audio and radio frequenceies. Losses in transmission line. Characteristics of quarterwave. half wave and other lengths, Smith chart and its application. Transmission line applications, Impedance matching Networks, Single & double stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

Unit-II

Attenuators & Filters: Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators. pi-section. T-section filter, m-derived filter sections. Lattics filter section.

Unit-III

Carrier Telephony: Multi-channel systems; frequency division & time division multiplexing, power line carrier communication.

Telephone Transmission: Telephone Instrument; Rotary dial singing. Echo suppressors & cancellors, cross talk.

Unit-IV

Basics of Automatictelephony: Truking concepts. Grade of service. Traffic definitions. Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange. EPABX and SPC Exchange. STD. ISD.

Recent Trends in Telecommunication: Voice frequency telegraphy. Fascimile & telex services.

Practicals: Based on Theory

Text Books/References

1. W. Fraser. Telecommunications (BPB Publication)
2. Vishvanathan. Telecommunication switching systems & Networks. Prentice Hall of India.
3. Cole. Introduction to Telecommunication. Pearson Education.
4. Floyd. Telecommunication Switching Traffic and Networks, Pearson Education.

EC 226 ELECTROMAGNETIC FIELD THEORY

Cr. Hrs. 2 (2 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**1**	**0**

Unit-I

Introduction: Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient. Divergence and curl, Green's & Stoke theorems.

Electrostatics: Electric field intensity & flux density. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. field determination by method of Image Boundary conditions.

Unit-II

Magnetostatics: Magnetic field intensity, flux density & magnetization, Faraday's Law. Bio-Savort's Law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy storage in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field maping and concept of field cells.

Unit-III

Time Varying Fields: Displacement currents and equation of continuity. Maxwell's equations. Uniform plane wave in free space dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of UPW, standing wave ratio. Pointing vector and power considerations.

Unit-IV

Radiation: Retarted Potentials and concepts of radiation, Radiation from a small current element, Radiation resistance.

EMI and EMC: Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating Interference shielding, grounding, conducted EMI. EMI testing: emission testing, susceptibility testing.

Text Books/References

1. Griffiths. Introduction to Electrodnamics. (2nd Ed.Prentice Hall of India.
2. V.V. Sarwate. Electromagnetic Fields and Waves, Willey Eastern Ltd.
3. J.D. Kraus. Electromagnetics, Mcgraw Hill.
4. E.C. Jordan and K.G. Balmain. Electromagnetic Waves and Radiating Systems, PHI.
5. W.H. Hayt Jr. Engineering Electromagnetics, Tata Mcgraw Hill.
6. Cheng. Field and Wave Electromagnetic, Pearson Education.
7. David Change, Sadiku. Elements of Electromagnetics, Oxford Press
8. F. Ulabi. Applied Electromagnetics
9. O. P. Gandhi. Schaum's Electromagnetics, MGH
10. Balanis. Applied Electromagnetics

EC 227 ELECTRONICS WORKSHOP PRACTICES

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

1. Identification, Study & Testing of various electronic components:
   (a) Resistance-Various types, Colour coding.
   (b) Capacitors-Various types, Coding.
   (c) Inductors
   (d) Diodes
   (e) Transistors
   (f) SCRs
   (g) ICs
   (h) Photodiode
   (i) Photo transistor
   (j) LED
   (k) LDR
   (l) Potentiometers
2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc.
3. To study and perform experiment on CRO demonstration kit.
4. Soldering and desoldering practice.
   (a) To Design and fabricate PCB for a Regulated power supply.
   (b) Assemble the Regulated power supply using PCB and test it.
5. To study the specifications and working of a Transistor radio kit and perform measurements on it.
6. To study the specifications and working of a Tape Recorder kit.
7. Coil winding and testing.

THIRD YEAR B.E. (V SEMESTER)

EC 311 DIGITAL SIGNAL PROCESSING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**1**	**2**

Unit-I

Sampling: Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.

Transform Analysis of LTI Systems: Time domain representation of Linear Time Invariant (LTI) systems, Properties of LTI systems, The frequency response of LTI systems. Introduction of Z transform , ROC, Properties of z-transform, Inverse z-transform, Applications of z-transform in the analysis of discrete time LTI systems.

Unit-II

Structures for Discrete-Time Systems: Block diagram and signal flow graph representation of LCCD (LCCD-Linear constant Coefficient Difference) equations, Basic structures for IIR and FIR systems. Transposed forms.

Unit-III

Filter Design Techniques: Introduction, Design of Discrete-Time IIR filter from Continuous-time filters, filter design by impulse invariance, Bilinear transformation, Design of FIR filters by Windowing-examples of FIR filter design by the kaiser window method.

Unit-IV

The Discrete Fourier Transform: The discrete fourier series (DFS) Properties of the DFS, The discrete Fourier transform (DFT), Properties of the DFT, Implementing LTI systems using the DFT, Efficient computation of the DFT, The Goertzel Algorithm, Decimation-in-Time and decimation-in frequency FFT Algorithms, Implementation of the DFI using convolution.

Practicals: Based on Theory

Text Books/References

1. Schafer. Buck. Discrete Time signal Processing, Pearson Education Asia.
2. Prokis & Monolakis. Digital Signal Processing: Principles, Algorithms & Application, Prentice hall of India.
3. S.K. Mitra. Digital Signal Processing. Tata Mc-Graw Hill.
4. Rabiner & Gold. Theory & Applications of Digital Signal Processing, Prentice Hall of India.
5. Lathi. Signal Processing & Linear System, Oxford Univ Pren

EC 312 THEORY & APPLICATIONS OF INTEGRATED CIRCUITS

Cr. Hrs. 4 (3 + 1)

	L	T P
Credit	**3**	**0 1**
Hours	**3**	**0 2**

Unit-I

Operational Amplifiers: Basic differential amplifier analysis, various stages of Op-amp, Op-amp parameters, Analysis of type 741 Op-amplifiers.

Unit-II

Operational Amplifier Applications: Comparators, Limiters, Voltage to frequency & Frequency to voltage converters; Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, saw tooth oscillators. Voltage controlled oscillators. Active Filters: Low pass high pass, band pass and band reject filters.

Unit-III

Phase-Locked Loops: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL, Introduction to digital PLL.

Unit-IV

Liner IC's: Four-quadrant multiplier & its applications, voltage reference, basic blocks of liner IC voltage regulators, Three terminal voltage regulators. Positive and negative voltage regulators, Switching regulator.

Practicals: Based on Theory

Text Books/References

1. R.A. Gayakwad. Op-amplifiers & Linear ICs, Prentice Hall of India.
2. Taubay. Operational Amplifiers.
3. K.R. Botkar. Integrated Circuits. Pearson Education.

EC 313 COMMUNICATION THEORY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Random Variables & Process: Probability & probability density function, Random variables, average value, and variance of a random variable, Techebycheffs inequality, Gaussian probability density and Rayleigh probability density, mean, variance and probability density of sum of random variables, Correlation between random variables Central limit theorem, Autocorrelation and spectral density, Power spectral density of a sequence of random pulses and digital data.

Unit-II

Noise & Its Mathematical Representation: External and internal sources of noise, Theory of thermal and shot noise. Freq domain representation of noise. Spectral component of noise. Effect of a filter on the power spectral density of noise. Superposition of noises. Noise in Mixing. Noise in reactive circuits. Noise figure and noise temperature. Techniques of improvements of S/N ratio, Measurement of noise.

Unit-III

Amplitude Modulation: Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM_DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers. Calculation of signal-to-noise ratio in SSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector, Super heterodyne receivers.

Unit-IV

Angle Modulation: Phase & freq. modulation & their relationship, Spectrum & bandwidth of a sinusoidal modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receiver. Calculation of S/N ratio in FM demodulators. Comparison of AM, FM , Pre emphasis & deemphasis. Threshold in FM, PLL demodulator.

Practicals: Based on Theory

Text Books/References

1. H.Taub & D.L. Schilling. "Principles of Communication Systems", Tata Mc-Graw Hill.
2. G.Kennedy. "Electronic Communication Systems:, John Wiely & Sons.
3. Simon Haykin. "communication Systems". John Wiely & Sons.
4. B.P. Lathi. "Communication Systems:, John Wiley.
5. Modern. Digital Analog communication Systems.
6. Louch. Digital & analog Communication, Pearson Education.
7. Tomasi. Electronic Communication. Pearson Education.

CS 314 (CS, EC) COMPUTER ARCHITECTURE

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit - I

Processor Basics: CPU organization: Fundamentals, Concept of RISC and SISC processor and their comparison, *Data Representation*: Word length, Fixed-point numbers, Floating-point numbers, *Instruction Sets*: Format, Types.

Unit - II

Control Design: Concepts, Hardwired control, *Micro-programmed Control*: Basic structure, Address Sequencing, Design of Control Unit, Pipeline Control.

Unit - III

Memory Organization: Memory Technology*:* Types, performance, access modes. Random Access Memories: RAM Organization and Design. Auxiliary Memories: Access methods and Organization, Magnetic disk, tapes and Optical memories. Memories hierarchies. Associative Memory.

Unit - IV

Cache Memories: Organization and mapping. Principles of Virtual Memory, Segmentation and Paging. Introduction to SIMD, MIMD, Array processor and pipelined architecture.

Text Books/References

1. J. P. Hayes. Computer Architecture and Organization, 3rd ed., McGraw Hill International edition.
2. Andrew S. Tenenbaum. Structured Computer Organization; PHI, New Delhi.

EE 315 (EC) CONTROL SYSTEM ENGINEERING

Cr. Hrs. 2 (2 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**1**	**0**

Unit-I

Introduction:- Concepts of open loop and closed loop systems. Mathematical models for feedback systems. Examples and applications of open loop and closed loop systems. Brief idea of multi-variable control systems.

Representation of physical systems: (Electro-mechanical) by differential equations, Determination of transfer function by block diagram, Reduction technique and signal flow graphs techniques.

Unit-II

System Performance and stability:- Time domain and frequency domain specifications and their correlation's. Time response analysis of first and second order systems. Transient response analysis steady state error and error constants.

Unit-III

Absolute and relative stability. Routh's stability criterion. Root locus method of analysis. Polar plots Nyquist stability criterion. M and N locii, Nichol's chart. Frequency domain methods, Bode plot, Design specification in frequency domain.

Unit-IV

State Variable analysis: Concept of state, state variables and state model. State models for linear continuous time systems. Diagonalization transfer functions. Solutions of state equations. Concept of controllability and observability.

Elementary idea of compensating networks: Lag, Lead and lag-Lead networks. Brief idea of proportional, derivative and integral controllers.

Text Books/References

1. Gopal Nagrath. Control System Engg.
2. Ogata. Modern Control System.
3. B.S. Manke. Linear Control System - Khanna Publisher.

EC 316 MICROWAVE ENGINEERING – I

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-1

Microwave wave guides & Components: - Introduction of microwaves and their applications, microwave signal propagation and transit time effect, Rectangular wave guides and Introduction of circular wave guides, Basic idea of TE, TM, TEM waves propagation, Scattering matrix representation of network, rectangular and circular cavity resonators, wave guide E and H plane Tees, Magic Tee and Hybrid Rings, Microwave corner, Bends, Twists, Directional couplers, Circulators and Isolators.

Unit-2

Klystrons:- Construction and operation of two cavity & multicavity Klystron, Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity Klystron , Construction, working and operation of Reflex Klystron, Applications and practical considerations, Velocity modulation, power output and frequency characteristics of a Reflex Klystron, Electron admittance.

Unit-3

Travelling Wave Tubes (TWT):- Construction, Operation and practical consideration of helix type TWT, Introduction of CW power, pulsed dual mode TWT, Coupled cavity TWT, Application of TWT.

Unit-4

Magnetron: - Types of Magnetron, operation and practical considerations of travelling wave (cavity) magnetron, Introduction of Coaxial, Voltage Tunable and frequency- Agile Coaxial magnetrons, Cylindrical Magnetron Oscillator.

Practicals: Based on Theory

Text Books/References

1. S.Y. Laio. 'Microwave devices and Circuits', Prentice-Hall of India.
2. H.J. Reich. 'Microwave Principles', East-West Press.
3. R.E. Collin. 'Foundations for microwave Engineering', Mc-Graw Hill.
4. Sisodia V.L. Gupta. 'Microwave Engineering', New Age.

THIRD YEAR B.E. (VI SEMESTER)

EC 321 MICROWAVE ENGINEERING-II

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Microwave Measurement: Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements

Unit-II

Microwave Semiconductor Devices: . Introduction to microstrip lines, Parallel striplines. Coplaner striplines, Shielded striplines, Slot lines.Construction, Operation and Practical applications of PIN diode, Varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.

Unit-III

Monolithic Microwave Integrated Circuits: Introduction, Materials, MMIC Growth, MOSFET fabrication thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.

Unit-IV

Introduction to Microstrip filters, Directional coupler (Branch line & parallel coupled), Hybrid rings, Power dividers, Microstrip phase shifter.

Practicals: Based on Theory

Text Books/References

1. S.Y.Liao. 'Microwave Devices and ckts', Prentice Hall of India.
2. K.C. Gupta. 'Microwaves', New Age International.
3. R.E. Collin. 'Foundations for Microwave Engg', Mc-Graw Hill.
4. T.C. Edwards. 'Foundation for Microstrip circuit Design', John Wiley & Sons.
5. B.Bhat & S.K. Koul. 'Stripline like Transmission Lines for Microwave Integrated Circuits, Wiley Eastern Limited.

EC 322 INDUSTRIAL ELECTRONICS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Semiconductor Power Devices: Characteristic of power diodes, power transistor, IGBTS, TRIAC, DIAC, SUS, SBS & SCS.

SCR: Construction & its characteristics, Methods of turning on & turning off. Rating & rating extension by series/parallel operation. Specification & ratings. String efficiency. Simple firing circuit using UJT. Protection of SCR against over current & voltage surges.

Unit-II

Controlled Rectifiers: Principle of phase control, single phase half wave circuit with RL, RLE, and effect of fly wheel diode. Full wave controlled rectifier, mid-point converter, bridge converter.

Three phase thyrister converter circuit: three phase full converter & three phase semi-converter.

Unit-III

Choppers: Principle, control strategies, types of chopper circuits, step-up & step-down choppers, thyrister commutation in chopper circuits, voltage & current commutated choppers, load commutated chopper & multi phase choppers.

Power Supply:

D.C Power Supply: switch mode d.c power supply, resonant d.c power supply, bidirectional d.c power supply.

A.C Power Supply: switch mode a.c power supply, resonant a.c power supply, bidirectional a.c power supply.

Unit-IV

Inverters: Principle of operation, single phase bridge inverter & three phase bridge inverter. Current source inverters.

Cycloconverter: Principle of operation, single phase to single phase step-up & step-down cycloconverter, mid-point cycloconverter & bridge type cycloconverter.Three phase half wave cycloconverter, three phase to three phase cycloconverter, load commutated cycloconverter.

Text Books/References

1. P.C. Sen. Power Electronics.
2. Dubey. Power Electronics.
3. Ramamurthy. Power Electronics.
4. G.K. Mittal. Industrial Electronics.
5. Agarwal. Power Electronics Systems. Pearson Education India).

EC 323 DIGITAL COMMUNICATION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Pulse Modulation Systems: Sampling theorem, Generation and demodulation of PAM, PWM, PPM, Quantization of signals, Quantization error, PCM, Companding and multiplexing of PCM signals, Delta and adaptive delta modulation, Bit, word and frame synchronization, Matched filter detection.

Unit-II

Line Coding: Properties of line codes, PSD of various line codes, Polar signaling, ON-OFF signaling, Bipolar Signaling. Pulse shaping, Nyquist criterion for zero ISI, Scrambling, Pre amplifier and equalizer, EYE diagram, Timing extraction and Timing jitter.

Unit-III

Digital Modulation Techniques: Various techniques of phase shift, amplitude shift and frequency shift keying, Minimum shift keying, Calculation of error probabilities for PSK, ASK, FSK & MSK techniques.

Unit-IV

Information Theory & Coding: Amount of Information, Entropy, Information rate, Increase in average information per bit by coding, Shannon's theorem and shannon's bound, Capacity of a Gaussian-Channel, BW-S/N trade off, Orthogonal signal transmission, Coding of Information, Hamming code, Single Parity-Bit code, Linear Block code Cyclic codes, BCH codes, Reed-solomon codes.

Practicals: Based on Theory

Text Books/References

1. H.Taub & D.L. schilling. "Principles of communication System", Tata Mc-Graw Hill.
2. Simon Haykin. "Communication Systems", John Wiley & Sons.
3. B.P. Lathi. "Communication Systems", Tata Mc-Graw Hill.
4. Proakis. "Digital Communication" Tata Mc-Graw Hill.
5. Sklar. "Digital Communication" Pearson Education.
6. P. Chakarbarti. "Principles of Digital Communication" Danpatrai & Sons.

EC 324 ANTENNA & WAVE PROPAGATION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Antenna Theory : Antenna fundamentals and definitions, Radiation from a current element in free space, Quarter & half wave antenna Reciprocity theorem, Resonant and non-resonant antenna, Antenna effective length and aperature, gain, beam width, directivity, radiation resistance, efficiency, polarization, impedance, and directional characteristics of antenna, antenna temperature. VLF, LF, MF and HF antennas, Effect of ground on antennas, antenna loading.

Unit-II

Antenna Arrays: Two element array, N-element linear arrays, Broadside, end fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Long wire, V and Rhombic antennas, Folded dipole, yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas.

Unit-III

UHF and Microwave Antennas: parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Micro strip antennas. Antenna Measurements: Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements.

Unit-IV

Radio Wave Propagation: Mechanism of radio wave propagation, Reflection, refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, reflection factors for horizontal and vertical polarizations.

Duct propagation and troposphere scattering, Various ionosphere layers, Characteristics of ionosphere and its effects on wave propagation. Critical frequency, virtual height, skip zone & maximum usable frequency. Multiple hop transmission.

Text Books/References

1. J.D. Kraus. 'Antennas', Mc-Graw Hill.
2. C.A. Balanis. 'Antenna Theory', Harper & Row.
3. K.D. Prasad. 'Antenna and Wave Propagation', SATYA Prakashan, New Delhi.
4. E.C. Jordan and K.G. Balmain. 'Electromagnetic waves and Radiating Systems', Prentice hall of India.
5. R.E. Collin. 'Antennas & Radio Wave Propagation', Mc-Graw Hill.

CS 325 (EC) OPERATING SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit -I

Operating system Introduction and Structure. Processes. Threads, Interprocess communication. *CPU Scheduling***:** Scheduling Algorithm, Multiprocess and Realtime process scheduling, Algorithm Evaluation. *Process Synchronizations*: Semaphores, Critical Regions and Monitors.

Unit - II

Deadlocks: Handling, Prevention, Avoidance and Detection of Deadlocks, Recovery from Deadlocks. *Memory Management*: Address spaces, Swapping, Contiguous Allocation, Paging, Segmentation.

Unit - III

Virtual Memory: Demand Paging, Page Replacement, Page replacement algorithms. *File System Implementation*: File System Structure, Allocation Methods, Free space Management, Directory Implementation, Efficiency and Performance, Recovery.

Unit - IV

I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem. Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable Storage Implementation. *Protection*: Goals, Domains, Access Matrix. *Security*: Problem, Authentication, Program Threats, System Threats, Threat Monitoring, Encryption.

Text Books/References

1. Silerschatz Abraham and Peter Baer Galvin. Operating System Concepts, 6th Ed ,
   John Wiley & Sons
2. D.M. Dhamdhere. System Programming and Operating System, Tata Mcgrawhill,
   New Delhi.

EC 326 PULSE & WAVE SHAPING CIRCUITS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit – I

Linear wave Shaping: High frequency and low frequency response of RC and RL circuits to step pulse, ramp and exponential wave form inputs, Attenuators, RL A and RLC circuits, Ringing circuit pulse Transformer (Application equivalent circuit and characteristics)

Unit – II

Non-Linear wave shaping: Steady state switching characteristics of semiconductor devices, clipping circuits, diode clippers, OPAMP. Clippers, Transistor clippers, clipping at two levels, diode comparators, Application of voltage comparators, clamping operation, Diode Clamping circuit, Clamping circuit theorem.

Unit – III

Transistor as switch, capacitively and inductively loaded transistor switch.
Generation of waveforms: Multivibrators – Bistable , Monostable and Astable multivibrators, A Fixed- Bias and self Bias transistor binaries, commutating capacitors Methods of improving resolution, Symmetrical and non- symmetrical triggering of Binaries

Unit – IV

Schmitt Trigger Circuit: Voltage time base generator, methods of generating a time base wave from: A transistor constant current sweep generator, Miller and Boot strap time base generators, Linearity improvement of current sweep: Blocking oscillators- An astable and monostable blocking oscillators, Application of Blocking oscillator.

Practicals: Based on Theory

Text Books/References

1. K.V. Ramanan. Functional Electronics, Tata Mcgraw Hill

EC 327 SYSTEM DESIGN LAB

Cr. Hrs. 1 (0 + 1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**1**	**2**

Design & simulation of following circuits with the help of software:

1. Any two of filter using operational amplifier.
   (a) Low pass
   (b) High Pass
   (c) Band pass
   (d) Band stop
   (e) Notch filter

2. Using op-amp-
   (a) Differentiator & Integrators
   (b) Voltage Follower
   (c) Adder

3. Following circuits using 555 timer.
   (a) Astable multi vibrator
   (b) Bi stable multi vibrator
   (c) Mono stable multi vibrator
   (d) Triangular wave generator.

4. Two port Parameter evaluation of active & passive circuits.
5. Switching time of a transistor/logic gates.
6. To design & simulate FIR filters.
7. Study the important characteristics of antenna land experimental measure the Radiation resistance, Radiation Pattern on polar plots and calculate the Beam width and gain of main lobe and bandwidth for the following types of antenna.
   (a) Half wave dipole
   (b) Folded dipole
   (c) Yagi UDA multiple element folded dipole
   (d) Hertz Antenna
   (e) End fire and broad side antenna
   (f) Phase array antenna

(g) combined collinear array

(h) Loop antenna

(i) Ground plane antenna

(j) Log periodic antenna

(k) Rhombus antenna

(l) Slot antenna

8. Demonstration of modeling of wire antenna using appropriate design software.
9. Simulation of antenna arrays using appropriate software.
10. Design and testing of micro strip rectangular patch antenna using appropriate software.

    (a) To construct a basic transmitter, receiver and line of sight microwave radio link using micro strip components.

    (b) To investigate the transmission characteristics of the link and to measure the gain of the micro strip patch antennas using in the above setup. Draw the antenna radiation diagram.

Text Books/References

1. Antenna Simulation Software Tools.
2. VHF and UHF Antenna Training Hardware Modules.

FOURTH YEAR B.E. (VII SEMESTER)

EC 411 VLSI TECHNOLOGY

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Introduction to MOS Technology: Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action nMOS and CMOS fabrication.

Unit-II

Basic Electrical Properties of MOS Circuits: Ids versus V ds relationship, Aspects of threshold voltage, Transistor Transconductance gm. The nMOS inverter, Pull up to Pull-down ratio for a nMOS Inverter and CMOS Inverter (Bn & Bp MOS transistor circuit Model, Noise Margin).

Unit-III

CMOS Logic Circuits: The inverter, Combinational Logic, NAND Gate NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation.

Unit-IV

Basic physical design of simple Gates and Layout issues, Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance. Introduction to VHDL, Prolog & other design tools, VHDL Code for simple Logic gates, flip-flops, and shift registers.

Practicals: Based on Theory

Text Books/References

1. Stephen Br s of Digital Logic with VHDL Design, Tata Mc-Graw Hill.
2. Neil H.E. Weste. Kamran Eshraghian-Principles of CMOS VLSI Design.
3. A. Douglas Pucknell. Kamran Eshraghian-Basic VLSI Design.
4. Michael John, Sebastian Smith. Application specific Integrated Circuit.
5. Behzad Razavi. Design of Analog CMOS Integrated Circuits, Mc-Graw Hill. own and Zvonlo Veranesic-Fundamental

EC 412 MICROWAVE & SATELLITE COMMUNICATION

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Propagation Phenomena: Fundamentals of fading multipath channels: Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing.
Line of Sight Microwave Communication: Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Tx-Rx.

Unit-II

Elements of Satellite Comm.: Satellite frequency bands. Frequency reuse, orbital period & velocity, coverage angle and slant Range, Eclipse.
Satellite Description: Comm. Sub-system, Telemetry, Command & Ranging sub-system, Attitude control sub-system and Electrical Power sub system, Study of Indian satellites like INSAT series & IRS series etc.

Unit-III

Launch vehicles: PSLV & GSLV & Placement of Satellite in orbit.
Earth Station: Block diagram, Antenna types, LNA, Up-converter & Down-converter, Monitoring & Control, VSAT.

Unit-IV

Satellite link design:- Basic link analysis, Interference analysis, Rain induced attenuation & cross polarization.
Introduction to FDMA, TDMA, CDMA with reference to Satellite Systems.

Practicals: Based on Theory

Text Books/References

1. Reppaport. Wireless Communication, Pearson Education.
2. William Stallings. Wireless communication & Networks, LPE, Pearson Education, Asia.
3. Tri. T. Ha.. Digital Satellite Communications, Mc-Graw Hill International.
4. Dr.Kamilo Feher. Digital Wireless Communication, Prentice Hall of India.
5. William C.Y. Le. Mobile Cellular Telecommunications, Mc-Graw Hill Interational Edition.
6. M. Richharia. Satellite Communication System, Mac Millan.
7. Gigliardi. Satellite Comm. CBS publications.
8. Pratt. and Bostian. Satellite Comm. Wiley Eastern Publications.

EC 413 WIRELESS & MOBILE COMMUNICATION

Cr. Hrs. 4 (3 + 1)

	L	T P
Credit	**3**	**0 1**
Hours	**3**	**0 2**

Unit-I

Mobile Radio Systems:- Historical background of mobile radio communication, Mobile radio standards around the world, Introduction of paging system, Cordless telephone systems and cellular systems, Call origination and Termination, Introduction of 2G, 2.5G, 3G and 4G Cellular networks.

Unit-II

Cellular System Design Fundamentals:- Introduction, Frequency reuse, Channel assignment strategies, Hand off strategies, Interference & system capacity, Improving coverage and capacity in cellular system, Call routing in GSM, GSM frequency allocation and frame structure, Authentication and security.

Unit-III

Mobile Radios Propagation: - Free space model, Ground- reflection model, Knife-edge diffraction model, Okumura model, IN –door propagation models.

Small Scale Fading & Multipath propagation:- Impulse responses model of a multipath channel, Doppler shift Multipath measurements, Parameters of mobile multipath channels, Types of small scale fading, Clark's model for slat fading & Two – ray Rayleigh fading model.

Unit-IV

Multiple Access Techniques for Wireless Communication: - FDMA, TDMA, SDMA, CDMA, Diversity techniques.

Data Transmission: - Wireless technique for data transmission & standards. Bluetooth and wireless LANs.

Text Books/References

1. S. Rappaport Theodore. Wireless Communications: Principles & Practices.
2. C. Y. Lee William. Mobile Cellular Telecomm.
3. Schiller. Mobile Communication. Pearson Education India..

EC 414 RADAR & TELEVISION ENGINEERING

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Radar: Radar Block diagram, frequencies and applications, Radar range equation, Continous wave (CW) & FM radar; Moving target indicator (MTI) : Delay line cancellors, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Concial scan and monopulse radar, Types of display, Radar receivers, Noise figure.

Unit-II

Navigationalaids: Principle of operation of Radar direction finder & range system, LORAN system, DME, TACAN, Aircraft landing systems.

TV Engineering Introduction: Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis.

Unit-III

Transmisson: Monochrome & colour T.V. cameras, Image orthicon, plumbicon, vidicon and CCD camera tubes, Picture, colour and sound carriers. Vestigial side band transmission. Encoding picture information. Chrominance modulation. Compatibility of colour and monochrome T.V. systems. Block diagram of T.V. transmitters. TV transmitting antennas.

Unit-IV

Reception: Types of Monochrome and colour picture tubes, set-up adjustments, Decoding picture information. Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and theri diagnosis T.V. receiving antennas.

Practicals: Based on Theory

Text Books/References

1. M.I.Skolink. 'Introduction to Radar System', Mc-Graw Hill.
2. N.S. Nagaraja. 'Elements of Electronic navigation', Tata Mc-Graw Hill.
3. R.R. Gulati. Monochromic and Colour Television, Wiley Eastem.
4. Dhake. Television Engineering. Tata Mc-Graw Hill.

EC 415 MEDICAL ELECTRONICS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Human Body Subsystems: Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.

Transducers and Electrodes: Principles and classification of transducers for Biomedical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.

Unit-II

Cardiovascular System Measurements: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, plethysmograph, Echocardiograph.

Instrumentation for Clinical Laboratory: Measurement of pH valve of blood, ESR measurement, haemoglobin measurement, O2 and CO2 concentration in blood, GSR measurement.

Unit-III

Measurement of Electrical Activity in Neuromuscular System and Brain: Neuron Potential, muscle potential, brain potentials, electroencephalography. electromyography.

Medical Imaging: Diagnostic X-rays CAT, MRI, theromography ultrasonography, medical ue of isotopes, endoscopy.

Unit-IV

Patient Care, Monitoring and Safety Measures: Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices.

Computer Applications and Biotelemetry: Real time computer application, data acquisition and processing, revote data recording and management.

Therapeutic and Prosthetic Devices: Introduction to cardiac pacemakers, defibrillators, muscile stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser.

Text Books/References

1. J.G. Webster. Medical Instrumentation, Application and Design, John Wiley and sons.
2. B.Jacobson, J.G. Webster. Medical and clinical Engineering, Prentice Hall of India.
3. Cromwell. Biomedical Instrumentation and Measurement, Prentice Hall of India.
4. R.S. Khandpur. Handbook of Biomedical Instrumentation, Tata Mc-Graw Hill.
5. Carr. Introduction to Biomedical Equipment Technology, Pearson Education.

ELECTIVE-I

EC 416 (a) IC TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Introduction to Technologies: Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation-Silicon Shaping, Etching and Polishing, Chemical cleaning.

Unit-II

Diffusion & Ion Implantation: Ficks diffusion Equation in One Dimension Atomic model, Analytic Solution of Ficks law, correction to simple theory, Diffusion in SiO2 lon Implantation and lon Implantation Systems Oxidation. Growth mechanism and Deal-Grove Model of oxidation, Linear, and Parabolic Rate coefficient, the structure of SiO2 Oxidation techniques and system Oxide properties.

Unit-III

Chemical Vapour Deposttion and Layer Growth: CVD for deposition of dielectric and polysilicon- a simple CVD system, Chemical equilibrium and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor, Epitaxy-Vapour Phase Expitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.

Unit-IV

Pattern Transfer: Introduction to photo/optical lithography, Contact/proximity printers, Projection printers, Mask generation, photoresists, Wet etching, Plasma etching, Reaction ion etching.

VLSI Process Integration: Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOSIC Technology, Bipolar IC Technology.

Text Books/References

1. S.M. Sze.VLSI Technology, Tata Mc-Graw Hill.
2. D. Nagchoudhary. Pinciples of Microelectronic Technology, Wheeler Publishing.
3. A Campbell Stephen. The Science and Engineering of Microelectronic Fabrication, Oxford University Press.
4. Hong Xiao. Introduction to Semiconductor Manufacturing, Prentice Hall India.
5. Kang- CMOS circuit design, Tata Mc-Graw Hill.
6. Razoni. Design of CMOS Analog Integrated Circuit.

EC 416 (b) ADVANCE DATA STRUCTURE

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Advanced Trees: Definitions and operations on weight balanced trees (Human trees), 2-3 trees and Red-Black trees. Augmenting Red-Black trees to dynamic order statistics and interval tree applications. Operations on disjoint sets and its Union-Find problem. Implementing sets, discitionerics, priority queues and concatenable queues using 2-3 trees.

Unit-II

Mergeable Heaps: Mergeable Heap operations, bionomial trees, Implementing bionomial heaps and its operations, 2-3-4 trees and 2-3-4 heaps, Structure and potential function of Fobonaccl heap. Omplementing Fibonacci Heap.

Unit-III

Graph Theory Definitions: Definitions of Isomrpl ismrphism, Components, Corciots, Fimda, emta; Corciots, Cut-sets, Cut-Vertices, Planer and dual graphes, Spanning trees, Kuratovskl's two graphs.

Unit-IV

Graph Theoretic Algorethms: Algorithms for connectedness, finding all spanning tress in a weighted graph and planarity testing. Breadth first and depth first search, topological sort, strongly connected components and, articulation point, Single source shortest path and all pair shortest path algorithms. Min-Cut Max-Flow theorem of hetwoek flows, Ford-Fulerson Max Flow algortms.

Text Books/References

1. Narsingh Deo. Graph Theory with Applications to Engineering and Computer Sicience, Prentice Hall of India.
2. Cormen. Introduction to Algorithms, Prentice Hall of India.
3. A.V. Aho, J.E. Hopcrpft and J.D. Ullman. The Design and Analysis of Computer Algorithms, Addition-Wesley.
4. Horwitz and Sawhni. Fundamentals of Data Structures, Galgotia Book source.
5. Wilson. Introduction to Graph Theory, Pearson Education.

EC 416 (c) AUDIO & VIDEO SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Audio Systems: Important types of microphones and speakers, Monophonic, sterephionic and quadraphonic audio systems.

Disc and Magnetic Recording & Reproduction: Monophonic and stereophonic disc recording and reproducing systems, Magnetic recording & playback Biasing & equalisation, Recording medium, Magnetic heads-replay & erase heads, Audio cassettes, Tape speed, Maximum usable frequency, Tape transport mechanism, Distortion & noise aspects, HI-FI stero system.

Unit-II

Video Cassette Recorders: Video recording requirements Video tape formats. Modulation-up conversion and down conversion of video signal, Servo systems, Functional Block diagram of VCR, Vodep doc recprdomg & playback.

Unit-III

Compact Disc Recording & Reproduction: Compact disc advantages, Specifications, CD player optical reuirements, CD technology & manufactruing, CDRO, CD video.

Unit-IV

Video Cameras: Image conversion principle, Plumbicon, Sidicon camera tubes, Three tube colour camera, Block diagram of colour camera tube.

TV Engineering: Scanning process, Interlaced acanning, Composite video signals, Principle of black & white TV colour TV receivers, Primary colours, Chrominance & luminance signals. Colour TV Systems-NTSC, SECAM, PAL, Transmission & reception using PAL systems.

Text Books/References

1. S.P. Bail & R. Bali. Audio Video systems, Khanna Book Publishing Co. Delhi.
2. Ajay Sharma. Audio and Video Systems, Dhanpat Rai & Co.
3. R.G. Gupta. Audio and Video Systems Tata Mc-Graw Hill.

EC 416 (d) ADVANCE MICROPROCESSOR

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

8086/8088 Microprocessor: Hardware specifications, architecture, address spaces, clock generator, bus controller and arbiter, Minimum and maximum mode. System Bus Timing. Assembly language programming, addressing mode and instructions of 8086/8088, linking and execution of programs. MACRO programming, assembler directives and operators.

Unit-II

I/O Interfaces: Serial Communication interfaces DMA and diskette controllers, CRT Controller 8275, A/D, D/A converter interfacing.

Unit-III

Multiprocessor Configurations: 8086/8088 base Multiprocessor systems, 8087 Numeric data processor. 8089 I/O processors.

80386, 80486 Microprocessors: Architecture, Register set, Instruction set and memory management of 80386, 80486 processors.

Unit-IV

Recent Advances in Microprocessor Architecture: Pentium II and III architecture, pipelining, SIMD features, branch handling on-chip cache and buffers, MMX technology.

Text Books/References

1. Dougtas V.Hall. Microprocessors & Interfacing: Programming and Hardware, Tata Mc-Graw Hill.
2. Yu-Cheng Liu, Glenn A.Gibson. Microprocessor systems: The 8086/8088", Prentice Hall of India.
3. A.K. Ray, K.H. Bhurchand. Advanced Microprocessor and Peripherals, Tata Mc-Graw Hill.
4. Barry B. Brey. The Intel Microprocessors: Architecture, Programming & Interfacing, Pearson Education Asia.
5. J.L. Antonalces . The pentium Microprocessors, Pearson.

EC 416 (e) AI & EXPERT SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Introduction to AI Knowledge: Importance of AI. knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI
programming Languages.

Unit-II

Knowledge Representation: Syntax Semantics, Inference Rules, Nondeductive Inference methods, and representation using rules, forward chainging and backward chainin. Fuzzy Logic & Natural languages computations, Probailistic Reasoning, Object Oriented Representations.

Unit-III

Knowledge Organization & Manipulation: Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.

Unit-IV

Knowledge Systems Architecture: Rule based, non-production, uncertainty knowledge system building tools.

Knowledge Acquisition: General concepts, learning by induction.

Text Books/References

1. AI & ES. Dan W.Patterson, Prentice Hall of India.
2. Luger. Artificial Intelligence, Pearson Education.
3. Jockson. Introduction Expert Systems, Pearson Education Rich & Knigh-Artifical Intelligence, Tata Mc-Graw Hill.

FOURTH YEAR B.E. (VIII SEMESTER)

EC 421 COMPUTER NETWORKS & INTERNET TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Introduction: Network structure, network architectures. The OSI reference model, services, standardization, example networks.

The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449. Pulse code modulation. FDM & TDM. Circuit switching. Packet switching. Hybrid switching. Polling. CCITT X.21. Ethernet.

Unit-II

The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols. IEEE standard 802 for LAN.

The Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms.

Unit-III

The Transport Layer: Design Issues. Connection management. Study of Internet and ATM transport layer protocols.

The Upper OSI Layers: The session, presentation and application layers design Issues. Introduction to Cryptography-Private and Public Key Cryptography. Protocol. Introduction to Data Compression.

Unit-IV

Internet Issues: Principles of bridges and routers. The TCP/IP Protocol suite: Overview of TCP/IP. Addressing, Subnetting and network layer protocols. Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.

Text Books/References

1. Andrew S. Tanenbaum. Computer Networks, PHI India.
2. Leon-Garcia,Widjaja. Communication Networks, TMH.
3. Forouzan. Data Communications & Networking, TMH.

EC 422 OPTICAL COMMUNICATION

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Optical Fibers: Basic optical laws and definitions, Principles of light propagation in fibres, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables.

Signal Degradation in Optical Fibers: Attenuation, signal distortion in optical fibers, dispersion-intra modal & inter modal, Dispersion shifted and flattened fiber.

Unit-II

Optical Sources: LED's- Structure, Materials, Characteristics, Modulation, Power and efficiency, Laser Diodes-Basic concepts, Structure, properties and modulation.

Unit-III

Optical Detectors: PIN and avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.

Unit-IV

Optical Fiber Communication Systems: Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Application, Wavelength division multiplexing.

Optical Fiber Measurements: Measurements of Fiber attenuation. Dispersion, refractive index profile, Numerical aperture & diameter.

Practicals: Based on Theory

Text Books/References

1. Gerd Keiser. Optical Fiber Communications, Tata Mc-Graw lHill.
2. J.N. Senior. Optical Fiber Communications, Prentice Hall of India.
3. J.Gowar. Optical Communications system, Prentice hall of India.
4. J.Wilson & Hawkes. Opto Electronics-An Introduction, Prentice Hall of India.
5. Joseph C. Palais. Fiber Optic Communications, LPE, Pearson Education Asia.

EC 423 VHDL PRINCIPLES & APPLICATIONS

Cr. Hrs. 4 (3 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Unit-I

Combinational Circuit Building Blocks: Multiplexer, Decoders, encoders, Code Converters, VHDL Code for Combinational Circuits.

Unit-II

Sequencial Circuits; VHDL code for Flip-Flops. shift registers, Counters.

Unit-III

Synchronous/Asynchronous Sequencial Circuits: Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine.

Unit-IV

Digital System Design: Bulding Block circuits, Memory organization, SRAM, Design examples of divider, Multiplier, Shifting & Sorting Operations, Clock Synchronization. CPU organization and design concepts.

Practicals: Based on Theory

Text Books/References

1. Stephen Brown and Zvonki Vranesic. Fundamentals of Digital Logic circuit VHDL Design, Tata Mc-Graw Hill.
2. Z.Navabi. Analysis and Modeling of Digital Systems, Tata Mc-Graw Hill.
3. D.L.Perry. VHDL 3rd cd., Tata Mc-Graw Hill.
4. Morris Mano. Digital Logic & Computer Design, Prentice Hall of India.

ELECTIVE – II

EC 424 (a) MICROCONTROLLER & EMBEDDED SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

THE 8051 Microcontroller: Introduction, The 8051 microcontroller hardware. I/O pins, Port, External memory. Counters and Timers, Serial data. Interputs.

Unit-II

8051 Assembly Language Programming: Addressing modes, External data moves, push and pop opcides, Logical operations, Byte level and bit level logival operations. Arithmetic operations, Jump and call instructions, Interrupts & returns.

Unit-III

Real World Interfacing: Interfacing of LCD, ADC to 8051.

Introduction to Real Time Operating Systems: Round robin with interrupts, RTOS Architecture, Task and task states, Semaphores and shared data.

Unit-IV

Basic Design Using RTOS: Encapsulating Semaphores and Queues, Saving Memory Space, Saving power.

Text Books/References

1. K.N. Ayala. The 8051 Microcontroller. Penram International.
2. M.A. Mazidi and J.G. Mazidi. The 8051 Microcontroller and Embedded Systems, Pearson Education Asia.
3. David Simon. An Embedded software Primer. Pearson Education Asia.
4. J.W. Valvano Brooks/Cole. Embedded Microcomputer Systems Thomson LearningTM

EC 424 (b) IMAGE PROCESSING & PATTERN RECOGNITION

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Introduction: Imaging in ultraviolet and visible band Fundamental steps in image processing. Components in image processing.

Digital Image Fundamentals: Image perception in eye light and electromagnetic spectrum, Image sensing and acquisition using sensor array. Image sampling and

quantization-Representing digital images, Spatial and gray-level resolution, Aliasing and Moirc patterns, Zooming and Shrinking digital images. relationship between pixels. Camera Model.

Unit-II

Image Enhancement in Spatial Domain: Gray-level transformation- image negatives, log transformation, power-low transformation, Histogram equalization and matching, Smoothing spatial and sharpening filters.

Unit-III

Image Restoration: Image restoration model. Noise Models- Spatial and frequency properties of noise, probability density functions. Noise-only spatial filter-Mean filter, order-statistics filter and adaptive filters. Frequency domain filters-Band reject filters, Band pass filters and Notch filters.

Unit-IV

Image Compression: Compression Fundamental-Coding Redundancey, Intesrpixel redundancy, Psychovisual redundancy and Fidelity criteria. Image Compression models-Source encoder and decoder, Channel encoder and decoder, Lossy compression standards.

Text Books/References

1. C. Gonzalez Rafael. Digital Image Processing, Pearson Edcation Asia.
2. R. Castleman Kenneth. Digital Image Processing, Pearson Education Asia.
3. Nick Effard. Digital Image Processing, Pearson Education Asia.
4. A.K. Jain. Digital Image Processing, Prentice hall of India.
5. Sonka, Hlavac & Boyle. Image Processing. analysis and machine Vision, Thomas Learning.

EC 424 (c) REMOTE SENSING

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Concepts and Fundamentals of Remote Sensing: Introduction, Energy sources and radiation principles, electromagnetic energy, Electromagnetic spectrum, Energy interactions in the atmosphere, Energy interactions with earth surface features, Remote sensing systems, Spectral reflectance curves, Data acquisition and interpretation, Image characteristics, Multispectral scanning system, Thernal scanning, Hyper-spectral scanning systems, reference data, Radar technologies and terrain interactions. Global positioning system. Introduction of microwave sensing.

Unit-II

Earth Resource and Environmental Satellites: Introduction to various sensing platforms, SPOT satellite, Landsat satellite, JERS satellite, Indian remote Sensing Satellites, Geostationary Environmental satellite, Polar orbiting NOAA Environmental satellite, Future satellite systems, Various satellite Radar systems like JERS-1, ERS-1, SIR-A mission, Radarsat, Almaz-1, Seasat.

Unit-III

Introduction to Visual Image Interpretation: Introduction and fundamentals of visual image interpretation. Introduction to Digital Image processing, Image rectification and restoration, Image enhancement Contrast mainpulation, Spatial feature manipulation, Multi miage mainpulation, image classification Supervised and unsupervised classification data merging and GIS integration, Scal effects.

Unit-IV

Introduction to Geographical Information System: Introduction various GIS operation of GIS to water resource, enviornmental impact assessment and urban & regional planning.

Text Books/References

1. Floyd F. Sabins. Remote Sensing Principles and Interpretation.
2. M. Thomas Lillesand & W. Ralph. Remote Sensing and Image Interpreation.
3. C.P. Lo, Albert K.W. Yeung. Concepts and Techniques of Geographic Information Systems. PIII (EEE).
4. Jensen. Remote Sensing of Environment, Pearson Education Asia.

EC 424 (d) NEURAL NETWORKS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Introduction: Biological basis for NN, background and brief history, classification of NN models & Implementations

Back Propagation Model:- topology, Calculations, training.

Unit-II

*Self-organization Model: T*opology, network initialization, training calculations, testing.

Systems considerations:- Various problems, developing a system specifications, various roles of neural networks, NN software, implementation issues.

Unit-III

Development Environment and Hardware Implementations: NN modeling languages, specifying NN models, the transputer, using transputers.

Unit-IV

Performance Metrics & Network Analysis: Percentage correct, average sum-square error, normalized error, network analysis, divide-by three problem, square-within –a square problem, analyzing weights in Trained Networks.

Case Studies: Issues in Radar Signal Processing, optical Character Recognition.

Text Books/References

1. Freeman / Skapura. Neural Networks (Pearson Education India.)

EC 424 (e) MULTIMEDIA SYSTEMS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Unit-I

Media and Data Streams: Medium, Properties of Multimedia, Data stream characteristics of continuous media information units.

Music and Graphics: Audio formats, MIDI, Speech Image format, Graphics format, disthering, computer Image Processing.

Unit-II

Video and Animation: Basic concepts, computer-based Animation, JPEG, MPEG, H.261, DVI, Hybrid coding, CD-ROM Technology. Compact disk digital audio.

Unit-III

Multimedia Operating Systems: Real time, Process management Rate monotonic algorithm, Earliest deadline first algorithm and Multimedia file systems.

Unit-IV

Documents: Hypertext, Hypermedia, MHEG.

Synchronization: Intra and Inter object synchronization. Live and Synthetic synchronization, Lip synchronization requirements, pointer synchronization requirements, Elementary media synchronization.

Text Books/References

1. Ralf Steinmetz & Klara Nahrstedt. Multimedia computing Communication & Application, Pearson Education Asia.
2. K. Andleigh Prabhat. Multimedia System Design, Prentice Hall, Kiran Thau.

9. Any other relevant and important information you want to display on the college website. NO