SCHEME OF INSTRUCTION AND SYLLABI

B.TECH DEGREE IN

ELECTRONICS AND COMMUNICATION ENGINEERING

EFFECTIVE FROM 2010-2011

National Institute of Technology Delhi

(NIT DELHI)

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I – Semester (Effective from 2006-2007)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	MH 101	Mathematics – I	4	0	0	4
2.	PH 101 CY 101	Physics / Chemistry	4	0	0	4
3.	EC 101 EE 101	Elements of Electronics Engineering / Elements of Electrical Engineering	3	0	0	3
4.	ME 101 CE 102	Elements of Mechanical Engineering / Environmental Studies	3	0	0	3
5.	CS 101 CE 101	Problem Solving & Computer Programming / Engineering Mechanics	4	0	0	4
6.	MH 102 ME 102	English for Communication / Engineering Graphics	3/2	0	2/3	4
7.	PH 105 CY 105	Physics Lab / Chemistry Lab	0	0	3	2
8.	CS 102 ME 103	Problem Solving & Computer Programming Lab / Workshop Practice	0	0	3	2
Total			**21/20**	**0**	**8/9**	**26**
9.	EA 101	Extra Academic Activity (mandatory) NSS/ NCC/ Games & Sports	0	0	3	- - -

I B.Tech II – Semester (Effective from 2006-2007)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	MH 151	Mathematics – II	4	0	0	4
2.	CY 101 PH 101	Chemistry / Physics	4	0	0	4
3.	EE 101 EC 101	Elements of Electrical Engineering / Elements of Electronics Engineering	3	0	0	3
4.	CE 102 ME 101	Environmental Studies / Elements of Mechanical Engineering	3	0	0	3
5.	CE 101 CS 101	Engineering Mechanics / Problem Solving & Computer Programming	4	0	0	4
6.	ME 102 MH 102	Engineering Graphics / English for Communication	2/3	0	3/2	4
7.	CY 105 PH 105	Chemistry Lab / Physics Lab	0	0	3	2
8.	ME 103 CS 102	Workshop Practice / Problem Solving & Computer Programming Lab	0	0	3	2
		Total	**20/21**	**0**	**9/8**	**26**
9.	EA 151	Extra Academic Activity (mandatory) NSS/ NCC/ Games & Sports	0	0	3	- - -

II B.Tech I – Semester (Effective from 2007-2008)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 201	Electronic Devices and Circuits-I	4	0	0	4
2.	EC 202	Networks and Transmission Lines	3	0	0	3
3.	EC 203	Switching Theory and Logic Design	3	0	0	3
4.	EC 204	Electronic Devices and Circuits Lab-I	0	0	4	3
5.	MH 202	Signal Transformations	4	0	0	4
6.	EE 211	Network Analysis	4	0	0	4
7.	CS 202	Data Structures	3	0	0	3

8.	CS 204	Data Structures Lab	0	0	3	2
		Total	**21**	**0**	**7**	**26**

II B.Tech., II – Semester (Effective from 2007-2008)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 251	Electronic Devices and Circuits-II	4	0	0	4
2.	EC 252	Signals and Systems	4	0	0	4
3.	EC 253	Electromagnetic Fields and Waves	3	0	0	3
4.	EC 254	Probability Theory and Stochastic Processes	3	0	0	3
5.	EC 255	Electronic Devices and Circuits Lab -II	0	0	4	3
6.	EE 256	Electronic Design Automation Lab -I	0	0	3/2	1
7.	MH	Elective - I (MH 252/253/254)	4	0	0	4
8.	CS	Elective - II (CS 261/262/263)	3	0	3/2	4
		Total	**21**	**0**	**10/8**	**26**

III B.Tech., I – Semester (Effective from 2008-2009)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 301	Pulse Circuits	4	0	0	4
2.	EC 302	Communication Theory	3	0	0	3
3.	EC 303	Linear IC Applications	3	0	0	3
4.	EC 304	Digital IC Applications	3	0	0	3
5.	EC 305	Digital System Design	3	0	0	3
6.	EE 306	Pulse Circuits Lab	0	0	4	3
7.	EC 307	IC Applications Lab	0	0	4	3
8.	EC 308	Digital System Design Lab	0	0	3	2
9.	MH 301	Engineering Economics and Accountancy	3	0	0	3
		Total	**19**	**0**	**11**	**27**

III B.Tech., II – Semester (Effective from 2008-2009)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 351	Digital Communications	3	0	0	3
2.	EC 352	Antennas and Propagation	3	0	0	3
3.	EC 353	Microprocessor Systems	4	0	0	4
4.	EC 354	Computer Architecture and Organization	3	0	0	3
5.	EC 355	Digital Signal Processing	3	0	0	3
6.	EE 356	Electronic Design Automation Lab – II	0	0	3	2
7.	EC 357	Microprocessor System Lab.	0	0	4	3
8.	CS	Elective - III (CS 362/ 364/ 467)	3	0	3/2	4
		Total	**19**	**0**	**9/8**	**25**

IV B.Tech., I – Semester (Effective from 2009-2010)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 401	Electronic Instrumentation	3	0	0	3
2.	EC 402	Radio & TV Engineering	3	0	0	3
3.	EC 403	VLSI Design	3	0	0	3
4.	EC 404	Microwave Engineering	3	0	0	3
5.	EC 405	Computer Networks	3	0	0	3

6.	EE 406	Communication Systems Lab	0	0	3	2
7.	EC 407	Electronic Instrumentation Lab	0	0	3	2
8	EC 449	Project Work	0	0	3	2
9	EC	Elective - IV (EC 411/ 412/ 413/ 414)	3	0	0	3
Total			**21**	**0**	**9**	**24**

IV B.Tech., II – Semester (Effective from 2009-2010)

Sl. No.	Course No.	Course Title	L	T	P	Credits
1.	EC 451	Optical Fiber Communication	3	0	0	3
2.	EC 452	Microwave & Optical Communication Lab	0	0	3	2
3.	EC	Elective - VI (EC 461/ 462/ 463/ 464/465)	3	0	0	3
4	EC 491	Seminar	0	0	3	1
5.	EC 499	Project Work	0	0	6	4
6.	ME 446	Industrial Management	3	0	0	3
Total			**18**	**0**	**12**	**16**

Degree Requirements for B.Tech in Electronics & Communication Engineering

Sl. No.	Category of Courses	Credits offered	Minimum Credits to be Earned
1.	Basic Science Core Courses	(≥ 20) 24	24
2.	Other Engineering Core Courses	(≥ 28) 44	44
3.	Humanities & Social Science Core Courses	(≥ 07) 07	07
4.	Departmental Core Courses	(≥ 75) 93	93
5.	Elective Courses	(≥ 24) 18	12
6.	Departmental Major Project	(=06) 06	06
7.	Mandatory Courses	(=06) 04	04
Total		**(≥166) 196**	**190**

Note: 1) Minimum number of credits through Departmental Electives – **4** credits

2) Minimum number of credits through Open Electives – **3** credits

A) Consolidated list of courses for: B.Tech in Electronics & Communication Engineering

Basic Science Core Courses

MH 101	Mathematics – I	(4-0-0)	4
PH 101	Physics	(4-0-0)	4
CY 101	Chemistry	(4-0-0)	4
PH 105	Physics Lab	(0-0-3)	2
CY 105	Chemistry Lab	(0-0-3)	2
MH 151	Mathematics – II	(4-0-0)	4
MH 202	Signal Transformations	(4-0-0)	4

Engineering Science Core Courses

EC 101	Elements of Electronics Engineering	(3-0-0)	3
EE 101	Elements of Electrical Engineering	(3-0-0)	3
ME 101	Elements of Mechanical Engineering	(3-0-0)	3
ME 102	Engineering Graphics	(2-0-3)	4
ME 103	Workshop Practice	(0-0-3)	2
CS 101	Problem Solving & Computer Programming	(4-0-0)	4
CS 102	Problem Solving & Computer Programming lab	(0-0-3)	2
CE 101	Engineering Mechanics	(4-0-0)	4
EE 211	Network Analysis	(4-0-0)	4
CS 202	Data Structures	(3-0-0)	3
CS 204	Data Structures Lab	(0-0-3)	2
EC 252	Signals and Systems	(4-0-0)	4
EC 253	Electromagnetic Fields and Waves	(3-0-0)	3
ME 446	Industrial Management	(3-0-0)	3

Humanities & Social Science Core Courses

MH 102	English for Communication	(3-0-2)	4
MH 301	Engineering Economics and Accountancy	(3-0-0)	3

Departmental Core Courses

EC 201	Electronic Devices and Circuits-I	(4-0-0)	4
EC 202	Networks and Transmission Lines	(3-0-0)	3
EC 203	Switching Theory and Logic Design	(3-0-0)	3
EC 204	Electronic Devices and Circuits Lab-I	(0-0-4)	3
EC 251	Electronic Devices and Circuits-II	(4-0-0)	4
EC 254	Probability Theory & Stochastic Processes	(3-0-0)	3
EC 255	Electronic Devices and Circuits Lab -II	(0-0-4)	3
EE 256	Electronic Design Automation Lab -I	(0-0-3)	1
EC 301	Pulse Circuits	(4-0-0)	4
EC 302	Communication Theory	(3-0-0)	3
EC 303	Linear IC Applications	(3-0-0)	3
EC 304	Digital IC Applications	(3-0-0)	3
EC 305	Digital System Design	(3-0-0)	3
EE 306	Pulse Circuits Lab	(0-0-4)	3
EC 307	IC Applications Lab	(0-0-4)	3
EC 308	Digital System Design Lab	(0-0-3)	2
EC 351	Digital Communications	(3-0-0)	3
EC 352	Antennas and Propagation	(3-0-0)	3
EC 353	Microprocessor Systems	(4-0-0)	4
EC 354	Computer Architecture & Organization	(3-0-0)	3
EC 355	Digital Signal Processing	(3-0-0)	3
EE 356	Electronic Design Automation Lab – II	(0-0-3)	2
EC 357	Microprocessor System Lab.	(0-0-4)	3
EC 401	Electronic Instrumentation	(3-0-0)	3
EC 402	Radio & TV Engineering	(3-0-0)	3
EC 403	VLSI Design	(3-0-0)	3
EC 404	Microwave Engineering	(3-0-0)	3
EC 405	Computer Networks	(3-0-0)	3
EE 406	Communication Systems Lab	(0-0-3)	2
EC 407	Electronic Instrumentation Lab	(0-0-3)	2
EC 451	Optical Fiber Communication	(3-0-0)	3
EC 452	Microwave & Optical Communs. Lab	(0-0-3)	2

Elective Courses

MH 252	Numerical Techniques and Graph Theory	(4-0-0)	4
MH 253	Linear algebra	(4-0-0)	4
MH 254	Graph Theory	(4-0-0)	4
CS 261	Object Oriented Programming & Operating Systems	(3-0-3/2)	4
CS 262	Advanced Data Structures	(3-0-3/2)	4
CS 263	Object oriented programming	(3-0-3/2)	4
CS 362	Internet Technologies & Programming	(3-0-3/2)	4
CS 364	Web Programming	(3-0-3/2)	4
CS 467	Internet and Web Programming	(3-0-3/2)	4
EC 411	Image Processing	(3-0-0)	3
EC 412	Satellite Communications	(3-0-0)	3
EC 413	Medical Instrumentation	(3-0-0)	3
EC 414	Data Acquisition Systems	(3-0-0)	3
EC 415	Telematics	(3-0-0)	3
EC 416	Digital Control System	(3-0-0)	3
EC 417	DSP Systems & Architectures	(3-0-0)	3
EC 418	Electronic Devices and Circuits – IV	(3-0-0)	3
EC 461	Radar Engineering	(3-0-0)	3
EC 462	Wireless Networks	(3-0-0)	3
EC 463	Power Devices and Applications	(3-0-0)	3
EC 464	VLSI Subsystem Design	(3-0-0)	3
EC 465	Cellular and Mobile Communications	(3-0-0)	3
EC 466	Embedded Systems	(3-0-0)	3
EC 467	RF Devices & Circuits	(3-0-0)	3
EC 468	Nano Electronics	(3-0-0)	3
EC 469	Personal Communication Systems	(3-0-0)	3
EC 470	Advanced Digital Signal Processing	(3-0-0)	3
EC 471	Advanced Microprocessors	(3-0-0)	3
EC 472	VLSI Technology	(3-0-0)	3

Open Elective Courses

EC 480	Fuzzy Logic Systems & Neural Networks	(3-0-0)	3
CE 470	Disaster Mitigation & Management	(3-0-0)	3
EE 468	New Enterprise Creation & Managemen	(3-0-0)	3
ME 466	Alternate Sources of Energy	(3-0-0)	3
MM 463	Surface Engineering	(3-0-0)	3
CS 463	Computer Graphics	(3-0-0)	3
MH 461	Operations Research	(3-0-0)	3

Departmental major project

EC 449	Project Work	(0-0-3)	2
EC 499	Project Work	(0-0-6)	4

Mandatory Courses

CE 102	Environmental Studies	(3-0-0)	3
EC 491	Seminar	(0-0-3)	1

B) List of Courses offered to other Departments:

EC 101	Elements of Electronics Engineering	(EE)	(4-0-0) 4
EC 220	Analog Electronics	(EE)	(4-0-0) 4
EC 221	Analog Electronics Lab	(EE)	(0-0-3) 2
EC 222	Digital Logic Design	(CS)	(4-0-0) 4
EC 223	Electronics Lab	(CS)	(0-0-3) 2
EC 270	Digital Electronics	(EE)	(4-0-0) 4
EC 271	IC Applications	(EE&CS)	(4-0-0) 4
EC 272	IC Applications Lab	(EE&CS)	(0-0-3) 2
EC 275	Electronic Instrumentation and Control Engineering	(ME)	(4-0-0) 4
EC 276	Basic Electronics Lab	(ME&MM)	(0-0-3) 2
EC 278	Applied Electronics	(CH)	(2-0-0) 2
EC 279	Applied Electronics Lab	(CH)	(0-0-3) 2
EC 320	Microprocessors & Interfacing	(CS)	(4-0-0) 4
EC 321	Microprocessors & Interfacing lab	(CS)	(0-0-3) 2
EC 322	Communication Engineering	(EE)	(3-0-0) 3
EC 370	Communication Systems	(CS)	(4-0-0) 4
EC 371	Computer Networks	(EE)	(3-0-0) 3
EC 480	Fuzzy Logic Systems and Neural Networks	Open Elective	(3-0-0) 3

Course No. MH 202 SIGNAL TRANSFORMATIONS Credits: 4

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Matrix theory: elementary row and column operations on a matrix - rank of matrix- caley-hamilton theorem. laplace transformation: laplace transform - inverse laplace transform - properties of laplace transform function - solution of ordinary differential equations. fourier series and fourier transforms: expansion of a function in fourier series for a given range - fourier transformation - sine and cosine transformation, gating functions.partial differential equations: solutions of wave equation, laplace's equation by the method of separation of variables, Z Transform and Inverse Z Transform, properties of ZT, Region of Convergence

Books:

1. Advanced Engineering Mathematics, **KREYSZIG E**, Wiley Eastern.

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Course No. EE 211 NETWORK ANALYSIS Credits: 4

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Circuit elements and relations :types of sources and source transformations. network graphs and analysis: graph of a network, cutset and tieset matrices. time domain analysis: solution of network equations in time domain-classical differential equations approach. applications of laplace transforms in circuit theory: laplace transforms of various signals of excitation-waveform synthesis. steady state analysis of circuits for sinusoidal excitations:1-phase series, parallel, series - parallel circuits - solution of ac networks using mesh and nodal analysis. resonance and locus diagrams: series and parallel resonance - selectivity - bandwidth - q factors. locus diagrams for RL and RC circuits. network theorems and applications: thevenins and nortons theorems; reciprocity theorem, maximum power transfer theorem; their applications in analysis of networks.

Books:

1. Network Analysis, 3/e, **M.E.VAN VALKEN BERG**, Prentice Hall.

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Course No. CS 202 DATA STRUCTURES Credits: 3

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Introduction: complexity expression in different notations. **abstract data types**: lists, stacks and queues. trees: binary trees, binary search trees, introduction to AVL trees. hashing: hash table organization, hash functions, open hashing, closed hashing. priority queues: the model and binary heap. sorting: insertion sort, shell sort, heap sort, merge sort, quick sort and bucket sort methods. graph algorithms: topological sort, shortest path algorithms, network flow problems, minimum spanning trees.

Books:

1. Data Structures and Algorithm Analysis in C++, **MARK ALLEN WEISS**, Pearson, 2000

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Course No. EC 201 ELECTRONIC DEVICES & CIRCUITS-I

Credits: 4 - - - -

Semiconductors: review of band theory of solids. carrier concentrations of N and P type semiconductors. Hall effect and its applications. semiconductor diodes: band structure of P-N junction. volt-ampere

characteristics. zener and avalanche breakdowns. the principles of photo diode, LED & LCD. junction transistor: PNP and NPN junction transistors. characteristics of the current flow across the base regions. transistor biasing: DC bias and various stabilization circuits. thermal runaway & thermal stability. field effect transistors:jfet and its characteristics. MOSFET; enhancement , depletion modes. biasing of FETs. small signal low frequency transistor amplifier circuits: analysis of transistor amplifier circuits using 'h' parameters. RC coupled amplifier, effect of bypass and coupling capacitors on the low frequency response of the amplifier. FET amplifiers - low frequency

and high frequency models. rectifiers: diode as a rectifier, half wave, full wave and bridge rectifiers. electron dynamics: motion of charged particles in electric and magnetic fields. principle of CRT , deflection sensitivity.

Books:

1. Integrated Electronics, **MILLIAN & HALKIAS**, Mc Graw Hill.

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Course No. EC 202 NETWORKS & TRANSMISSION LINES Credits: 3

Networks: image and iterative impedances. Insertion loss. attenuators & pads. lattice network and its parameters. impedance matching networks. filters: low pass, high pass, band pass and band elimination filters. constant K and m derived sections. composite filters. equalisers: inverse impedances. series & shunt equalizers. T & bridged T equalisers. the lattice equalisers. transmission line theory: primary & secondary constants. phase & group velocities. transmission line equations. characteristics of LF lines. RF lines: RF lines, lossless lines, reflection coefficient & VSWR. smith chart. impedance matching with single and double stub.

Books:

1. Transmission Lines and Networks, **JOHNSON**, Mc-Graw Hill, 1950.

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Course No. EC 203 SWITCHING THEORY & LOGIC DESIGN Credits: 4

Introductory digital design concepts: numbersystems, base conversion methods**.** switching algebra and switching functions: boolean algebra, minimisation of boolean functions. combinational logic: principles and practices: logic design of combinational circuits. sequential logic: review of flip-flops, finite state model of sequential circuits, tabulation methods, state assignment and hazards in asynchronous sequential circuits. fault detection: static and dynamic hazards. fault detection methods. logic design: binary addition, subtraction, multiplication & division. digital system design methods: introduction to VHDL: ASM chart notations, development of respective VHDL models.

Books:

1. An engineering approach to digital design, **FLETCHER**, P.H. India.

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Course No. MH 252 NUMERICAL TECHNIQUES & GRAPH THEORY Credits: 4

Numerical Analysis: Curve fitting by the method of least squares. Newton's forward & backward interpolation formulae, Numerical differentiation at the tabulated points with forward backward &central differences, Numerical Integration with Trapezoidal rule, Simpson's 3/8 rule and Romberg integration. Euler's method, Runge-Kutta method of 2^{nd} & 4^{th} orders for solving first order ordinary

differential equations. Graph Theory:Introduction to Queuing Theory: Poisson process and exponential distribution. Poisson queues - Model (M/M/1):(∞/FIFO) and its characteristics.

Books:

1. Fundamentals of Mathematical Statistics, **S.C.GUPTA AND V.K.KAPOOR**

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Course No. CS 261 OBJECT ORIENTED PROGRAMMING & OPERATING SYSTEMS

Credits: 3

Operating systems**:** introduction: early history, buffering and spooling, batch, time-sharing & real time systems. protection.

operating system structure: system components, operating system services, system structure. concurrent processes: process concept. the producer/ consumer problem. the critical section problem. semaphores. deadlocks**:** system model. dead lock characterisation, prevention. recovery from deadlock. file systems: file concept. operations. access methods. directory systems. directory structure organisation. object oriented programming**:** introduction-data hiding and member functions-object creation-adhoc polymorphism-visitation: iterators and containers-inheritance: subtyping and code reuse-parametric polymorphism-exceptions.

Books:

1., Operating Systems Concepts, **A SILBERSCHATZ AND GALVIN,** 4th Edition, Addison Wesley.

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Course No. EC 251 ELECTRONIC DEVICES & CIRCUITS- II Credits: 4

Multistage amplifiers: analysis of multistage amplifier. frequency response of amplifiers: high frequency response of a CE stage, frequency response of cascaded stages, analysis of difference amplifiers. feedback amplifiers: properties of negative feedback amplifiers, general analysis of multistage feedback amplifiers. stability and response of feedback amplifier: effect of feedback on bandwidth, stability, test of stability, compensation, phase margin and gain margin. oscillators: phase shift oscillator, wein bridge oscillators, crystal oscillators. power amplifer: class A, B, & AB power amplifier: push-pull amplifier, efficiency, cross over distortion. tuned amplifier: single tuned and double tuned interstage design. class b and class c tuned power amplifiers.

Books:

1. Integrated Electronics, **J.MILLMAN & HALKIAS**, TMH.

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Course No. EC 252 SIGNALS AND SYSTEMS Credits: 4

Signals & systems: continuous time & discrete time signals, exponential & sinusoidal signals, continuous & discrete time systems. linear time invariant systems: discrete time LTI systems, continuous time LTI systems, properties of LTI systems. fourier series representation of periodic signals: response of LTI systems to complex exponentials, fourier series representation of CT periodic signals. continuous time fourier transform: representation of a periodic signals by continuous FT, FT of periodic signals, time and frequency characterization of signals and systems**:** magnitude and phase representation of FT, magnitude and phase response of LTI systems. discrete time fourier transform & discrete fourier transform: properties

of DTFT and DFT. sampling: sampling theorem, reconstruction of signal from its samples using interpolation**.** z-transform: inverse z transform, properties of ZT, signal flowgraphs: impulse response and transfer function of linear systems, block diagrams, signal flow graphs, basic properties of SFG, & SFG terms.

Books:

1. Signals & Systems- **AV OPPENHEIM, AS WILLSKY, S HAMID NAWAB**, PHI, 2000
2. Signals & Systems- **S HAYKIN**, J Wiley, 2000
3. Signals & Systems- **MJ ROBERTS**, TMH, 2003
4. Signals, Systems and transforms, 3/e, **CL PHILLIPS** et al, Pearson, 2004

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Course No. EC 253 ELECTROMAGNETIC FIELDS AND WAVES
Credits: 4

Static electric field: introduction, the electric dipole and dipole moment, gauss's law, boundary relations, divergence theorem. static magnetic field: magnetic field of current carrying element- biot savart law, magnetic flux & flux density, analogies between electric and magnetic fields. maxwell's equations: the equation of continuity for time varying fields, maxwell's

equations, conditions at a boundary surface. **el**ectromagnetic waves: plane waves: wave equations, plane waves in conducting media, skin effect and surface impedance. poynting vector and the flow of power: poynting theorem, power flow for a plane wave and power loss in a plane conductor. guided waves: waves between parallel planes, te and tm waves, characteristics of te and tm waves, tem waves, attenuation in parallel plane guides. **wave guides**: rectangular wave-guides, te & tm modes in wave-guides, impedance and attenuation in rectangular waveguides.

Books:

1. Electromagnetic waves and Radiating Systems, **E.C.JORDAN & K.G.BALMAIN**, PHI.

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Course No. EC 254 PROBABILITY THEORY & STOCHASTIC PROCESSES Credits: 3

Probability**:** probability through sets, joint and conditional probability , bayes theorem. random variable: definition, distribution function, density function, gaussian uniform, rayleigh distributions. operations on one random variable: expectation, moments, characteristic function, transformations of a random variable. multiple random variables: joint distribution joint density, conditional distribution & density. operations on multiple random variables: joint moments, transformations of multiple random variables. random processes: time averages & ergodicity , auto correlation & cross correlation functions, properties. spectral characteristics of random processes: power density spectrum and it's properties, bandwidth. linear systems with random inputs: random signal response , auto correlation functions of the response, cross correlation functions of input and output, power density spectrum of the response.

Books:

1. Probability, Random Variables & Random Signal Principles, **PZ PEEBLES JR**., MGH, 3/e, 2003
2. Probability, Random Variables & Random Signal Principles, **A PAPOULIS**., MGH, 3/e, 2003
3. Probability, Random Variables & Random Signal Principles, STARK et al, Pearson, 2002

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Course No. EC299 Industrial Training Credits: 2

Course No. EC 301 PULSE CIRCUITS

Credits: 4

Linear and non-linear wave Shaping Circuits, Bootstrap and Miller sweep circuits, principle of current sweeps, Voltage and current controlled negative resistance switching circuits, Applications using Tunnel diode and UJT only, Transistor multi-vibrator and Schmitt trigger circuits, Triggered transistor blocking oscillators- base timing and emitter timing, Astable diode controlled and RC controlled.

Books:

1. Pulse and Digital and Switching Waveforms, **MILLMAN AND TAUB** – TMH, 1995
2. Wave Generation and shaping, **L. STRAUSS**, TMH, 1995.

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Course No. EC 302 COMMUNICATION THEORY

Credits: 3

Communication channels, Transmission of Random Process through an LTI Filter, Noise types, Representation of Narrow Band noise In phase and Quadrature Components, Noise Figure, Noise Bandwidth, Noise Temperature, Linear modulation schemes,

noise in AM receivers, Angle modulation schemes, Noise in FM receiver, Pulse analog and pulse digital modulation schemes, Noise performance, Source Coding Theorem, Information Capacity Theorem,, Huffman Coding.

Books:

1. Communication Systems, **S.HAYKIN**, 4/e, John Wiley & Sons, Singapore, 2001.
2. Modern Digital & Analog Communication Systems, **B.P. LATHI**, 3/e, Oxford University Press, 1998.
3. Communication Systems Engineering, **JG PROAKIS**, Pearson, 2003
4. Principles of Communications, 4/e, **ZIEMER and TRANTER**, Houghton Mifflin, 1995

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Course No. EC 303 LINEAR I.C. APPLICATIONS

Credits: 3

Operational Amplifiers, Linear Applications of OP. Amps, Non Linear Applications OP Amps, Design considerations and applications of 555 Timer IC, 566 VCO IC and 8038 function generator IC, Design considerations and applications of 723 voltage regulator IC, three terminal and Switching regulator ICs, Phase locked loop IC and its typical applications, Active filters., Analogue Multipliers and modulator circuits.

Books:

1. Operational Amplifiers, **G.B. CLAYTON,**
2. Applications of Operational Amplifiers, **G.B. CLAYTON**

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Course No. EC 304 DIGITAL I.C. APPLICATIONS Credits: 3

RTL, DTL, TTL , CMOS logic families, circuit analysis, noise considerations, Multiplexer, comparators, Adders, ALU's Counters, Shift Registers, Combinational PLD's Drivers for LCD and 7 segment displays. ROM, RAM, Static RAM, Dynamic RAM, Principles and implementation schemes of DAC's and ADC's, study of standard ICs

Books:

1. Digital Design Principles & Practices, **JOHN F. WAKERLY**, 3rd Ed.,Pearson Education Asia, 2002.
2. Digital Integrated Electronics, **TAUB AND SCHILLING**, MGH, Singapore, 1994

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Course No. EC 305 DIGITAL SYSTEM DESIGN

Credits: 3

Introduction to fabrication of Integrated active and passive components, Digital System design – top down approach, separation of controller and architecture, refining architecture and control algorithm, Algorithmic state Machines (ASM) ASM Chart notations, HDL Models for building blocks like Adders, ALUs, Encoders, PLA, PAL, timing devices, Building blocks for Digital System Design, Realizing ASMs, Asynchronous inputs and races, Design case studies, Power distribution, noise, cross talk, reflections line drivers and receivers, EDA Tools

Books:

1. The Art of Digital Design, **PROSSER AND WINKLE**, Prentice-Hall, 1996.
2. Hand Outs on EDA tools

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Course No. 351 DIGITAL COMMUNICATIONS

Credits: 3

Basic signal processing operations in Digital communications, Detection of known signals in noise, Correlation receiver, Matched

filter receiver, Estimation, Discrete PAM signals, Nyquist criterion for zero ISI, Adaptive equalizers, Baseband M-ary PAM, Digital modulation formats, M-ary modulation techniques, : Linear block codes, Cyclic codes, Convolutional codes and Trellis codes.

Books:

1. Digital Communications- **S.HAYKIN**, John Wiley & Sons, 1988.
2. Digital Communications**- B.SKLAR**, Pearson Education, 2002
3. Digital Communications- **J.G. PROAKIS**, 4/e, MGH, 2001
4. Digital and Analog Communication Systems, 6/e, **LEON W COUCH**, Pearson, 2001

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Course No. EC 352 ANTENNAS AND PROPAGATION

Credits: 3

Radiation from an alternating current element, Antenna theorems, effective lengths and effective aperture areas of antennas, directivity, gain and field patterns of antennas, Two element array, linear array, multiplication of patterns, effect of earth on vertical patterns, mutual impedance effects, Binomial arrays, Travelling wave radiators, Rhombic antennas, Travelling wave radiators, Rhombic antennas, V.H.F. and UH.F. antennas, Antenna measurements, Propagation of radio waves.

Books:

1) Electromagnetic waves & Radiating Systems, **E.C. JORDAN & K.G. BALMAIN**, PHI, 1986.
2) Transmission and Propagation, **E.V.D. GLAZIER and H.R. LAMONT**, HMSO, 1990.

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Course No. EC 353 MICROPROCESSOR SYSTEMS
Credits: 4

Introduction to 8-bit, 16-bit and 32-bit microprocessors, 80X86 family assembly language programming, 8086 Minimum mode, Timing and Bus cycles, Addressing memory banks and I/O, Timing parameters, Design and testing of a simple 8086 based system, 8086 Interrupts, Interfacing peripheral Ics-8255, 8254, 8251A, 8257, Interfacing Centronics Printer, Keyboard and Displays, 8051 family 8-bit microcontrollers, Architecture, Simple programming, Applications.

Books:

1. Microprocessors and Interfacing, **DOUGLAS V.HALL** ,TMH, 2000.
2. 8051 Micro controller and Embedded systems, **MAZIDI**, Pearson Education, 2002.

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Course No. EC 354 COMPUTER ARCHITECTURE & ORGANISATION
Credits: 3

Computer interconnection structure, Computer memory systems, Modes of I/O data Transfer, I/O channels and Processors, Operating Systems Overview, Scheduling and memory management, Computer arithmetic, Instruction Sets - Machine instruction characteristics, Control Unit Operation, Parallel organisation - Multiprocessing, Vector Computation, Fault tolerant Systems**.**

Books:

1. Computer Organization and Architecture - Principles of structure and function, **W.STALLINGS**, II Ed, Maxwell Macmillan Int. Edition, 2003
2. Computer Architecture and Organization, **J.HAYES**, McGraw Hill Int. Edition.,2001.

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Course No. EC 355 DIGITAL SIGNAL PROCESSING Credits: 3

DFT algorithms, Computation of DFT, Design of FIR filters and IIR filters, Bilinear transformation, Matched z-transform, Digital filter structures, Quantization of filter coefficients, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, TMS 320X/ ADSP 21XX Architectures and Applications.

Books:

1. Digital Signal Processing - Principles, algorithms & Applications, **J.G.PROAKIS & D.G.MANOLAKIS**, PHI, 2000.
2. Digital Signal Processing- **S.K. MITRA**, TMH, 2003
3. DSP Processors and Architectures, **VENKATA RAMANI**, TMH, 2002
4. Handouts on DSP Processors.

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Course No. EC 320 MICROPROCESSORS & INTERFACING
Credits 4

Course No. EC 322 COMMUNICATION SYSTEMS Credits 3

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Course No. EC 401 ELECTRONIC INSTRUMENTATION
Credits: 3

Static and Dynamic Characteristics of instruments . Different Analyzers Analog and Digital Multimeters, Digital Frequency Meter. Impedance Measurement instruments l,Q meter, . Noise and Interference reduction techniques in Measurement Systems.;Study of Different Types of Oscilloscopes, Transducers, Introduction to Data Acquisition Systems, GPIB.

Books:

1. Electronic Measurements and Instrumentation, **OLIVER AND CAGE**, Mc Graw Hill.
2. Electronic Instrumentation & Measurement techniques - **W.D.COOPER & FELBRICK**, PHI, (ch.2 & 7)

Course No. EC 402 RADIO AND T.V. ENGINEERING
Credits: 3

Elements of a Communication Systems, Low Level and High Level AM, AM Detector, SSB Modulator, Synchronous Detector, FM Modulators, FET Phase Modulator, Foster-Seeley FM Discriminator, Ratio Detector, AM Transmitter, FM Transmitter, SSB Transmitter, TRF Radio Receiver, Superheterodyne Receiver, RF Section, Mixer, IF Section, Image Frequency, AGC, SSB Transceiver, Special Features in Communication Receiver. Television Broadcasting, TV Channels, TV Scanning, Indian TV Standards, composite video Signal, H and V Scanning, Synchronization, Blanking Signal, video Signal Frequencies, TV Cameras, RGB Video Signals, Color Matrix, I and Q Signals, Chrominance Modulation, Color Sub-Carrier Frequency, VSB Transmission, FM Sound Signal, Tricolor Picture Tubes, Y Matrix, Functional Blocks of TV Receiver, Video Detector and Amplifier, Sound IF section, Synch Separator, Chroma Section

Books:

1. Communication Electronics: Principles and Applications – **LOUIS E FRENZIL**, **3/e**, MGH., **2001**.
2. Electronic Communication Systems, **GEORGE KENNEDY &BERNARD DAVIS,** TMH**, 4/e**, **2000**.
3. Basic Televison and Video Systems, **BERNARD GROB,** 6/e., MGH, Singapore, **2000.**
4. Electronic Communication Modulation & Transmission, **R.J. SCHOENBECK**, **2/e**, PHI, **1999**.
5. Modern Television Practice, Principles, Technology and Servicing, **R.R. GULATI**, **2/e**., New Age Intl., **2002.**

Course No. EC 403 VLSI DESIGN
Credits: 3

Review of micro electronics and introduction to MOS technology, Introduction to IC technology, MOS technology and VLSI, basic MOS transistor, fabrication of NMOS, CMOS and BiCMOS transistors, thermal aspects of processing and production of E-beam marks MOS AND BICMOS CIRCUIT DESIGN PROCESSORS:

Basic Circuit Concepts: Sealing Of Mos Circuits: Subsystem Design And Layout: Basic Cmos Analog Ic Building Blocks: System Design And Design Methods: Cmos Testing.

Books:

1. Douglas A.Pucknell and Kamran Eshraghian, "Basic VLSI Design", IIIrd Ed., Prentice Hall of India Pvt. Ltd. (Cha
2. Neil H.E.Weste and Kamran Eshraghian,"Principles of CMOS VLSI Design", IInd Ed., Addison Wesley publishing company

Course No. EC 404 MICROWAVE ENGINEERING Credits: 3

Klystron amplifier, reflex Klystron oscillator. Travelling Wave tube amplifier, backward wave oscillator, cavity magnetron and crossed field amplifier, study Of Different Microwave Tubes, Microwave Solid State Devices, Microwave Components, Microwave Circuits, Microwave Measurements, Scattering matrix and its properties, Scattering matrix of transmission lines, three port and four port microwave junctions

Books:

1. Microwave devices and circuits, 3 rd Edn , **S.Y.LIAO**, Prentice Hall of India 1991
2. Microwaves Systems , 2nd Edn, **K.C.GUPTA**, Wiley Eastern Ltd., 1979
3. Microwave technology, **DENNIS RODDY**, PH , 1986

Course No. EC 405 COMPUTER NETWORKS
Credits: 3

Data Communication, Networks, Protocols and Standards, Topology, Categories of Networks, OSI & TCP/IP Protocol suites, Detailed study of Physical layer, Data Link Layer, LANS AND MANS, NETWORK LAYER, TRANSPORT LAYER, APPLICATION LAYER:

Books:

1. Data Communications and Networking, **BEHROUZ A. FOROUZAN**, 3/E, TMH, New Delhi, 2003
2. Computer Networks, **ANDREW S. TANENBAUM,** 4rd Ed., Prentice-Hall of India, New Delhi, 2000
3. Computer Networks and Internet, **DOUGLAS E COMER**, Pearson Education, Asia, 2000
4. Data and Computer Communications,6/e, **W STALINGS**, Pearson, 2002

Course No. EC 411 I M A G E P R O C E S S I N G Credits: 3

Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital Image Processing Systems, Simple

image model, Neighborhood of Pixels, Pixel Connectivity, Labeling of Connected Components, Distance Measures, Arithmetic

and Logic Operations, Image Transformations, Stereo Imaging, image enhancement, Point processing, Intensity Transforms, Histogram Processing, Smoothing and Sharpening Filters, Enhancement in the Frequency Domain, Homomorphic filtering, Pseudo-Coloring, Image Compression Model, Error free Compression, Lossy Predictive Coding, Transform Coding, Detection of Discontinuities, Lines and Edges, Edge Linking, Boundary Detection, Thresholding, Region Growing , Region Splitting, Chain Codes,

Polygonal Approximations, Signatures, Skeleton, Boundary Descriptors, Shape Numbers, Fourier descriptors, Moments, Topological Descriptors, Image Analysis, Pattern and Pattern Classes, Minimum Distance Classifier, Baye's Classifier, Neural Network Training, Structural methods.

Books:

1. Digital Image Processing: **RC GONZALEZ & RE WOODS**, Pearson Education, 2000.
2. Digital Image Processing and Analysis: **B. CHANDA, D. DUTTA MAJUMDER**, PHI, 2000.
3. Fundamentals of Digital Image Processing: **A.K. JAIN**, PHI, New Delhi, 2001.
4. Image Processing, analysis, and machine vision, **M SONKA, V HLAVAC, and R BOYLE**, Thomson ITP, 1999

Course No. EC 412 SATELLITE COMMUNICATIONS

Credits: 3

Overview of satellite System Engineering, Orbital Mechanics, satellite orbit, Lo0k Angles,: Subsatellite point, Azimith and Elevation, orbital perturbation, satellite eclipse, sun transit outage, satellite subsystems, AOCS, TT&C, Power System, Antennas, System noise temperature and G/T ratio, Design of down link, Up link design, satellite modulation, and multiplexing, FM with multiplexed telephone signals, Analog FM SCPC, TDM, multiple access, FDM/FM/FDMA, TDMA-Bits, Symbols, and channels, Frame structure, synchronization, CDMA- Spread spectrum transmission and reception, forward error correction - Convolution codes, Implementation of error detection on satellite links.

Books:

1. Satellite Communication - **PRATT & CW BOSTIAN**, J.Wiley & Sons, NY, 1986.
2. Satellite Communication - **M RICHHARIA**, BS publishers, 2003
3. Satellite Communication - **WL PRITCHARD**, Pearson, 2003

Course No. EC 413 MEDICAL INSTRUMENTATION

Credits: 3

Basics of medical instrumentation,biomedical transducers, biomedical signal measuremet basics, therapeutic and prosthetic devices, cardiovascular measurements:,eeg & emg, medical imaging systems noninvasive instrumentation: Elements of Intensive care monitoring heart-rate monitors; Arrhythmia monitors, EEG & EMG, Bioelectric Potentials from Brain, Clinical EEG, Electromyography, Radiography, MRI, Computed Tomography, Ultrasonography, Temperature Measurements, Ultrosonic Measurements and applications, Introduction to Biotelemetry, Physiological parameters, Biotelemetry System Components, Implantable units and Applications of Telemetry in Patient Care.**Books:**

Books:

1. Principles of Biomedical Instrumentation**, L.A.GEDDES AND WILEY**, L.E.Baker (2nd Ed.)
2. Biomedical Instrumentation and Measurements, **L.CROMWELL**, Prentice Hall.

Course No. EC 414 DATA ACQUISITION SYSTEMS

Credits: 3

Acquisition systems – configurations – components – analog multiplexers and sample and hold circuits – specifications and design considerations. Digital data acquisition systems and analog Data Acquisition systems – specifications – characteristics monolithic / hybrid DAS –error budget of DAS and ADAS:

Books :

1. Users Handbook of D/A and A/D Converters- **E.R. HNATEK**
2. Data Converters - **G.B. CLAYTON**

Course No. EC 415 TELEMATICS
Credits: 3

Basic telephone system, Telephone exchange, Telephone network - structures, services, standards, trunking, message, circuit and packet Switching, electronic switching, Digital Switching, space switches, Time switches, hybrid switching, time division switching networks, single stage, two stage, three stage and four stage networks, non blocking networks, Functions of control unit, call processing functions, common control, SPC control software, Telephone circuit, electronic telephone, Feature phone, speaker phone, ISDN phone, key telephone system, PBX, PC answering machine, 2 wire , 4 wire circuits, echoes, digital transmission, PCM – TDM, trans-multiplexer, synchronous digital hierarchy, Customer line signaling, PCM signaling, Common Channel signaling, CCITT signaling system No.7, ISDN- rates, channels and user interfaces, Applications, broadband networks, SONET rates and benefits, optical components, SONET/SDH network topology and hierarchy, broadband services and rates, path, line and section, STS-1 frame structure, floating frames, overhead.

Books:

1. Telecommunications switching, Traffic and Networks.– **JE FLOOD**, Pearson Education, 2002.
2. ISDN and B-ISDN**, W. STALLINGS, 3/e, PHI, 1995**.
3. Introduction to Telecommunications: Voice, data & Internet, **MARION COLE**, Pearson, 2002.
4. Digital Telephony, **J BELLAMY**, 2nd edition, John Wiley, 2001.

Course No. EC 416 DIGITAL CONTROL SYSTEMS
Credits: 3

State Equations and State Transition Equations of Continuous and Digital Systems , Solution of the Time – Invariant Discrete State Equation by the Z – Transformation, Relation Between State Equation and Transfer Function, state Diagram, stability of digital control systems: Comparison of Time Responses of Continuous – Data and Digital Control Systems, Correlation between time response and Root Locations in the S-Plane and the Z-Plane, Effect of the pole – Zero configurations in the Z-plane Upon the Maximum Overshoot and peak time of transient Response of Sampled – Data Systems, Root Loci for Digital Control Systems. Steady State Error Analysis or Digital Control Systems, Nyquist plot, Bode diagram , Gain margin and Phase Margin, Gain – phase diagram and Nichols Chart, Digital Controller, Design of Digital Control Systems with Digital Controllers through the Bilinear transformation, Root Locus diagram, Digital PID Controller, Design of Digital Control systems with deadbeat response.

Books:

1. Digital Control Systems, **BENJAMIN C.KUO** Holt, Rinehart and Winston, Inc, 1980.
2. Digital Control Systems, **M.GOPAL**, New Age. Int., 1992.

Course No. EC 417 DSP SYSTEMS & ARCHITECTURES
Credits: 3

Programmable DSP architectures, multiport memory, Special addressing modes, on chip peripherals, Architecture of TMS 320

C5X, Bus structure, programme controller, CALU, IDEX, ARCER, ALU, BMAR, onchip memory, TMS320C5X Assembly language, Instruction pipelining in C5X, Applications programs in C5X, Least Square methods for system modeling and filter design, Signal analysis with higher order spectra, Adaptive transversal filters

Books:

1. DSP Architectures and Algorithms- **B. VENKATRAMANI and M. BHASKAR**, TMH, 2002
2. Algorithms for Statistical Signal Processing- **JG PROAKIS** et al, Pearson, 2002
3. Algorithms for Comm. Systems & Applications - **N. BENVENUTO and G. CHERUBINI,** John Wily, 2005.
4. Advanced Signal processing Hand book - **S. STERCVOPOULOS,** CRC Press, 2001
5. Signal Processing, The Model based approach – **JANES V.CANDY**, McGraw-Hill, 1987.

Course No. EC 451 OPTICAL FIBER COMMUNICATIONS
Credits: 3

Overview Of Optical Fiber Communications Optical Fibers,: Signal Degradation In Optical Fibers: Optical Sources: Leds, Laser Diodes : Structure, Materials And Modulation. Optical Coupling: Photodetectors: - Physical Principles, Photo Detector Noise, Detector Response Time, Photodiode Materials. Optical Receiver: Transmission Link Analysis:

Books:

1. Optical Fiber Communications, **G.KEISER** , 3/e, MGH, 1998.
2. Fiber Optic Communication, **MYANBUE**V, Pearson, 2001
3. Fiber Optic Communication, **AGRAWAL**, John Wiley, 2002
4. Fiber Optic Communication, **PC GUPTA**, PHI, 2000

Course No. EC 461 RADAR ENGINEERING
Credits: 3

Radar and Radar Equation: Introduction, Radar block diagram and operation, frequencies, applications, CW Radar – Doppler Effect, , FM – CW radar, Pulse Radar Tracking Radar Phased Arrays – Navigational Aids: Direction Finder, VOR, ILS, Loran

Books:

1. Introduction Radar Systems,- **M.I. SKOLNIK**, 2/e, Mc Graw Hill Book Co.,1981
2. Radio Engineering- **F.E. Terman,** Mc Graw Hill Book Co. (for Chapter 7 only) , 4/e, 1955

Course No. EC 462 WIRELESS NETWORKS
Credits: 3

Wireless communication principles, 1G cellular systems-AMPS, 2G cellular systems- DAMPS, CDMA, GSM, CDPD, GPRS, 3G cellular systems- service classes and standards, IMT 2000, future 4G systems-OFDM and services, fixed wireless access- WLL, IEEE 802.16 standards, WLAN- concepts, applications, topology, physical and MAC layers, IEEE 802.11a,b and g, wireless ATM and Adhoc routing- HIPERLAN, Personal area networks(PAN)- Bluetooth and Home RF, wireless geolocation systems, E-911 services, cordless telephony and PCS, Wireless application Protocol (WAP), wireless enterprise networks

Books:

1. Wireless networks- **R NICOPOLITIDIS** et al, John Wiley 2003

2. Wireless networks- **PAHLAVAN, P KRISHNA MURTHY**, PHI, 2003.
3. Wireless and mobile network architectures- **YB LIN & I CHLAMTAC**, John Wiley 2001
4. Cellular and mobile Communication Systems, **WCY LEE**, MGH, 2004

Course No. EC 463 POWER DEVICES AND APPLICATIONS
Credits: 3

Course No. EC 464 VLSI SUB SYSTEM DESIGN
Credits: 3

Review of Combinational Logic Gates in CMOS: Designing Sequential Logic Circuits: Implementation Strategies for Digital ICs: Coping with Interconnect**:** Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics,Advanced Interconnect Techniques, Perspective: Networks–on–a–Chip.Timing Issues in Digital Circuits: **-**Designing of Arithmetic Building Blocks: Designing memory and Array structures:

Books:
1. Digital Integrated Circuits - **JAN M RABAEY, A. CHANDRAKASAN, B. NIKOLIC** , Pearson, 2002

Course No. EC 465 CELLULAR AND MOBILE COMMUNICATIONS
Credits: 3

A Basic Cellular System, Why Cellular Mobile Telephone Systems, Service Quality, Mobile Radio Transmission Medium, Mobile Fading, Delay Spread And Coherence Bandwidth, Operation Of Cellular Systems, Hexagonal Shaped Cells, Analog And Digital Cellular Systems.Elements Of Cellular Mobile Radio System Design: Ell Coverage For Signal And Traffic: Cell Site And Mobile Antennas **:** Cochannel Interference (Cci) Reduction : Frequency Management And Channel Assignement : Hands Offs And Cell Splitting : Digital Cellular Networks :

Books:
1. Mobile Cellular Telecommunications: **WILLIAM C Y LEE**, MGH, 2004
2. Wireless Communications : Principles and practice, 2/e., **T. S. RAPPAPORT**, Pearson Education Asia, 2002.
3. Mobile Radio Communication, 2/e, **R STEELE**, John Wiley, 1999
4. Wireless Communication and Networking, **JW MARK and W ZHUANG**, PHI, 2005.

Course No. EC 466 EMBEDDED SYSTEMS Credits: 3

Course No. EC 467 R.F. DEVICES AND CIRCUITS
Credits: 3

Introduction to RF and wireless technology**,** complexity comparison, design bottle necks, applications, analog and digital systems, basic concepts in RF design**,** nonlinearity and time variance, ISI, random process and noise, sensitivity and dynamic range, passive impedance transformation, multiple access techniques and wireless standards, mobile RF communication, FDMA, TDMA, CDMA, wireless standards, transceiver architectures, general considerations, receiver architecture, transmitter architectures, transceiver performance tests, case studies, amplifiers, mixers and oscillators, LNAs, down conversion

mixers, cascaded stages, oscillators, frequency synthesizers, power amplifiers, linear and nonlinear power amplifiers, high frequency power amplifiers, large signal impedance matching,

Books:

1. RF Microelectronics", **Behzad Razavi ,** Prentice Hall , 2001.
2. The Design of CMOS Radio Frequency Integrated Circuits, **Thomas H. Lee**, Cambridge Univ. Press.

Course No. EC 468 NANO ELECTRONICS
Credits: 3

Course No. EC 469 PERSONAL COMMUNICATION SYSTEMS
Credits: 3

Introduction to Personal communication Systems(PCS), New wireless technology, PCS, Unlicensed PCS (UPCS)devices, UPCS applications, LANs using UPCS band, cellular spectrum efficiency, micro cell design in PCS environment, Adaptive mobile network, WLAN technology and standardization, future cellular speech encoding, antennas and power for mobile PCS system, multiband mobile antennas, PCS channel propagation in maritime environments, satellite based mobile communication systems, LEO systems, LEO signal processing design for TELSTAR I satellite, mobile cellular CDMA application and implementation, CDMA in mobile satellite service,

Books:

1. Personal Communications Systems Applications: **FRED J RICCI**, Prentice Hall PTR, 1997
2. Mobile Satellite Communication Networks – **RE SHERIFF, YF HU,** John Wiley, 2001
3. Wireless and Cellular telecommunications, 3/e, **WILLIAM CY LEE**, MGH, 2006

Course No. EC 470 ADVANCED DIGITAL SIGNAL PROCESSING
Credits: 3

Linear Prediction and Optimum linear filters:,Power spectrum estimation: Adaptive Filter theory: Discrete cosine transforms (DCTs), Discrete sine transforms (DSTs), KL transforms, Hadamard transforms, Walsh transforms and Wave let transforms. Applications of DCTs and Wavelets.

Books:

1. DSP – Principles, Algorithms and Applications -- **JG PROAKIS, DG MANOLAKIS**, 3/e, PHI., 2001.
2. Adaptive Filter Theory – **S.HAYKIN**, 2nd Edition, PRENTICE HALL. 2001
3. Signal Processing, The Model based approach – **JANES V.CANDY**, McGraw-Hill Book Company, 1987.

Course No. EC 471 ADVANCED MICROPROCESSORS
Credits: 3

Course No. EC 472 VLSI TECHNOLOGY
Credits: 3

Crystal structure, crystal growth and vapour phase epitaxy. Unit processes for VLSI-Oxidation, Photolithography, diffusion and ion implantation. Deposition of metal and dielectric films by vacum evaporation, sputtering and CVD techniques, Wet chemical and dry etching techniques. Device and Circuit fabrication-Isolation, Self alignment and local oxidation techniques. MOS based silicon ICs-NMOS and CMOS ICs, Memory Devices, SOI Devices, BJT based ICs- choice of transistor types, PNP transistors, advanced structures, Bipolar – CMOS (BICMOS) ICs, Resistors, Capacitors.

Books:

1. VLSI Fabrication Principles, **S.K.GANDHI** , John Wiley and Sons, NY, 1994
2. VLSI Technology, **S.M.SZE**, McGraw-Hill Book Company, NY, 1988.
3. Principles of Microelectronics Technology, **D. NAGCHOUDHURI**, Wheeler (India), 1998.

Course No. CE 470 DISASTER MITIGATION AND MANAGEMENT
Credits: 3

Natural and human-induced disasters - Disaster Classification and Statistics – Disaster Management – Prevention, preparedness and relief, rehabilitation and reconstruction – hazard vulnerability and Risk Mapping - International Decade of Natural Disaster Management – Need for the study. Remote Sensing and GIS applications in natural disaster management Post disaster management – concept of risk – relief operations – community education and involvement

Books:

1. Environmental Risks and Hazards, **CUTTER S.L**.,(Prentice Hall of India, N.Delhi, 1999)
2. Remote Sensing of Environment, **LINTZ J JR AND D.S. SIMONETT** , Addison Wesley, . (1976)

Course No. EE 468 NEW ENTERPRISE CREATION & MANAGEMENT
Credits: 3

Entrepreneur And Entrepreneurship Establishing The Small Scale Enterprise: Operating The Small Scale Industry: : Management Performance Assessment And Control; Strategies For Stabilisation And Growth; Managing Family Enterprises.

Books:

1. Entrepreneurial Development: Principles, Policies and Programmers, ESS Pec Key Publishing House, 1989 – P. **SARAVANAVEL.**

Course No. ME 466 ALTERNATE SOURCES OF ENERGY
Credits: 3

1. ALTERNATE SOURCES OF ENERGY:
Introduction, problems associated with fossil fuel based energy options, need for alternate sources of energy, present energy scenario, renewable energy sources. SOLAR ENERGY: WIND ENERGY: HYDROGEN ENERGY: OTHER SOURCES:

Books:

1. Solar Energy – Thermal Collection and Storage, **S. P. SUKHATME** , Tata- McGraw Hill, New Delhi, 1984 –
2. Non-conventional Energy Sources, **G. D. RAI** , Khanna Publishers, New Delhi, 1999 –

Course No. EC 480 FUZZY LOGIC SYSTEMS AND NEURAL NET WORKS
Credits: 3

Background And History; Knowledge-Based Information Processing; Neural Information Processing; Hybrid Intelligence.Basic Neural Computational Models: Learning: Knowledge Based Neural Networks: Incremental Learning: Principles; Symbolic Methods; Neural Network Approaches (Probabilistic Nn's); Incremental Rbcn.Nn Applications: Fuzziness Vs Probability: Fuzzy Associative Memories: Comparison Of Fuzzy & Neural Systems: Case Studies.

Books:

1. Neural Networks in Computer Intelligence, **LIMIN FU**, McGraw Hill Co., 1994.
2. Neural Networks & Fuzzy systems, B.KOSKO, Prentice Hall (India) Ltd., 1992. Chapters: 7, 8, 9, 10, 11

Course No. MM 463 SURFACE ENGINEERING
Credits: 3

Scope, concept and significance of surface engineering, development of the technology of surface improvement in structural materials, geometrical, mechanical and physico- chemical concept of the surface, surface energy and surface phenomena.Coatings and evaluation of coatings. Techniques for producing surface layers: Process fundamentals and applications of newest techniques of producing surface layers:

Books:

1. Surface Engineering of Metals – Principles, Equipment, Technologies, CRC Press, 1999 – T. Burakowski and Wierzchon.
2. Surface Engineering for wear Resistance, Prentice Hall, New Jersey, 1998 - K. G. Budinski.

Course No. CS 463 COMPUTER GRAPHICS
Credits: 3

Course No. MH 461 OPERATIONS RESEARCH
Credits: 3

Course No. ME 446 INDUSTRIAL MANAGEMENT
Credits: 3

General Management, marketing Management: Productivity And Work Study: Quality Management: Inventory Management**:** Project Management:

Books:

1) Donald J Clough. "Concepts in Management Science", Prentice Hall of India.
2) Philip Kotler, "Marketing Management", Prentice Hall of India, New Delhi, 2000