Electronics & Communication Engg Old

SECOND YEAR FIRST SEMESTER

A. Theory							
Sl. No.	**Code**	**Subject**	**Contacts Periods/Week**				**Credits**
			L	**T**	**P**	**Total**	
1.	M 302	Mathematics	3	1	--	4	4
2.	EE 301	Circuit Theory & Networks	3	1	--	4	4
3.	EC 301	Solid State Devices & Circuit	3	0	--	3	3
4.	CS 302	Data Structure & Algorithms	3	1	--	4	4
5.	CS 312	Numerical Methods &	3	0	--	3	3
6.	EE 302	Programming Electrical and Electronic Measurement	3	1	--	4	4
Total Theory						**22**	**22**
B. Practicals							
	EE391	Circuit & Network Lab	--	--	3	3	2
	M(CS)382	Numerical Methods &	--	--	3	3	2
		Programming Lab	--	--	3	3	2
	EE392	Electrical and Electronic Measurement Lab	--	--	3	3	2
	CS392	Data Structure Lab					
Total Practical						**12**	**6**
Total of Semester						**34**	**30**

Electronics & Communication Engg Old

Second Year Second Semester

A.THEORY:

A. Theory							
	Code	**Theory**	**Contacts Periods/Week**				**Credits**
			L	**T**	**P**	**Total**	
	EC 401	Analog Electronic Circuits	3	0	0	3	3
	EC 402	Digital Electronics & Integrated Circuits	3	1	0	4	4
	CS 404	Computer Organization & Architecture	3	0	0	3	3
	EC 403	Analog Communication	3	0	0	3	3
	EI 402	Electronic measurements & Instrumentation		0	0	3	3
Total Theory						**16**	**16**

B. PRACTICAL:

B. Practicals							
	Code	**Practicals**	**Contacts Periods/Week**				Credits
			L	**T**	**P**	**Total**	
	EC 491	Analog Electronic Circuits Lab	0	0	3	3	2
	EC 492	Digital Electronics & Integrated Circuits Lab	0	0	3	3	2
	EC 493	Analog Communication Lab	0	0	3	3	2
	EI 492	Electronic Measurements & Instrumentation Lab	0	0	3	3	2
Total Practical						**12**	**8**

C. SESSIONAL:

HU 481	Technical Report writing & / Language Practice Lab	0	0	0	3	2
	TOTAL OF SESSIONAL				3	2
	TOTAL of Semester :				**31**	**26**

Third Year First Semester

THEORY

SL NO.	CODE	THEORY	CONTACT PERIODS PER WEEK			TOTAL	CREDITS
			L	T	P		
1	EC 501	Line Communication System	3	0	0	3	3
2	EC 502	EM Theory, Propagation & antenna	3	1	0	4	4
3	EC 503	Audio & Video Engineering	3	0	0	3	3
4	EC 513	Linear & Digital Control Systems	3	1	0	4	4
5	EI 502	Microprocessor & Microcontroller	3	1	0	4	4
		TOTAL THEORY				**18**	**18**

PRATICAL

SL NO.	CODE	PRACTICAL	CONTACT PERIODS PER WEEK			TOTAL	CREDITS
			L	T	P		
1	EC 592	Propagation & Antenna Lab	0	0	3	3	2
2	EC 593	Audio & Video Engg. Lab	0	0	3	3	2
3	EC 583	Linear & Digital Control System Lab	0	0	3	3	2
4	EI 592	Microprocessor &	0	0	3	3	2

		Micro controller Lab					
		Total Practical				**12**	**8**

Total of Semester: **30 26**

C. SESSIONALS							
				0	0	0	0
Total of Sessionals						**0**	**0**
Total of Semester -						**30**	**26**

Third Year Second Semester

A. Theory						
Code	**Theory**	**L**	**T**	**P**	**Total**	**Credits**
HU 601	Industrial Management	3	0	0	3	3
EC 601	Optoelectronic Devices & Circuits	3	1	0	4	4
EC 602	RF & Microwave Engineering.	3	1	0	4	4
EC 603	Digital Communication Systems	3	1	0	4	4
EC 604	Microelectronic Technology and Circuits	3	1	0	4	4
Total of Theory					**19**	**19**

B. Practical						
Code	**Practicals**	**L**	**T**	**P**	**Total**	**Credits**
EC 692	Microwave Engineering. Lab	0	0	2	2	2
EC 693	Digital Comm. Systems Lab	0	0	2	2	2
Total of Practicals					**4**	**4**

C. Sessional						
Code	**Sessionals**	**L**	**T**	**P**	**Total**	**Credits**
EC 683	Electronic Design Lab	0	0	5	5	4
EC 682	Group Discussion & Seminar	0	0	3	3	2
	Total of Sessionals				**8**	**6**
Total of Semester					**31**	**29**

6 –Week Industrial Training during Summer Vacation

Electronics & Communication Engg Old

FOURTH YEAR FIRST SEMESTER – 7th

A. Theories							
Sl. No.	Code	Subject	Contacts Periods/Week			Total	Credit
			L	T	P		
1	EC701	Digital Signal Processing	3	1	0	4	4
2	EC702	VLSI Design	3	1	0	4	4
3	EC703	System Programming & Operating Systems	3	1	0	4	4
4	EC 704	Elective-I	3	1	0	4	4
		Total of theory				**16**	**16**

B. Practicals							
Sl. No.	Code	Subject	Contacts Periods/Week			Total	Credit
			L	T	P		
1	EC791	Digital Signal Processing Lab	0	0	3	3	2
2	EC792	VLSI Design Lab	0	0	3	3	2
		Total of practical				**6**	**4**

C. Sessionals							
Sl. No.	Code	Subject	Contacts Periods/Week			Total	Credit
			L	T	P		
1	EC793	Project-I	0	0	3	3	2
2	EC794	Group discussion	0	0	3	3	4
		Total of sessionals				**6**	**6**
		Total credit of semester					**26**

Elective-I		
	Code	Subject
1	EC704A	Advanced Antenna Engineering
2	EC704B	Advanced Semiconductor
3	EC704C	Advanced Mathematics for Electronic Engineering
4	EC704D	Computer Communication & Networking
5	EC704E	Object Orient Programming
6	EC704F	Data Base Management Systems
7	EC704G	□□□□□□Techniques & Management

8	EC704H	Process Control Engineering
9	EC704I	Industrial Electronics
10	EC704J	Numerical Techniques for RF Systems
11	EC704K	Pattern Recognition & Machine Intelligence
12	EC704L	Computer Vision

FOURTH YEAR SECOND SEMESTER – 8th

A. Theories							
Sl. No.	**Code**	**Subject**	**Contacts Periods/Week**			**Total**	**Credit**
			L	**T**	**P**		
1	EC801	Values of Ethics of Profession	3	0	0	3	3
2	EC 802	Optical Fibre Communication	3	1	0	4	4
3	EC 803	Wireless Communication	3	1	0	4	4
4	EC804	Elective – II	3	1	0	4	4
		Total of theory				**15**	**15**

C. Sessionals							
Sl. No.	**Code**	**Subject**	**Contacts Periods/Week**			**Total**	**Credit**
			L	**T**	**P**		
1	EC891	Advanced Communication Lab	0	0	3	3	2
2	EC892	Project-II	0	0	3	3	4
3	EC893	Grand Viva					4
4	EC894	Seminar-II			3	3	4
		Total of sessionals				**9**	**14**
		Total credit of semester					**29**

Elective-II		
	Code	**Subject**
1	EC804A	Fibre Optic Metrology
2	EC804B	RF & Microwave Network
3	EC804C	Modern Control Systems
4	EC804D	Software Engineering
5	EC804E	CAD VLSI
6	EC804F	Coding Theory & Cryptography
7	EC804G	Biomedical Electronics
8	EC804H	Data-Communication Systems
9	EC804I	Internet Technology
10	EC804J	Distributing Computing

11	EC804K	Digital Image Processing

Third Semester

Mathematics
Code : M 302
Contacts : 3L + 1T
Credits: 4

Fourier Series, Integrals and Transforms :

Properties, Inverse, Fourier Transform of Derivative, Convolution, use of Fourier Series and Transforms in solving Partial Differential Equations.

Partial Differential Equations :

Boundary and Initial Conditions, Solution of Laplace's and Heat Conduction Equations
Complex Analysis :

Functions, Limits and Continuity, Analytic Functions, Cauchy Riemann Conditions, Analytic Continuation, Complex Integration and Cauchy's Theorem, Cauchy's Integral Formula, Taylor's and Laurent Series, Reside Theorem and it's application to evaluation of integral, Introduction to Conformal Mapping.

Probability and Statistics :

Mean, Median, Mode, Standard Deviation, Moments, Skewness, Kurtosis. Definition of Laws of Probability, Conditional probability, Multiplication, Independence of Events, Bayes' Rule, Sample Space, Random Variable, Discrete and Continuous Probability Distributions - Cumulative Distribution Functions-Mathematics Expectancy, Standard Probability Models - Binomial, Poisson, Normal, Sampling and its Distribution, Correlation and Regression, Method of Least Square - Fittings.

Graph Thoery :

Graphs, Digraphs, Isomorphism, Walks, Paths, Circuits, Shortest Path Problem, Dijkstra's Algorithm, Trees, Properties of Trees, Cotrees and Fundamental Circuits, Shortest Spanning Trees - Kruskal's Algorithm, Cut Sets, Fundamental Cut Sets and Cut Vertices, Planar and Dual Graphs, Metric Representation of Graphs, Networks, Flow Augmenting Path, Ford-Fulkerson Algorithm for Maximum Flow.

Text Books :

1. Gupta S . C and Kapoor V K : Fundamentals of Mathematical Statistics - Sultan Chand & Sons.
2. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.
3. Spiegel M R : Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.
4. Veerarajan :Probability &statistics 2/e TMH
5. Goon A. M., Gupta M K and Dasgupta B: An Outline of Statistical Theory- Vol.I - The World Press Pvt. Ltd.
6. Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt. Ltd.
7. Spiegel M R : Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill Book Co.
8. Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.
9. Ross S L : Differential Equations - John Willey & Sons.
10. Sneddon I. N. : Elements of Partial Differential Equations - McGraw Hill Book Co.
11. West D.B. : Introduction to Graph Theory - Prentice Hall
12. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.
13. Grewal B S : Higher Engineering Mathematics (thirtyfifth edn) - Khanna Pub.
14. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.
15. Discrete Structure And Graph Theory.- Rathor / Chaudhuri,EPH.
16. Jana- Undergraduate Engg. Math,Vikas
17. Lakshminarayan- Engg. Mathematics 1,2,3 ,Vikas
18. Gupta- Matehmatical Physics ,Vikas
19. Subir Das- Key to Differential Equations (EPH)

Circuit Theory & Networks
Code: EE 301
Contact: 3L + IT
Credit: 4

Different types of systems & networks: continuous & Discrete, Fixed and Time varying, Linear and Non-linear, Lumped and distributed, Passive & Active Networks & Systems
Laplace transform of impulse and sinusoidal steps waveforms for RL, RC, LC and RLC Circuits. Transient analysis of different electrical circuits with and without initial conditions, Fourier Series and Fourier Transform
Network theorems and their applications in circuit analysis, Formulation of network equations, Source transformations, Loop variable analysis and node variable analysis

Graph of network, concept of tree branch, tree link. Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials
Two port networks, Open circuit Impedance and Short circuit Admittance parameters, Transmission parameters, hybrid parameters, and their inter-relations
Indefinite admittance matrix- their applications to the analysis of active network
Active filter analysis and synthesis using operational amplifier

SPICE: How SPICE works. Model statement, models for passive and active device, D.C. circuits analysis, small signal analysis, capacitors and inductors in D.C. Circuits, steady state and transient, plotting and printing, input and output Impedance, D.C. sensitivity analysis, harmonic decomposition (Fourier Series), Harmonic re-composition, voltage controlled components

Text books **:**

1. Sudhakar:Circuits & Networks:Analysis & Synthesis 2/e TMH New Delhi
2. Valkenburg M. E. Van, "Network Analysis", Prentice Hall.
3. Engineering circuit analysis with PSPICE and probe-Roger
4. Engg Circuit Analysis,: Hayt 6/e Tata Mcgraw-Hill
5. A. Chakravarty: Networks, Filters & Transmission Lines
6. D.Chattopadhyay and P.C.Rakshit: Electrical Circuits
7. A.V. Oppenheimer and A.S.Wilsky: Signals & Systems, PHI
8. R.V.Jalgaonkar.: Network Analysis & Synthasis.EPH.
9 . Sivandam- Electric Circuits and Analysis, Vikas
10. V.K. Chandna, A Text Book of Network Theory & Circuit Analysis, Cyber Tech

References **:**

1.Reza F. M. and Seely S., "Modern Network Analysis", Mc.Graw Hill Book Company
2.Roy Choudhury D., "Networks and Systems", New Age International Publishers.
3.Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.

Solid State Devices & Circuits
Code: EC 301

Electronics & Communication Engg Old

Contacts: 3L
Credits: 3

Transport phenomena in solids – drift and diffusion. Properties of p-n and metal semiconductor junctions, rectifier and detector diodes, photovoltic effect-solar cells, zener and tunnel diodes
Varactor gunn and impatt diodes, Bipolar transistor – physical mechanism, current gain, punch-through and avalanche effect
High voltage and high power transistors
Field effect transistors –JFETS and IJFETS. MOS-capacitors-flat band and threshold voltages –P-and N-channel MOSFETS, CMOS and VLSI MOSFETS, Semi conductor sensors and detectors. LEDs & LCDs, Elements of device fabrications technology
Different configurations of feedback amplifiers-voltage series, voltage shunt, current series and current shunt, effects on gain, i/p and o/p impedance's, positive feedback and oscillator circuits- phase shift, wien bridge, hartlay, colpit and crystal oscillators.

Books :

1. Millman & Halkias - Integrated Electronics, THH
2. Millman & Grabel, - MGH Micro-Electronics
3. Neamen: Semiconductor Physics &devices TMH
4. Malvino - Principle of Electronics, TMH
5. Chattopadhyay, Rakshit, Saha & Purkait, 2nd, Edn -Foundation of Electronics

1. Prof. Manis Mukherjee -- Foundation Of Electronics Devices And Circuits. EPH.
2. Kasap:Principles of Electronic Materials &devices Tata Mcgrawhill

Data Structures and Algorithms
Code: CS 302
Contact: 3L + IT
Credit: 4

Overview of C language
Time and Space analysis of Algorithms - Order Notations.

Linear Data Structures - Sequential representations - Arrays and Lists, Stacks, Queues and Dequeues, strings, Application.

Linear Data Structures - Link Representation - Linear linked lists, Circularly linked lists. Doubly linked lists, application.

Recursion - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.

Non-linear Data Structure : Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

Hashing - Hashing Functions, collision Resolution Techniques.

Sorting and Searching Algorithms - Bubble sort, Selection Sort, Insertion Sort, Quicksort, Merge Sort, Heapsort and Radix Sort.

File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.

Text books:

1. Data Structures and Algorithms- O.G.Kadke and U.A.Deshpandey, ISTE/EXCEL

2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", Addison Wesley
3. Ajoy Agarwal.: Data Structures Through C.Cybertech.
4. Lipschutz: Data Structures TMH

References :

1.Heileman: Data structures,algorithims &OOP Tata McGraw Hill
2. Data Structures Using C, M.Radhakrishnan and V.Srinivasan, ISTE/EXCEL BOOKS
3.Weiss Mark Allen, "Algorithms, Data Structures, and Problem Solving with C++", Addison Wesley.
4. Horowitz Ellis & Sartaj Sahni, "Fundamentals of Data Structures", Galgotria Pub.
5. Tanenbaum A. S. , "Data Structures using 'C' "

Numerical Methods and Programming
Code : CS 312
Contacts : 3L
Credits : 3

Approximation in numerical computation, Truncation and rounding errors;
Interpolation: Lagrange's Interpolation, Newton forward & backward differences Interpolation, Newton divided difference;
Numerical Integration: Trapezoidal, Rule, Simson's 1/3 Rule, Weddle' Rule;
Numerical Solution of a system of linear equation

Gauss elimination method, Matrix Inversion, LU Factorization method, Gauss Jacobi method, Gauss Seidal method;
Algebraic Equation: Bisection method, Secant method, Regular-Falsi method, Newton-Raphson method;
Numerical solution of ordinary differential equation: Taylor's series method, Euler's method, Runge-kutta method, Predictor-Corrector method;
C Language Overview: Loop, recursion, function, array, pointers, structures, various types of file access methods: Sequential, Indexed Sequential, Random;
Various types of files in C and various types file handling statements in C
Implementation above Numerical & Statistical Problems in C Language;

Books:

1.Numerical Analysis and Algorithms by Pradeep Niyogi TMH
1. Numerical Mathematical Analysis by J.B.Scarborough
2. C Language and Numerical Methods by C.Xavier
3. Introductory Numerical Analysis by Dutta & Jana
4. Balagurusamy :Numerical methods
5. Numerical Methods (Problems and Solution) by Jain, Iyengar , & Jain
6. Numerical Methods In Computer Applications. : P.U.Wayse.EPH

ELECTRICAL AND ELECTRONIC MEASUREMENT
Code : EE 302
Contacts : 3L + 1T
Credits :4

General features – Construction and principle of operation of moving coil, moving iron, Dynamometer, Thermal and Rectifier type deflecting instruments. Deflecting, controlling and damping torques, extension of instrument ranges using shunts, multipliers and instrument transformers. Measurement of low, medium and high resistances, Kelvins double bridge, multimeters, megger, localization of cable faults.

D.C. and A.C. potentiometers, Measurement of high voltage, Electrostatic instruments, measurement of inductances, capacitance and frequency by A.C. Bridges.
Measurement of power in polyphase circuits, various wattmeter connections. A.C. and D.C. energy meters.

C.R.O. construction & principle measurement of voltage, current, frequency and phase by oscilloscope.
Electronic voltmeters – analog and digital. Digital multimeters, Audio oscillators, signal generators and frequency counter.

Text Books:
1. Electronic Instrumentation – H.S. Kalsi, ISTE/EXCEL BOOKS
2.Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
3.Kalsi:Electronic Instrumentation
4.Industrial Instrumentation & Control : SK Singh Tata McGraw Hill.New Delhi
5.Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat Rai & Co.
6.Heltrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
7.Patranabis D: Sensors & Transducers, Wheeler 96

Circuits & Networks Lab

Code: EE 391
Contact: 3P
Credit: 2

List of Experiments:

1. Transient response in R-L and R-C Network: Simulation/hardware
2. Transient response in R-L-C Series & Parallel circuits Network: Simulation/hardware
3. Determination of Impedance (Z) and Admittance(Y) parameters of two port network
4. Frequency response of LP and HP filters
5. Frequency response of BP and BR filters
6. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form
7. Evaluation of convolution integral, Discrete Fourier transform for periodic & non-periodic signals and simulation of difference equations using MATLAB

2 Representation of poles and zeros in z-plane, determination of partial fraction expansion in z-domain and cascade connection of second order system using MATLAB
3 Determination of Laplace transform and inverse Laplace transformation using MATLAB
4 Spectrum analysis of different signals

Note: An Institution/College may opt for some other software or hardware simulation wherever possible in place of MATLAB

Numerical Methods & Programming Lab

Electronics & Communication Engg Old

Code: CS 382
Contact: 3P
Credit: 2

1. Assignments on Interpolation: Newton forward & backward, Lagrange

2.Assignments on Numerical Integration: Trapezoidal Rule, Simson's 1/3 Rule, Weddle's Rule

1. Assignments on Numerical solution of a system of linear equation: Gauss elimination, Gauss Jacobi, Matrix Inversion, Gauss Seidal
2. Assignments on Algebric Equation: Bisection, Secant, Regular-falsi, Newton Raphson
3. Assignments on Ordinary Differential Equation: Taylor Series, Euler's method, Runga-Kutta
4. Assignments on Statistical Problem: Mean, Median, Mode, Standard deviation (for simple & frequency type data), Correlation & Regression

Electrical and Electronic Measurement Lab
Code: EE 392
Contact: 3P
Credit: 2

List of Experiments:

1. Instrument workshop- observe the construction of PMMC, Dynamometer, Electro thermal and Rectifier type instrument, Oscilloscope and digital multimeter
2. Calibrate moving iron and electrodynamometer type ammeter/volmeter by potentiometer
3. Calibrate dynamometer type Wattmeter by potentiometer
4. Calibrate A.C. energy meter
5. Measure the resistivity of material using Kelvin Double Bridge
6. Measurement of Power using Instrument transformer
7. Measurement of Power in Polyphase circuits
8. Measurement of Frequency by Wien Bridge using Oscilloscope

9. Measurement of Inductance by Anderson Bridge
10. Measurement of Capacitance by De Sauty Bridge

Data Structure Lab
Code: CS 392
Contact: 3P
Credit: 2

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

Fourth Semester

ANALOG ELECTRONIC CIRCUITS
Code : EC 401
Contacts : 3L
Credits :3

Transistor Biasing and Stability: Self Bias-CE, CC, Compensation techniques. Voltage, current, transresistance & transconductance amplifier. High frequency model of transistor.

Power amplifiers – Class A, B, AB, C, Tuned amplifier.

Electronics & Communication Engg Old

Different stages of Operational Amplifier: Differential Amplifier, Constant current source (current mirror etc.), level shifter, Ideal and practical OpAmp. Comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier

Multivibrator – Monostable, Bistable, Astable.
Timer. Monostable and astable operation using 555 timer.

Linear voltage regulator : series and shunt.
Switched mode power supply.

Function generator, wave shapers.
V-I, I-V, V-F & F-V converters. VCO, PLL lock-in amplifier.

Text Book:

1. Millman & Halkias – Integrated El;ectronics, Tata McGraw Hill.
2. Franco—Design with Operational Amplifiers & Analog Integrated Circuits , 3/e,TMH
3. Schilling & Belone—Electronic Circuit:Discrete & Integrated , 3/e ,TMH
4. Gayakwad R.A -- OpAmps and Linear IC's, PHI
5. Coughlin and Drisscol – Operational Amplifier and Linear Integrated Circuits – Pearson Education Asia.

Reference:

1. Malvino—Electronic Principles , 6/e ,TMH
2. Millman & Taub- Pulse, Digital & switching waveforms- TMH
3. Horowitz & Hill- The Art of Electronics; Cambridge University Press.
4. Hayes & Horowitz- Student Manual for The Analog Electronics; Cambridge University Press.
5. Boyle'stead & Nashelsky: Electronic Devices & Circuit theory, PHI.
6. Millman & Halkias: Basic Electronic Principles; TMH.
7. Tobey & Grame – Operational Amplifier: Design and Applications, Mc Graw Hill.
8. Tushar Jadhab – Linear Integrated Circuits, Everest Publishing House

DIGITAL ELECTRONICS & INTEGRATED CIRCUITS
Code : EC 402
Contacts : 3L + 1T
Credits :4

Data and number systems, Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, EBDIC, Gray, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic.

Electronics & Communication Engg Old

Boolean algebra, Venn diagram, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method and Quine Mc Clauskey method
Combinational circuits- adder, subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator, etc

Design of combinational circuits-Programming logic devices and gate arrays.

Sequential Circuits- Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology.
Different types of A/D and D/A conversion techniques.
Different Logic families- TTL, ECL, MOS and CMOS, their operation and specifications.
Memory Systems: RAM, ROM, EPROM,EEROM

Textbooks:

1. Jain—Modern Digital Electronics, 2/e ,TMH
2. Leach & Malvino—Digital Principles & Application, 5/e, TMH
3. Digital Logic Design- Morries Mano, PHI.

Reference:

1. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.
2. Givone—Digital Principles & Design, TMH
3. Digital Technology- Virendra Kumar, New Age.
4. Digital Circuit & Design- S.Aligahanan, S.Aribazhagan, Bikas Publishing House.
5. Fundamentals of Digital Electronics & Microprocessor- Anokh Singh, A.K. Chhabra, S.Chand.
6. Introduction to Digital Computer Design 4th Ed.- V.Rajaraman & T. Radhakrishnan, P.H.I.

Computer Organization & Architecture
CS-404
Contacts: 3L
Credits: 3

Concepts & Terminology: Digital computer concepts; Von-Neumann concept ; Hardware & Software and their nature ; structure & functions of a computer system , Role of operating system.

Memory Unit : Memory classification , characteristics ; Organization of RAM , address decoding ROM/PROM/EEPROM ; Magnetic memories , recording formats & methods , Disk & tape units; Concept of memory map , memory hierarchy ,

Associative memory organization ; Cache introduction , techniques to reduce cache misses , concept of virtual memory & paging.

CPU Design: The ALU – ALU organization , Integer representation , 1s and 2s complement arithmetic ; Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address; Multiplication of signed binary numbers-Booth's algorithm ; Divide algorithms- Restoring & Non-Restoring ; Floating point number arithmetic; Overflow detection , status flags.

Instruction Set Architecture- Choice of instruction set ; Instruction word formats ; Addressing modes.

Control Design – Timing diagrams; T-States , Controlling arithmetic & logic instruction , control structures ; Hardwired & Micro programmed, CISC & RISC characteristics.

Pipelining-general concept , speed up , instruction & arithmetic pipeline; Examples of some pipeline in modern processors , pipeline hazards; Flynn's classification –SISD ,SIMD , MISD , MIMD architectures-Vector and Array processors & their comparison , Concept of Multiprocessor; Centralized & distributed architectures.

Input/output Organization : Introduction to Bus architecture , effect of bus widths , Programmed & Interrupt I/O , DMA.

Text:

1.Hayes-- Computer Architecture & Organization,3/e ,MH
2.Carter—Computer Architecture (Schaum Series), TMH
3.Mano M.M—"Computer System Architecture"
4.Chaudhury P. Pal—" Computer Organization & Design" , PHI

Reference:

1.Hamacher—Computer Organization, 5/e, MH
2.Stallings W—" Computer Organization & Architecture" , MH

ANALOG COMMUNICATION
EC 403
Contacts: 3L
Credits: 3

Introduction to analog communication:

1. Types and reasons for modulation
2. Transmitters, transmission channels and receivers.

Electronics & Communication Engg Old

Spectral Analysis

1. Review of Fourier Transform theory, energy,power,parseval's theorem
2. Power spectral density functions (PSDF), Analog spectrum analysis
3. The auto correlation functions, relationship between the PSDF and the auto correlation functions, PSDF's of harmonic signals and uncorrelated (white) signals.
4. Review of signal transfer in linear systems, the ideal low pass filters and distortionless transmission, importance of channel bandwidth.

Continuous wave linear modulars

1. Amplitude modulation(AM), Time domain expression and modulation index., frequency domain(spectral) representations, transmission bandwidth foR am.
2. AM for a single tone message, phasor diagram of an AM signal, illustration of the carrier and side band components.
3. Transmission requirements for AM, normalized power and side band power.
4. Double side band suppressed carrier (DSB) modulation, time and frequency domain expressions.
5. Transmission requirements for DSB , bandwidth and transmission power for DSB.
6. Methods of generating ASM and DSB, squre law modulators, balanced modulators, ring modulators.
7. Single side band modulation(SSB), generation of SSB using a side band filter, indirect generation of SSB.
8. Representation off SSB signals.
9. Transmission requirements for SSB, transmit band width and power, side band filter examples.
10. Vestegial side band modulation (VSB)

Demodulation for linear modulation

1. Demodulation of AM signals, square law and envelope detectors
2. The superheterodyne receiver for standard AM radio.
3. Synchronous demodulation of AM,DSB and SSB using synchronous detection
4. Effects of frequency and phase errors in the local oscillator in DSB and SSB
5. Demodulation of SSB using carrier reinsertion and the use of SSB in telephony.
6. Carrier recovery circuits
7. Introduction to Phase-Locked Loop(PLL)

Frequency modulation (FM) and Phase modulation (PM)

1. Instantaneous frequency instantaneous phase, time domain repesentation for FM and PM, Phasor diagram for FM and Pm.
2. FM and PM signals for a single tone message, the modulation index and phasor diagrams.
3. Spectral representation of FM and PM for a single tone message, Bessel's functions and Fourier series.
4. Generation of FM using Armstrong method, commercial FM requirements.
5. Demodulation of FM and Pm signals, the limiter discriminator.'

6. Commercial FM radio and stereo Fm radio.
7. Demodulation of PM using phase locked loop.

Frequency division multiplexing (FDM) systems

1. FDM in telephony, telephone hierarchy an examples of group and super group generation.
2. Satellite system and applications and frequency division multiple access (FDMA) systems.
3. Filters and oscillator requirement in FDM.

Representation of random signals and noise in communication system

1. Signal power and spectral representations, the auto-correlation and power spectral density function (PSDP)
2. White noise, thermal noise, PSDF of white signals.
3. Input and output relationship for random signals and noise passed through a linear invariant system, band limited noise, ARC filtering of white noise.
4. The noise bandwidth of a linear time invariant system and its use in communication
5. Narrow band noise representation , generation of narrow band noise and PSDF time domain expression for narrow band noise.

Noise performance of Analog Communication systems

1. Signal-to-noise ratio in linear modulation, synchronous detection of DSB
2. Signal-to-noise ratio for AM and SSB, comparison of DSB, SSB and AM
3. Effect of noise in envelope and square law detection of AM, threshold effects in nonlinear detectors.
4. Signal-to-noise ration for FM,SNR improvement using pre-emphasis and de-emphasis networks.
5. FM threshold effects, noise clicks in FM system.
6. Comparison of linear and exponential modulation system for additive white band-limited noise channels.

Text Books:

1. Taub and D.LSchilling , “Principles of Communication Systems”, 2nd ed., Mc-Graw Hill Book Co.
2. Carlson—Communication System,4/e ,TMH

References:

1. Singh—Communication Systems: Analog & Digital, TMH
2. L.W.Couch Ii, “Digital and Analog Communication Systems”, 2nd Edition, Macmillan Publishing Co., New York, 1987

ELECTRONIC MEASUREMENT AND INSTRUMENTATION
EI 402
Contacts: 3L
Credits: 3

Basis Measurement Techniques for Analog and Digital Measurements Units and standards of physical quantities. Documentation standards. Block diagram of Instrumentation schemes – Static and Dynamic.

Accuracy, Precision, Fidality, speed of response, Linearization of techniques.

Errors in measurement : Classifications of errors, Statistical Analysis, Introduction to Reliability.

Digital Multimeters, Theory of Operational and Constructinal Details SHE, A-D-C D-A-C, Multiplexing, Data Acquisition Systems, Actuator, Elements of Transducer, Analog Multiplier, R M S and Average value detectors, Wave and Spectrum Analysers, Q-meters.

Measurement of high frequencies RF and VHF

Text:

1.Jain—Digital Electronics, 2/e,TMH
2.Malvino & Leach – Digital Principles & Application , 5/e,TMH
3.Helric A.D & Cooper W.D—Modern Electronic Instrumentation & Measuring Instruments, Wheeler Pub.
4.Dhir S.M—Applied Electronics & Instrumentation, TMH

Reference:

1. Taub & Schilling – Digital Integrated Electronics,TMH
2. Givone—Digital Principles & Design,TMH
3. Shawney A.K—A course in Electrical & Electronic Measurements, Dhanpat Rai & Sons.

EC 491
ANALOG ELECTRONIC CIRCUITS LAB
Contacts: 3P
Credits: 2

1. Introduction: Study of characteristics curves of B.J.T & F.E.T .
2. Construction of a two-stage R-C coupled amplifier & study of it's gain & Bandwidth.

3. Study of class A & class B power amplifiers.
4. Study of class C & Push-Pull amplifiers.
5. Realization of current mirror & level shifter circuit using Operational Amplifiers.
6. Study of timer circuit using NE555 & configuration for monostable & astable multivibrator.
7. Construction & study of Bistable multivibrator using NE555.
8. Study of Switched Mode Power Supply & construction of a linear voltage regulator using regulator IC chip.
9. Construction of a simple function generator using IC.
10. Realization of a V-to-I & I-to-V converter using Op-Amps.
11. Realization of a Phase Locked Loop using Voltage Controlled Oscillator (VCO).
12. Study of D.A.C & A.D.C.

EC 492
DIGITAL ELECTRONIC & INTEGRATED CIRCUITS LAB
Contacts: 3P
Credits: 2

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 & vice-versa.
3 .4-bit parity generator & comparator circuits.
4. Construction of simple Decoder & Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK & D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops & logic gates.
9. Realization of Universal Register using multiplexer & flip-flops.
10. Construction of Adder circuit using Shift Register & full Adder.
11. Realization of Asynchronous Up/Down counter.
12. Realization of Synchronous Up/Down counter.
13. Design of Sequential Counter with irregular sequences.
14. Realization of Ring counter & Johnson's counter.
15. Construction of adder circuit using Shift Register & full Adder.

ANALOG COMMUNICATION LAB
EC 493
Contacts: 3P
Credits: 2

1. Study of Amplitude Modulation & Demodulation techniques.
2. Study of Double Side Band Suppressed Carrier (DSB-SC) & Demodulation technique.

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

Electronic Measurements and Instrumentation Lab
Code: EI 492
Contacts: 3P
Credits: 2

1. Study of static characteristics (accuracy, precision, hysteresis, repeatability, linearity) of a measuring instrument.
2. Study of dynamic characteristic (fidelity, speed of response)
3. Acquaintance with basic structure of DMM and measurement of different electrical parameters
4. Statistical analysis of errors in measurement using computer simulation
5. Study of A/D converter along with its associate circuitry
6. Study of D/A converter
7. Realization of Data Acquisition system
8. Wave and spectrum analysis using Q meter
9. Measurement of HF and VHF

Electronics & Communication Engg Old

TECHNICAL REPORT WRITING & / LANGUAGE PRACTICE LABORATORY

Code: HU 481

Contact: 3

Credits: 2

Topics to be covered and number of hours required for it:

1. Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place(3 hours)
2. Conversion practice is done on given situation topics. The students are also made to listen to pre-recorded cassettes produced by British Council and also by the Universities of Oxford and Cambridge (6 hours)
3. Group Discussions:- The students are made to understand the difference between the language of conversion and group discussion. Strategies of such discussions are to teach to them. It is also helpful to use videocassettes produced by the U.G.C. on topics like group-discussion. After wards the class is divided into groups and the students have to discuss on given topics on current socio-economic-political-educational importance(12 hours)
4. Interview sessions-students are taught the do's and don'ts of facing a successful interview. They then have to face rigorous practices of mock-interviews. There simulations of real life interview sessions where students have to face an interview panel(12 hours)
5. Presentations: The secrets of an effective presentation are taught to the students. Then each and every student has to make lab presentations with the help of the Overhead projector/ using power point presentation and other audio-visual aids in the laboratory. They also have to face the question answer sessions at the end of their presentation (12 hours)
6. Classes are also allotted to prepare the students for competitive examinations like the T.O.E.F.L. by making the students listen to specially produced C.D. cassettes of such examinations (3 hours)

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

Text:

1. Sharma—Business Correspondence & Report Writing, TMH
2. Prasad—Group Discussion & Interview (With Audio Cassette) , TMH

Reference:

1. Sashi Kumar—Spoken English (with Cassette) , TMH

Electronics & Communication Engg Old

Fifth Semester

Line Communication System
Code: EC 501
Contacts: 3L
Credits: 3

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

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

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

Time Division Switching:
Basic time division space switching, Basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, Frequency division switching, grouping.

Transmission Lines:
Transmission line equations, characteristic impedance, propagation constant , group & phase velocities, voltage-current distribution.

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

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

Text Books:

1. T. Viswanathan, " Telecommunications Switching Systems & Networks", PHI
2. Tannenbaum, " Computer Network", PHI
3. J. Ryder, " Networks, lines & fields", PHI

References:

1. H. Taub & D.T. Schiling, " Principles of Communication System ", MGH

2. S. Rambhandran, " Telecommunication Principles, Circuits & Systems", Khanna Publishers
3. G. Kennedy, Electronic Communication System", TMH

EM Theory , Propagation & Antenna
Code : EC 502
Contacts : 3L + 1T
Credits 4

EM Theory :

Ampere's law , magnetic vector potential , Maxwell's equation: time varying electric & magnetic field , Faraday's law , displacement current, electromagnetic radiation, uniform plane wave equation & solution , skin depth , Poynting theorem , Poynting vector, reflection & refraction of plane waves , RF lines , smith chart.

Propagation :

Different modes of radio wave propagation , ionospheric propagation , MUF, critical frequency, skip distance, duct propagation, troposphere propagation.

Antenna :

Antenna parameters: Directivity, beam width , gain, radiation resistance, short dipole antenna , thin linear antenna , antenna array, pattern multiplication, Yagi -Uda array , loop antenna , log periodic antenna, Friss transmission formula , horn antenna , parabolic reflector & its feed , cassegrain feed , Antenna for mobile communication.

References :

1. Hayt: Engineering Electromagnetics TMH
2. Jordan E.C & Balmain K.G , " Electromagnetic Waves and Radiating systems " Prentice Hall of India , 1971.
3. Kennedy G. " Electronic Communication Systems " 4th ed. , McGraw Hill Book Co ., 1985.
4. John D. Ryder , " Network Lines & Fields " , 2nd ed., Prentice Hall of India,1984.
5. J.D Kraus , "Antennas ", McGraw Hill,3rd ed.
6. J.D Kraus , " Electromagnetics with Applications " , McGraw Hill,5th ed..

Electronics & Communication Engg Old

Audio & Video Engineering
Code: EC 503
Contacts: 3L
Credits: 3

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

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

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

HDTV:
Introduction, Principle, Standards, applications

Text Books:
1. D. P. Roychowdhury, " Advanced Acoustics", The New Book Stall
2. R.R. Gultari, " Monochronic & Colour Television",

References:
1. M. Dhake," TV & Video Engineering", TNH
2. K. Blair Benson & Donald G. Fink, " HDTV", Advanced television for 1990's, MGH

Electronics & Communication Engg Old

Microprocessor and Microcontrollers
Code: EI 502
Contacts: 3L + 1T
Credits:4

Introduction to 8085A CPU architecture-register organization, addressing modes and their features. Software instruction set and Assembly Language Programming. Pin description and features.

Instruction cycle, machine cycle, Timing diagram.

Hardware Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO).

Interrupts and DMA.

Peripherals: 8279, 8255, 8251, 8253, 8237, 8259, A/D and D/A converters and interfacing of the same.

Typical applications of a microprocessor.

16 bit processors: 8086 and architecture, segmented memory has cycles, read/write cycle in min/max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features. Software instruction set (including specific instructions like string instructions, repeat, segment override, lock prefizers and their use) and Assembly Language programming with the same.

Brief overview of some other microprocessors (eg. 6800 Microprocessor).

References:

1. Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
2. Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley inter science publications, 1980.
3. An introduction to micro computers Vol. 2 – some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
4. Advanced Microprocessors by Ray and Bhurchandi - TMH
5. Intel Corp. Micro Controller Handbook – Intel Publications, 1994.
6. Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
7. Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987

8. The Intel Microprocessors: 8086/8088, 80186, 80286, 80386 & 80486, Bary B. Brey, Prentice Hall, India 1996.

Linear & Digital Control Systems
Code: EE 513
Contacts: 3L+1T
Credits: 4

Basic components, open & closed loop, effect of feedback; mathematical models, differential equations, state equations, state diagram, linear, non-linear, time invariant & time-varying systems; impulse response, transfer functions of linear systems, signal flow graph, Mason's Gain formula, state space representation , stability analysis, state transmission matrix, eigen value.

Modeling of Electrical & Mechanical systems, DC motor, error Detector, tachometer.

Characteristics of control systems; first & second order systems, transient response, steady-state error, stability of linear system; Routh-Hurwitz criterion; Root-locus method, principle & properties; frequency response plot: Bode Plot, Nyquist criterion, Grain & Phase margin, transient & error function analysis, type of a system & its effect on error function.

Design of Control Systems, lead-lag compensation , proportional, proportional-integral (PI),
PID controller.

Digital Control Systems, effect of Sampling rate on stability, transient response & steady state error.

BOOKS ;

1. Kuo B.C. Automatic Control System, PHI
2. Das Gupta S : Control System Theory ; Khanna Pub.
3. Nagrath I J & Gopal M : Control Systems Engineering, New Age International Pub.
4. Ogata K : Modern Control Engg. PHI
5. Dorf R C & Bishop R.H.: Modern Control System ; Addison – Wisley
6. Bolton: Industrial Control & Instrumentation, Orient Longman
7. Nakra: Theory & Applications of Automatic Control, New Age International
8. Gopal: Modern Control System Theory, New Age International
9. Gopal: Digital Control Engineering, New Age International
10. Sinha: Control Systems, New Age International

Propagation & Antenna Lab:

Electronics & Communication Engg Old

Code EC: 592
Contacts: 3P
Credits: 2

Name of the experiments :

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

Microprocessor and Micro-controller Lab
Code: EI 592
Contacts: 3P
Credits: 2

Sl. No.	Name of the Experiments	No. of hours
1.	Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.	**3**
2.	a) Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical) b) Assignments based on above.	**3**
3.	a) Familiarization with 8085 simulator on PC. c) Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. b) Assignments based on above	**3**
4.	Programming using kit/simulator for i) table look up ii) Copying a block of memory iii) Shifting a block of memory iv) Packing and unpacking of BCD numbers v) Addition of BCD numbers vi) Binary to ASCII conversion	**9**

vii) String Matching
viii) Multiplication using Booth's Algorithm

5.	Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit eg, subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc	**3**
6.	Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding	**3**
7.	Interfacing with I/O modules: a) ADC b) Speed control of mini DC motor using DAC c) Keyboard d) Multi-digit Display with multiplexing e) Stepper motor	**12**
8.	Writing programs for 'Wait Loop (busy waiting)' and ISR for vectored interrupts (eg, counting number of pulses within specified time period)	**3**
9.	Study of 8051 Micro controller kit and writing programs for the following tasks using the kit a) Table look up b) Basic arithmetic and logical operations c) Interfacing of Keyboard and stepper motor	**6**
10.	Familiarization with EPROM programming and Erasing	**3**

Linear & Digital Control System Lab:
Code: EE 583
Contacts: 3P
Credits: 2

1. Familiarization with MATLAB Control System tool Box, MATLAB-SIMULINK tool box & PSPICE.
2. Determination of step response for 1^{st} order & 2^{nd} order system with amity feedback on CRO & calculation of control system specifications for variations of system design.
3. Simulation of step response & impulse response for Type-II, Type-I & Type-2 system with unity feedback using MATLAB & PSPICE.
4. Determination of root locus, Bode-plot, Nyquist Plot, using MATLAB control system toolbox for a given 2^{nd} order transfer function & determination of different control system specifications.
5. Determination of PI, PD, PID controller action on 1^{st} order simulated process.
6. Determination of approximate transfer function experimentally using Bode Plot.

7. Evaluation of steady-state error, setting time, percentage peak overshoots, gain margin, phase margin with addition of lead compensator in forward path transfer functions using MATLAB & PSPICE.
8. Study of position control system using servomotor.

Audio & Video Engineering Lab:
Code : EC 593
Contacts: 3P
Credits: 2

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

Electronics & Communication Engg Old

Sixth Semester

INDUSTRIAL MANAGEMENT
Code: HU-601

Basic concepts of management, objectives, classification and hierarchy, different schools of management thought, principal functions of management, Management as an organizing and directing force, Structure of the management decision making process, Organization structure, authority and responsibility, Organisation dynamics, Managerial leadership, communication systems, Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective bargaining, disciplinary procedure.

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of management science for the efficient administration of economic units, production, financial and marketing management.

Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management.

Books:

1. Essentials of Mgmt, Koontz, TMH
2. Industrial Management - S C Jain, W S Bawa, Dhanpat Rai & Co. (P) Ltd.
3. Industrial Management, Vol.1 L.C. Jhamb, EPH,
4. Industrial Engineering & Production Management - Martand Telsang, S. Chand
5. Industrial & Business Management - Martand T. Telsang, S. Chand
6. Introduction to Materials Management - J Tony Arnold & Stephen N. Chapman, Pearson Education Asia
7. Production & Operations Management – Adam, Pearson Education /PHI
8. Altekar, Production Management, Jaico
9. Industrial Relations, Trade Unions & Labour Legislation - Sinha, Pearson Education Asia
10. Business Organisation & Management - Tulsian, Pearson Education Asia.

Electronics & Communication Engg Old

RF & Microwave Engineering
Total lectures : 40 periods (minimum)
EC-602

Introduction –
RF and microwave spectrum, historical background, application of RF and microwave. 1L

Microwave Impedance Matching –
Unknown impedance measurement using shift in minima technique and impedance matching using single and double stub matching 4L

Microwave waveguides and components –
Rectangular waveguide and circular waveguide – mode structure, cutoff frequency, wall current, attenuation; microwave cavities – rectangular cavity resonator, Q factor, scattering matrix and transmission matrix, attenuator, phase shifter, directional coupler, Bethe hole coupler, magic tee, hybrid ring, circulator, isolator, Antennas 8L

Planar structures –
Strip line, microstrip line, coplanar structure - circulator, rat race, proximity coupler 3L

Microwave Tubes –
Limitations of conventional tubes, Multicavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube, Backward Wave Oscillator 5L

Semiconductor Microwave Devices –
Tunnel diode, Gunn diode and their waveguide mounts, Avalanche diodes – IMPATT, TRAPATT, Microwave bipolar transistor, heterojunction bipolar transistor, Microwave field effect transistor – JFET, MOSFET, MESFET, Parametric amplifier 8L

Applications of microwave –
Radar systems, Satellite Communication System, Industrial Applications of microwave 3L

Microwave Measurement –
VSWR measurement, power measurement, impedance measurement, frequency measurement 3L

RF Circuits –
Low pass filter, high pass filter, band pass filter, RF amplifier 2L

EMI / EMC –
EMI standard, radiated and conducted EMI and susceptibility, wire antenna, EMI sensor, antenna factor, cable to cable coupling, electrostatic discharge 3L

Textbooks --
[1] Matthew M Radmanesh, Radio Frequency and Microwave Electronics Illustrated, Pearson Education Asia
[2] David M Pozar, Microwave Engineering, John Willy & Sons, Inc.
[3] Peter A. Rizzi, Microwave Engineering – Passive Circuits, Prentice Hall of India
[4] M L Sisodia, Microwave Active Devices – Vacuum and Solid State, New Age Int. Publication
[5] Kraus, Antennas, TMH
[6] S Y. Liao, Microwave Devices and Circuits, Pearson Education/PHI.

[7] M.N.O Sadiqu, Elements of Electromagnetism, Oxford
[8] K. C. Gupta, Microwaves, New Age Int. Publication
[9] M I Skolnik, Introduction to Radar Systems – Tata-McGraw-Hill

Optoelectronic Devices and Circuits
Total lectures : 40 periods (minimum)
EC-601

Introduction –
Optical processes in semiconductors, radiative and non-radiative recombination processes, Einstein's relations for spontaneous and stimulated emissions and absorption, direct and indirect band-gap semiconductors, ternary and quaternary materials, heterojunctions, coherence properties of light, light as an electromagnetic radiation 6L

Light Emitting Diodes –
Electroluminescent process, Injection efficiency, recombination efficiency, LED materials, LED construction, device configuration and efficiency, LED structures – planar, dome shaped, hetero junction, surface emitting, edge emitting LED; device performance, drive circuitry, spectral response 5L

Laser –
Principle of operation, population inversion, gain, lasing threshold condition, semiconductor laser structures – Buried heterostructure laser, distributed feedback laser, quantum well laser; gas lasers, mode locking, Q switching, tunable semi-conductor lasers 7L

Photodetectors –
Photoconductors, Photodiodes – pn, pin, hetero junction photodiodes, avalanche photodiodes, comparison of different photodiodes, photo transistor 5L

Optoelectronic Modulation and Display Device –
Electro-optic and acousto-optic modulators, liquid crystal displays, solar cells 3L

Optical Fibers –
Introduction, optical fiber as waveguide, principle of ray propagation (ray theory), material and structure, meridional and skew rays, numerical aperture, step index and graded index fibers, electromagnetic wave propagation in step and graded index fibers, single mode and multimode fibers, normalized frequency, mode volume, mode field diameter, cut-off wavelength 10L

Optoelectronic Integrated Circuits –
Hybrid and monolithic integration, application of OEIC, integrated transmitter and receiver, Introduction to optical integrated devices 4L

Text books –
[1] J. Wilson & J.F.B Hawkes, Optoelectronics – an introduction, Prentice Hall of India.
[2] Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India
[3] Jasprit Singh, Optoelectronics – an introduction to materials and devices, McGraw Hill.
[4] John M. Senior, Optical fiber communication, Prentice Hall of India
[5] Keiser, Optical fiber communication, Tata McGraw Hill.
[6] Prince S, Optical & Optoelectronic Devices, Scitech

Digital Communication System
Total lectures: 40 periods (minimum)
EC-603

1.	Introduction A historical perspective in the development of digital communication. Elements of digital communication system.	1L
2.	Source encoding Pulse code modulation, quantization noise, linear and non linear quantization, companding. Differential pulse code modulation, delta modulation, adaptive delta modulation, Delta sigma modulation, linear predictive coders.	5L
3.	Multiplexing: Introduction to different type of multiplexing, Frequency Division & Time Division Multiplexing: multiplexing hierarchy, synchronous and asynchronous multiplexing, pulse staffing and word staffing.	4L
4.	Baseband transmission Baseband signal receiver: integrate and dump type filter probability of error calculations, optimum filters, coherent reception, matched filter and its transfer function. Probability of error of matched filter. Regenerative repeater, Bit synchronization, Inphase and midphase synchronizer. Early late gate synchronizer. Frame synchronization.	6L
5.	Different type of line coding – UPNRZ, UPRZ, PNRZ, PRZ, Manchester, differential encoding and their spectral characteristic, self synchronization properties of some of the encoded signal..	2L
6.	Equalization	6L

Inter symbol interference (ISI), Purpose of equalization, Eye pattern, Nyquiest criterion for zero ISI, fixed equalizer. Design of equalizer, Adaptive equalizer, Decision directed equalizer, Adaptive decision directed equalizer, Partial response signaling.

7. Digital modulation techniques — 6L
   BPSK, DPSK. BFSK, MARY-PSK & -FSK, QPSK, MSK principles, QASK, Error calculation.

8. Spread-spectrum modulation — 3L
   Pseudo-Noise Sequence, A notion of Spread Spectrum, Direct-Sequence Spread-Spectrum with Coherent Binary Phase-Shift Keying, Processing Gain, Probability of Error, Frequency-hop Spread Spectrum, Code-Division Multiplexing.

9. Information theory and coding — 7L
   Concept and measure of information, Entropy, Discrete and continuous messages, Message source, zero memory source, extension of zero memory source, Markov source and their entropy, Channel with and without memory, Channel capacity, Hartlay and Shannon's law.
   Properties of code: Uniquely decodable codes, Instantaneous codes, Kraft inequality and Macmillion inequality, Construction of instantaneous codes, Hoffman and Shannon – Fano coding.

Text Books :

1. Taub & Schilling, Principle of Communication System, Tata McGraw Hill.
2. B.P. Lathi, Modern Digital and Analog Communication System, Oxford University press.
3. Simon Haykin, Communication System, John Wiley & Sons,
4. L.W. Couch II, Modern Communication System, Prentice Hall India.
5. Roden, Analog & Digital Communication Systems, 5e, SPD
6. Dungan,Electronics Communication System, Vikas
7. Zeimer & Tarnter, Principles of Communication, Jaico
8. Rekha, Digital Communications, Scitech

Reference:

1. J.G. Proakis, Digital Communications, McGraw Hill.
2. J.Das, S.K. Mullick, P.K. Chatterjee, Principle of Digital Communication, Wiley Eastern Limited.

Electronics & Communication Engg Old

Microelectronics Technology & Circuits
Total lectures : 40 periods (minimum)

EC-604

1.	Introduction Discrete & Integrated Circuit, TTL, MOS & CMOS IC.	4L
2.	Process Technology Clean environment, Wafer preparation, oxidation, diffusion, Ion implantation, plasma etching & deposition, lithography, Metallization contact & interconnects, bipolar & CMOS processing	10L
3.	Basic Devices BJT models, Ebers-Moll & Gummel-Poon models, C-V behavior of an ideal MOS System, Capacitance of the MOS system, MOS capacitors and charge-coupled devices, Long channel and short channel MOSFETS, CMOS design, CMOS Latch-up.	10L
4.	MOS Inverters Definition & properties, MOS & CMOS inverter	4L
5.	Analogue Circuits Differential amplifies, Comparators, Integrators, Filters, DAC & ADC Circuits, Casecode amplifiers, design of two-state & cascode op-amplifier.	6L
6.	BI CMOS Circuit Technique BI CMOS Device & Technology – basic analog sub-circuit	6L

Text Books :

[1] S.M.Sze – VLSI Technology, TMH
[2] Cambell – Microelectronics Science & Engineering. Fabrication, Oxford University Press.
[3] Demicheli, Synthesis & Optimization of Digital Circuits, TMH
[4] S.K. Gandhi – VLSI Fabrication Principles, John Wiley & Sons.

Microwave Engineering Lab
EC 692

(Students are required to perform at least ten experiments taking all from group A and any two from group B)

Group A

1.Measurement of wavelength, guided wavelength and frequency using

waveguide test bench (WR 90) . Calculation of broad wall dimension of waveguide & $\omega - \beta$ plot

2.Calibration of attenuator, measurement of A_D and A_R using waveguide test bench (WR 90) and Smith Chart

3.Calibration of a crystal detector using waveguide test bench (WR 90)

4.Measurement of coupling and directivity of directional coupler using calibrated attenuator

5 Study of characteristics of Gunn oscillator using power meter with bolometer and frequency meter

6.Measurement of unknown impedance (inductive, capacitive and resonat windows)

7. Klystron characteristics (static method and dynamic method) using power meter with bolometer and frequency meter

8. Measurement of reflection coefficient without using slotted line (using two directional couplers and calibrated attenuator)

Group B

1.Measurement of dielectric constant using waveguide test bench (WR 90)

2.Scattering matrix of a magic tee / E plane tee / H plane tee using waveguide test bench (WR 90)

3.Measurement of phase shifter of a phase shift oscillator

4.Measurement of radiated emission in open area test side (OAT)

5.Frequency response of low pass filter, high pass filter, band pass filter using Spectrum Analyzer with tracking generator

6.Frequency response of RF amplifier using Spectrum Analyzer with tracking generator

7. Measurement of conduction EMI using LISN and Spectrum Analyzer

Digital Communication Systems Lab
EC 693

(Students are required to perform at least ten experiments taking 3 from Group A, 3 from Group B, 3 from Group C and 1 from Group D)

GROUP - A

1. Design, implementation and studies of the properties of 15 bit P.N. Sequence using shift register
2. Studies of the properties of A/D and D/A converter (AD7820/ADC0820 and ICL 8018A/8019A/8020A).
   (Properties like transfer characteristics, code central line method of

nonlinearty study, differential nonlinarity, integral nonlinearity, resolution etc).

3. Study of pulse amplitude modulation and demodulation.
   (Studies of distortion factor of the constructed signal as a function of signal frequency & amplitude. Further study of distortion factor of filtered reconstructed signal as a function of sampling frequency and thus verify the sampling theorem).
4. Studies of PCM transmitter and receiver.
   (To measure the bit rate, bandwidth requirement and distortion factor of the reconstructed signal in presence of channel noise).
5. Study of line coders : UPNRZ, PRZ, BPRZ, PNRZ
   (To study the nature of waveform in CRO and its spectrum by spectrum analyzer. At least any one of the line coders has to designed, fabricated and tested).
6. Studies of Manchester coding and decoding technique.
   (Studies of the nature of waveform, spectrum and self synchronizing characteristic).

GROUP - B

7. Studies of PSK modulator and demodulator, connected by either physical or simulated channel.
8. Studies on FSK modulator and demodulator, connected by either physical or simulated channel
9. Studies on ASK modulator and demodulator, connected by either physical or simulated channel
10. Studies on QPSK modulator and demodulator, connected by either physical or simulated channel

(In all above experiments, nature of the modulated waveform is to be studied by a CRO. The spectrum is to be studied with a spectrum analyzer and the essential bandwidth is to be determined; finally the reception quality is to be analyzed by cross co-relation characteristics and measurement of bit error rate in presence of channel noise).

GROUP - C

11. Studies on Delta modulator & Demodulator
12. Studies on Adaptive delta modulation
13. Studies on delta signal modulation
14. Studies on PCM/TDM system (Multiplexing/Demultiplexing)
    (Object is to measure distortion factor of the demodulated signal with variable signal amplitude and frequency, measure the essential B.W. of the modulated signal
15. Studies of PCM/TDM system (Multiplexer & Demultiplexer)
    (To study the interchannel interference and synchronization problem in multiplexer and demultiplexer system

GROUP - D

16. Studies of direct sequence spread spectrum modulation and demodulation
17. Studies of frequency hopped spread spectrum modulation and demodulation (To study spreading and dispersing, effect of channel noise, single tone interference etc.
18. Study of features of ISDN network.
19. Study of ISDN Emulator and its programming, using appropriate communication software (like protocol analyzer software).

Electronic Design LAB

EC-683

Objective: To impart the essential knowledge of electronic circuit design and fault analysis, to enhance hands on experience and to encourage innovativeness.

Modus operandi: The subject will be a sessional subject so that students can employ all their resources in order to excel.
Total 15 designs have been indicated in the syllabus classified in 3 groups. Each student has to complete at least 6 designs in a semester taking two from each group.
At the end of the semester, the student will be interviewed by a panel of examiners, constituted by the head of the department/institution.

Guidelines: Each design given in the syllabus indicates the basis. On this basis, the teacher will prepare an exact design problem with specified parameters and assign to the student.
Objective of the job in brief is also given in the syllabus. As such the teacher can further elaborate or specialize the problem creating enough room for the student to learn and innovate.
If same job is assigned to more than one student/group, it must be with different parameter values.
The students will find their own design solutions with minimum input from the teacher. Of course there can be more than one solution but the student should ultimately know their comparative merits/demerits.
The hardware assembly and testing has to be done only during assigned class hours under general supervision of a teacher. The student must always make a comparative study between the theoretical and measured performance parameters and analyze their causes.
At the end of each job, the student will prepare a report including detail technical specification of his design, circuit diagram, design calculations, theoretical & measured values, graphs, references etc.

Scoring: The total score of 100 will be in two parts, e.g. a) continuous evaluation-60 and b) semester end viva-40.

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A full mark of 10 is allotted to each job. At the end of each job, the teacher will evaluate the performance on the basis of initiative, innovativeness, speed and insight. The sum of 6 such evaluations will make the total for continuous evaluation.
At end semester, each student will be interviewed to assess his expertise in various facets of electronic design, and a score out of 40 will be allotted.

A. DISCRETE ANALOG CIRCUITS.

1. Rectifiers.
   (To design a rectifier for a given average output dc voltage and a given load resistance, compare between the theoretical values of V_{dc}, V_{rms}, RF, HD, output regulation, transformer utility factor etc. with the measured values, and thus comprehend the relevance/effect of these various parameters.)
2. DC power supply regulation and protection circuits.
   (To learn designing a series transistor based output regulation circuit, an output current limiting circuit, fold back circuit needed for a given output parameters.)
3. Single stage audio frequency voltage amplifier with BJT for a given A_v, Z_{in} and Z_{out} and maximum symmetrical out put swing.
   (To learn basic design principles, different methods of biasing, bias stability, selection of transistor from data manuals and effect of ac coupling on bandwidth.)
4. Single stage audio frequency emitter follower with JFET for a given A_v, Z_{in} and Z_{out} and maximum symmetrical out put swing.
   (To learn the design principles and applications of an emitter follower.)
5. Complimentary symmetry power amplifier with pre amplifier, if necessary, for a given out put power to a given load with single ended power supply.
   (To learn the distinction of a power amplifier over and above a voltage or current amplifier, its design principles, issues like, efficiency, cross over distortion etc.)
6. RC phase shift Oscillator , Wien Bridge oscillator, Hartley and Colpitt oscillator
   (To learn the design of oscillators and measuring the frequency and amplitude of oscillations)

B. OPAMP BASED ANALOG CIRCUITS

1. Inverting and non-inverting amplifier of given dc gain, input impedance and output impedance.
   (To learn the basic design, inter relation between the dc gain and input/output impedances, offset balance and the relation between feedback and GBW.)
2. Adder and subtractor.
   (To learn the basic design and function of a multi input adder/subtractor (with ac and dc inputs present simultaneously).

3. Comparator/voltage level detector for a given upper threshold level and a given lower threshold level with facility of independent adjustment of hysteresis and center point.
   (To learn the design and the technique of independent adjustment of both hysteresis and center point.)
4. Active filters: LP, BP, HP, 1st order, 2nd order.
   (To learn the design of a filter and it's inherent phase shifting characteristics.)
5. 555 based monostable and astable of duty cycle below and above 50%.
   (To learn designing 555 based timer circuits.)

C. DIGITAL LOGIC CIRCUITS

1. Design and implement a BCD to 7-segment decoder with basic and universal gates.
   (To understand clearly the method of writing a truth table, use of K-map, simplifying a logic function and optimum design with minimum number of ICs and inputs.)
2. Design and implement a 4-digit frequency counter with a clock generator.
   (To learn designing a digital circuit using available standard gate, FF, counter and display Ics.)
3. Designing logic circuits using multiplexers, demultiplexers and gates to implement logic functions.
   (To learn the use multiplexers and demultiplexers)
4. Design and implement a sequence detector.
   (To learn designing a sequential circuit, whose output is 1 or 0 when any input bit is preceded or succeeded by a predefined binary sequence. To define the input & output sequence from a given physical problem, to prepare a state diagram, derive a minimal state table, to find the simplified state equation, to implement the same & verify the result)
5. To design and implement a combination of a logic circuit and a RAM in order to generate a 4-bit data after simplifying a logic expression, to store the output data at a predefined location in the RAM, to retrieve the same and verify.
   (To comprehend the structure and operating principle of memory devices.)

Group Discussion Seminar
EC-682

(Objectives – To encourage in-depth study, practice oration and instill a habit of participation)

About 20 minutes presentation / lecture on any topic covered in the first to sixth semester syllabus followed by 5 minutes interaction / discussion session. Seminar topic would be selected in consultation with teacher guide and a report to be submitted at least seven days before the presentation. The presentation should be in front of teachers and

students of the class. The observer-students should take active participation in the presentation for which there is marks. Evaluation should be based on the following parameters of the students: Presentation skill, Delivery of the speech, Depth and breadth of the subject matter presented. The attendance of other students in the seminar will be recorded and their participation should also be assessed for evaluation of their participations

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Seventh Semester

EC 701 **Digital Signal Processing**
Contact: 3L + 1T
Credit: 4

Introduction, Overview of digital signal processing. 2L
Discrete – Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system. Classifications of sequence, recursive and non-recursive system. 8L

Mathematical operations on sequences: Convolution, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems, MATLAB examples (Tutorial) 4L

Z-transform: Definition, relation between Z transform and Fourier transform of a sequence, properties of Z transform, mapping between S-plane and Z-plane. Unit circle, convergence and ROC, Inverse z-transform, solution of difference equation using the one sided Z-transform MATLAB examples (Tutorial). 6L

Discrete Fourier transform: Definition, inverse discrete Fourier transform (IDFT) Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, Fast Fourier transform (FFT), FFT algorithm, Radix 2 algorithm. Decimation-in-time and decimation-in-frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm, MATLAB examples (Tutorial). 10L

Digital filter realization: Principle of digital filter realization, structures of All-zero filters. Design of FIR (Finite impulse response) filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman. Design of infinite impulse response filters (IIR) from analog filters. Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimisation method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples (Tutorial). 10L

Books:

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

EC 702 VLSI Design
Contact: 3L + 1T
Credit: 4

Analog VLSI Circuit Design: -

i) Review of MOSFET characteristics, scaling and small-geometry effects, MOSFET capacitances. 3L

ii) MOS resistor, MOS current source, current mirror circuits. MOS voltage source Linear voltage and current converters. 4L

iii) CMOS operational amplifier (OPAMP) design: - Differential amplifier, level shifter, source follower, output stage voltage and power amplifiers. Cascode OPAMP. Compensation techniques. 6L

iv) Analog Filters: - Switched capacitor (SC) fundamentals, first order SC circuits, second-order SC circuits and cascade design. 4L

v) Analog to digital and digital to analog converters, speed of conversion and over sampling issues. 4L

vi) VLSI Interconnects: - distributed RC model, transmission line model. Future inter connect technologies. 2L

Digital VLSI Circuit Design: -

i) MOS inverters, CMOS inverter, state characteristics, switching characteristics, power dissipation issues. 3L

ii) CMOS logic gates: NAND, NOR, XOR, CMOS logic design of half and full adders. CMOS transmission gates, pseudo-nMOS, domino logic gates. 5L

iii) Sequential MOS Logic Circuits: The SR latch circuit, clocked latch and flip-flop, CMOS D-latch and edge-triggered circuits, Schmitt trigger circuit, Comparator. 4L

iv) Dynamic Logic Circuits: Pass transistor logic, synchronous dynamic circuit techniques. 3L

v) Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, drivers and buffers, Buffer scaling and design issues. 5L

CAD Tools for VLSI Design: -

i) SPICE: Element lines, Control lines, Command lines, Types of analysis, Models and model parameters, Sub circuits and Macros. 3L

ii) Layout design rules, Layout of inverters, NAND, NOR gates using LASI. 3L

ii) VHDL Syntax: Basic concepts in VHDL and VHDL grammar, Structural specification, VHDL description of Inverter, NAND gate, Full adder. 3L

Books:

1. Analog VLSI Signal and Information Processing - M.Ismail and T. Fietz.

2. VLSI Design Techniques for Analog and Digital Circuits - R.L. Geiger, P.E. Allen and N.R. Strader, MGH
3. CMOS Analog VLSI Design - P.E. Allen and D.R. Holberg, OUP.
4. Ken Martin, Digital Integrated Circuit Design, OUP
5. CMOS Digital Integrated Circuits - S.M. Kang and Y. Leblebici, TMH
6. Digital Integrated Circuits - J.M. Rabaey, PHI.
7. Introduction to Digital Systems - M. Ercegovac, T. Lang and J.H. Moreno.
8. CMOS Circuit Design, Layout and Simulation - R.J.Baker, H.W. Li and D.E. Boyce,PHI

EC 703 System Programming & Operating Systems
Contact: 3L + 1T
Credit: 4

Assemblers: - Elements of Assembly Language Programming; Pass Structure of Assemblers; Two Pass Assembler	4L
Compilers and Interpreters: - Aspect of Compilation; Memory Allocation; Compilation of Expressions; Compilation of Control Structures; Code Optimization; Interpreters.	5L
Linkers: - Relocation and Linking Concepts; Design of A Linker; Self-Relocating Programs.	3L
Software Tools: - Editors; Debuggers.	3L
Introduction to Operating Systems: - OS Functions; Evolution of OS Functions; Batch Processing Systems; Multiprogramming Systems; Time Sharing Systems.	4L
Scheduling: - Scheduling Policies; Job Scheduling; Process Scheduling; Process Management in UNIX.	4L
Deadlocks: - Definitions; Resource Status Modeling; Handling Deadlocks; Deadlock Detection and Resolution; Deadlock Avoidance.	3L
Process Synchronization: - Process Definition; Process Control; Implementing Control Synchronization; Classical Problems; Semaphores.	5L
Memory Management: - Preliminaries; Contiguous Memory Allocation; Noncontiguous Memory Allocation; Virtual Memory Using Paging; Virtual Memory Using Segmentation	5L
I/O Organization: - IO Organization; IO Devices; file Organizations; Directory Structures; File Sharing.	3L

Protection and Security: - Encryption of Data; Protection and Security Mechanisms; Protection of User Files. 3L

Distributed Operating Systems: - Definitions and Examples; Design Issues in Distributed Operating Systems. 3L

Books:

1. *Systems Programming and Operating Systems* by D.M. Dhamdhere; Second Revised Edition, Tata McGraw-Hill.
2. *System Programming* by J.J. Donovan; Tata McGraw-Hill.
3. *An Introduction to System Programming* by L.L. Beck; Addison Wesley.
4. *Operating System & System Programming* , Prasad, Scitech
5. *Guide to Operating System , Palmer, Vikas*
6. *Operating System Concepts* by A. Silberschatz and Galvin; Addison Wesley.
7. *Operating Systems* by W. Stallings; Pearson.
8. *Operating Systems: Concepts and Design* by Milan Milenković; Tata McGraw-Hill.
9. *Operating Systems* by Stuart E. Madnick and John J. Donovan; Tata McGraw-Hill.
10. *Operating Systems: A Design-Oriented Approach* - by Charles Crowley; Tata McGraw-Hill.
11. *Advanced Concepts in Operating Systems* - by Mukesh Singhal and Niranjan G. Shivaratri; Tata McGraw-Hill.

References:

1. *Schaum's Outlines Operating Systems* by J. Archer Harris; Tata McGraw-Hill.
2. *Unix Systems V.4 Concept and Application* by S. Das; Tata McGraw-Hill.
3. *The Unix Programming,* by B.W. Kernigham; Tata McGraw-Hill.
4. *The Design of Unix Operating System* by M.J. Bach; Prentice-Hall India.
5. *Operating Systems With Case Studies in UNIX, NetWare, Windows NT* by Achyut S. Godbole; Tata McGraw-Hill.

EC 791 Digital Signal Processing Lab
Contact: 3P
Credit: 2

All the students shall perform first five experiments and the remaining three shall be given as mini- projects.

1. Sine wave generation using C.
2. Designing an FIR Filter using MATLAB and DSP KIT
3. Designing of an IIR Filter using MATLAB & DSP Kit
4. Fourier analysis of periodic signal
5. Time and frequency domain properties of different windows using MATLAB

6. Development of a DTMF Tone Generator using DSP Kits and Code composer
7. A-Law and μ-Law Companding implementations using the TMS320C54x
8. Implementation of the Double-Precision Complex FFT for the TMS320C54x DSP

EC 792 VLSI Design Lab
Contact: 3P
Credit: 2

Each student need to complete both experiments of group-A, any two from group-B and any one from group-C

Group-A:
1. Design layout of a two input CMOS NAND gate using LASI (Use Mead Conway design rules of any standard
2. Using LASI, draw the layout of a simple CMOS amplifier

Group-B:
1. Using SPICE, simulate a CMOS inverter. Obtain the transfer characteristics for different values of β_n/β_p
2. Using SPICE, simulate a simple CMOS amplifier and obtain the transfer characteristics and frequency response
3. Using SPICE, simulate a CMOS differential amplifier with a current source. Use <.SUBCKT> command of SPICE
4. Draw a full adder using AND/OR/INVERT gates in schematic editor

Group-C:
1. a) Use VHDL/VERILOG to describe the carry function of a full adder
   b) Create a VHDL test bench for the above circuit, perform timing simulation & observe the waveform
2. a) Design a 4-bit counter using VHDL, simulate and observe the wave form
   b) Down load the above in any FPGA and test the circuit.

EC 793 Project-I
Contact: 3P
Credit: 2

- Students (preferably not more than four in each group) need to complete one project during 7^{th} & 8^{th} semester together.
- It is suggested that the project involves investigative study over & above the routine curriculum and also hardware activity. It should be result oriented and should explore newer topics.

- Students will finally prepare a comprehensive project report and give a demonstration & presentation of their project to the class of students and the review committee as nominated by the university.
- Total score of 200 (credit = 6) is distributed in 7th & 8th semester. Depending on the progress and quality, each student will be given a score out of 100 at the end of 7th semester, and at the end of 8th semester.

EC 794 **Group Discussion**
Contact: 3P
Credit: 2

- Purpose: - To train the students in the art & science of professional speaking and also in presenting themselves properly to their prospective employers.
- They need to communicate with clarity, structure and conciseness in both one to one and group situations. They have to gear their presentations to the level of the listener.
- The institute may choose any appropriate method available with them to train the students on this very important aspect.
- The evaluation should be continuous during the semester and at the end, a total score out of 100 will allotted to each student.

EC 704A **Advanced Antenna Engineering**
Contact: 3L + 1T
Credit: 4

Antenna fundamental and radiation mechanism	2L
Vector potential concept, Gain, Effective aperture	3L
Wire antenna, Loop antenna	3L
Aperture antenna	2L
Reflector antenna, Cassegrain antenna, Gregorian antenna	4L
Planar antenna	2L
Lens antenna	1L
Broadband antenna	2L
Frequency independent antenna	2L

Antenna synthesis	3L
Near field – Far field transformation	3L
Antenna arrays, Grating lobes	6L
Antenna for mobile communication	3L
Antenna measurements: Radiation pattern, Gain and Radiation impedance.	6L

Text Books:

1 Antennas and Wave Propagation, G. S. N Raju, Pearson Education.
2 Electromagnetic Waves and Radiating Systems, 2nd edition, by C. Jordan & Keith G. Balmain, Published by – 1968 by PHI
3 Antenna Theory Analysis and Design Constantine by A. Balabis, Published by 1982,1977. John Wiley & Sons INC. Hoboken, Newyork, U.S.A.
4 Antenna Theory and Design Revised Edition by Robert S. Elliott, Pulished 2003 IEEE Press, John Willey & Sons, Hoboken, U. S. A.
5 Electromagnetics with applications, Fifth Edition by Kraus / Eleisch, Electromagnetics with applications, International Edition 1999, Mc. Graw Hill, Book co- Singapore.
6 Introduction to RADAR Systems , 3rd Edition. Merrill I. Skolink, Published by – Mc-Graw- Hill Companies, INC- New York, TMH
7 Adaptive Antenna arrays, Satish Chandran, Springer Verlag
8 Finite Element Method for Electro Magnetics, Volakis, University Press

EC 704B **Advanced Semiconductor Devices**

Contact: 3L + 1T
Credit: 4

Review of Semiconductor properties: - Crystal structure of semiconductors, band theory, occupation statistics, electrical properties, optical properties, recombination kinetics, avalanche process in semiconductors, photon statistics;

MOSFET: - Analysis of MOSFET parameters; short channel and narrow width effects; hot electron effects

MESFET: - Transport in two dimensional structures

HEMT: - Hetero junction BJT, MODFETS

Design of high frequency amplifiers and oscillators

Resonant tunneling structures, RTD oscillators

Inter valley scattering, Gunn diodes, IMPATT diodes, TRAPATT, BARPATT, mixer diodes, Step recovery diodes

Outline of numerical approach to 2D and 3D device models

Introduction to device simulation programs

Books:

1. D.J Roulston, Bipolar Semiconductor Devices, McGraw Hill
2. S.M.Sze, Physics of Semiconductor, John Wiley
3. Hamaguchhi, Basic Semiconductor Devices, Springer India
4. Dimitrizev, Understanding Semiconductor Devices, OUP
5. Jasprit Singh, Physics of Semiconductors and Their Heterostructures,MH
6. S.M.Sze, High Speed Semiconductor Devices, John Wiley
7. B.G.Streetman & S. Banerjee, Solid State Electronic Devices, Pearson
8. Dilip Kr. Roy, Physics of Semiconductor Devices, University Press

EC 704C **Advanced Mathematics for Electronics Engineering**

Contact: 3L + 1T

Credit: 4

Complex variable, Cauchy Riemann eqns, Residue calculus technique, Pole at infinity, Contour integral, Jordon's lemma 6L

Conformal mapping and Conformal transformation 6L

W = A ln Z, Z = k Cosh W,

$W = A \ln \frac{Z-a}{Z+a}$

Series evaluation using contour integration 3L

Partial differential equation 6L

A) Transform techniques
B) Green's function techniques

Fourier series and Fourier transform 4L

Sampling techniques	2L
Special functions, Bessel and Hankel functions, Fourier Bessel series	6L
Method of Moments, Evaluation of capacitance of a square plate.	6L

Text Books:

- Gustafson, advanced mathematics Engineering, Springer India
- Advanced Engineering Mathematics by Erwin Kreyzig, Published 1962 John Willey and Sons, INC, New York
- M. D. Greenberg, Advanced Engineering Mathematics, Pearson Education.
- Jordon & Smith, Mathematical Techniques, OUP
- Field Computation by Method of Moments by RF Harrington Published 1968 Robert E. Krieger Publishing Company, Malabar, Florida.
- Engineering Mathematics , Vol. 1 & Vol.2, Sastry, PHI

- Advanced Engineering Mathematics, Willey, TMH

EC 704D **Computer Communication & Networking**

Contact: 3L + 1T
Credit: 4

Introduction to computer network, classification of networks (WAN, MAN, LAN), distributed systems, digital signals and data rates, bit stream, symbols and band rate, transmission media, modems, structure of computer network, circuit, packet, message switching topological design, back bone design OSI, reference model. 8L

Physical and data link layer, bit communication between DTE and DCE, RS232C, novel modem Terminal handling, multiplexing and concentration data link layer service and design issues, errors detection and correction, retransmission strategies, sliding window protocols, satellite and packet radio networks, pure Aloha protocols, slotted Aloha protocol, satellite networks, reservation Aloha protocol, DES, PCEM, packet radio networks. 10L

Network layer, basic design issues, network layer services, connection oriented and connection less services, routing, static multi path, centralized isolated distributed hierarchical broadcast, flow based routing, congestion deadlocks ratio, concept of Ethernet LAN topology and architecture CSMA/CD protocol, token ring LAN, token bus LAN, Fiber optic LAN bridges, transparent bridge source routing bridges, gateway, gateway design issues x25 internet working. 12L

ISDN, B-ISDN and ATM, evolution of ISDN services, ISDN system architecture and network terminating devices, ISDN interface, ISDN signaling, broad band ISDN, Asynchronous transfer modem, ATM adaptation layer, transport layer, OSI transport protocol, session layer designing issues, data exchange, OSI session layer primitives, transport protocol TCP. 10L

Presentation layer, abstract syntax notation, data compressed on oxyptography, application layer OST, service elements ASCE and CCR, the transfer access and management, concurrence control nistual terminals, electronic mail directory services distributed systems, formal protocol modules, network management, mobile networking. 10L

Books:

1. Tanenbaum, Computer Network, PHI/ Pearson
2. B. A. forouzan, Data communication and networking, TMH, 3rd edition.
3. Zheng, Networks for Scientists & Engineering, OUP
4. Keizer, LANs, TMH
5. Stalling W., Computer Networks, PHI/ Pearson
6. Miller, Data Communication & Networks, Vikas
7. Miller, Data Communication & Networks, Jaico
8. ISDN: Stalling W., PHI/ Pearson
9. Murty, Data communication and networking, Himalaya

EC 704E **Object Orient Programming**

Contact: 3L + 1T
Credit: 4

Introduction: - Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language. 8L

Object oriented design: - Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes- association, aggregation, using, instantiation, meta-class, grouping constructs. 16L

Basic concepts of object oriented programming using Java: - Object, class, message passing, encapsulation, polymorphism, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages. 16L

Books:

1. Ali Bahrami, - "Object –Oriented System Development" - Mc Graw Hill.
2. Rambaugh, James Michael, Blaha - "Object Oriented Modelling and Design" - Pearson
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" - Tata Mc graw Hill.
4. M. P. Bhave et al, Object Oriented Programming with C++, Pearson Education.
5. Doke, Object Orient Programming with JAVA, Vikas
6. Somsundaram, programming in Java 2, Jaico
7. Horton, Beginning Java 2, SDK 1.4, SPD
8. Xavier, Programming with JAVA 2, Scitech

EC 704F **Data Base Management Systems**

Contact: 3L + 1T

Credit: 4

Introduction: - Overview; Data Models; Database Languages; Database Users and Administrators; Database System Structure; Application Architectures. 4L

Entity-Relationship Model: - Basic Concepts; Constraints; Keys; Design Issues; Entity-Relationship Diagram; Weak Entity Sets; Extended E-R Features. 6L

Relational Model: - Structure of Relational Databases; The Relational Algebra; Extended Relational Algebra Operations; The Relational Calculus; Modification of the Database; Views. 5L

SQL: - Basic Structure; Data-definition language; Data-manipulation language; Set Operations; Aggregate Functions; Null Values; Nested Sub queries; Views; Modification of the Database; Embedded SQL; Dynamic SQL. 4L

Integrity and Security: - Domain Constraints; Referential Integrity; Assertions; Triggers; Authorization; Authentication. 4L

Relational Database Design: - First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form; Functional Dependencies, Decomposition, Desirable Properties of Decomposition. 10L

Transactions and Concurrency Control: - Concept of a Transaction, Transaction 7L

State, Properties of a Transaction and their Implementations; Serialisability; Recoverability; Concurrency Control and Recovery Management: Lock-Based Protocols; Two-Phase Locking; Deadlock Handling.

Books:

1. *Database System Concepts* by A. Silberschatz, H. Korth, S. Sudarsan; Fourth Edition, McGraw-Hill.
2. *Fundamentals of Database Systems* by R. Elmasri & S. Navathe; Fourth Edition, Pearson Education.
3. *Database Management Systems,* ***Leon & Leon, Vikas***
4. *Database Management Systems,****Evan Bayross, SPD***
5. *Inside Relational Databases,* ***Whitehorn, Springer India***
6. *An Introduction to Database Systems* by C.J. Date; Seventh Edition, Pearson Education.
7. *Database Systems: The Complete Book* by H. Garcia-Molina, J.D. Ullman, J. Widom; First Indian Reprint 2004 Edition, Pearson Education.
8. *Database Management Systems* by R. Ramakrishnan and J. Gehrke; Third Edition, McGraw-Hill.
9. *Database Systems: A Practical Approach to Design, Implementation and Management* by T. Connolly and C. Begg; Third Edition, Pearson Education.

References:

1. *Oracle Forms Developer's Handbook* by A. Lulushi, Seventh Indian Reprint 2004 Edition, Pearson Education.
2. *SQL, Nagpal, S. Chand*
3. *Oracle 9i Development by Example* by D. Hotka, First Indian Reprint 2003 Edition, Pearson Education.
4. *Database Management Systems: Designing & Building Business Applications* by G.V. Post; Second Edition, Tata McGraw-Hill.
5. *Oracle PL/SQL Programming,* ***Feurstein, SPD***

EC 704G **EMI / EMC Techniques & Management**
Contact: 3L + 1T
Credit: 4

Introduction to EMC	2L
Common EMC units	2L
Signal source specifications	2L
EMC requirements for electronics systems	2L

Measurement of commercial product	2L
Emissions for verification of compliance, radiated emissions, conducted emissions, radiated susceptibility, conducted susceptibility, electrostatic discharge	6L
Dipole antennas, antenna arrays, antenna factor, broadband measurement antennas	6L
Non-ideal behaviour of components	4L
Effect of component leads	1L
Signal spectra	3L
Spectrum analysis	1L
Line Impedance Stabilisation Network	1L
Network Chokes, Pads, Filters	4L
Three conductor lines & cross-talk	4L
Shielding	4L

Text Books:

1 EMI/EMC Computational Modeling Hand Book, by Archambeult.
2 Introduction to Electromagnetic Compatibility, by Clayton R. Paul, Published by – John Wiley & Sons INC
3 EMC Analysis Methods & Computational Models, by – Frederick M, Tesche, Michel V. Ianoz, Torbjorn Karlsson,Published by – John Wiley & Sons, INC
4 Electrostatic Discharge in Electronics, by – Willian D. Greason, Published by – John Wiley & Sons INC
5 The ARIAL RFI Book by Hare, W1RFI Published by – The American Radio Relay League Newington CT 06111-14941

Electronics & Communication Engg Old

EC 704H **Process Control Engineering**

Contact: 3L + 1T
Credit: 4

Transfer function from process analysis: - Heating process, mixing process, DC motor	2
Process modeling via experimental tests, via study of frequency response	5
Review of response characteristics of 1^{st} & 2^{nd} order system	2
Controllability & Stability – a qualitative study: • Proportional control factor, deviation reduction factor, subsistence ratio, process reaction curve, dead time • Self regulation in a process • Concept of stability with poles & zeroes	4
Control schemes & controllers: • On/OFF control, • P, PI, PID control, related terminologies, parameter adjustments and implications • Electronic P, PI & PID controller.	7
Various principles of process control: - ratio control, feed forward control, cascade control	5
Common process control loops: - Flow, pressure, level, temperature	5
Computer aided process control: • Data acquisition, set point control, direct digital control • Review of Z-transform theory and its application in digital control • Digital PID algorithms	6
A typical process control systems: - Boiler	4

Books:

1. "Principles of Process Control' 2^{nd} ed. by D.Patranabis, TMGH
2. "Process Control Instrumentation Technology" 7^{th} ed. by Curtis D Johnson, PHI
3. "A Text Book of Instrumentation & Control" by D.Patranabis, Umesh Publication.
4. "Industrial Process Control Systems" Dale Patrick, Thomson Delmar

Electronics & Communication Engg Old

EC 704I **Industrial Electronics**

Contact: 3L + 1T
Credit: 4

Basic Power Devices:
Power diode: 2L

- Special features of construction & v-i characteristics
- Turn on & turn off characteristics, reverse recovery time, reverse recovery current

Power BJT: 2L

- Construction, working principle
- Special features like low □, quasi saturation, primary breakdown, secondary breakdown

Power MOSFET: 2L

- Construction, working principle, special features of construction
- Special properties of power MOSFET with V-groove structure

IGBT: Construction & working principle. 1L

Comparative study of important performance parameters of power BJT, MOSFET & IGBT 1L

Thyristors 6L

- Construction, working principle
- di/dt & dv/dt protection, snubber circuit
- Series & parallel operation, static & dynamic equalization network
- Commutation circuits: - natural commutation & self commutation

AC voltage controllers (AC/AC) 2L

- Single phase half wave & full wave controllers
- Single phase cycloconverter
- Single phase PWM AC voltage controllers

Controlled rectifiers (AC/DC): - Single phase semi converter, full converter, dual converter. 2L

Choppers/Switched mode converters (DC/DC) 3L

- Principle of step up/step down operation
- Classifications – A.B.C.D.E
- Buck, boost, buck-boost, Cuk regulators
- Principle of operation (qualitative) of full bridge converter

PWM switch mode inverters (DC/AC) 4L

- Principle of operation
- Harmonic profile: - harmonic factor for nth harmonic (HF_n), Total harmonic distortion (THD), Distortion factor (DF), Lowest order harmonic (LOH)
- Single phase bridge inverter: - operating principle & harmonic profile
- Voltage control of single-phase bridge inverter: - single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation; - estimation of RMS output and harmonic factor in each case.

Power supplies: 4L

- Overview of SMPS, its merits over linear regulated DC power supplies
- Working principle of various techniques of SMPS, - fly back, feed forward, push-pull, half bridge & full bridge
- UPS – operating principle

Control of DC motors: 6L

- Basic characteristics of DC motors
- Operating modes in four quadrants
- Match between the motor & the electronic control
- Application of different single phase converters and chopper drives in motor control
- Principle of closed loop speed control & phase locked loop control

Float cum boost charger 2L

Time delay relays, sequential timers, synchronous timers 1L

Industrial heating: 2L

Induction heating, dielectric heating; - principle, characteristic features & control

Books:

1. Krein, Elements of Power Electronics, OUP
2. Power Electronics (Converters, Applications & Design) – Mohan, Undeland, Robbins – John Wiley
3. Power Electronics, Jacob, Vikas
4. Power Electronics (Circuits, Devices & Applications) – M H Rashid – Pearson
5. Power Electronics – M D Singh & K B Khanchandani – TMH
6. Modern Power Electronics, B.K. Bose, Jaico
7. Modern Power Electronics – P C Sen – Wheeler Publishing
8. Power Electronics, Dr. P.C. Sen, S.Chand
9. Industrial Electronics – S N Biswas – Dhanpat Rai & Co.
10. Industrial Electronics & Control" – S K Bhattacharya & S Chatterjee (TTTI, Chandigarh) - TMH

EC 704J **Numerical Techniques for RF Systems**

Contact: 3L + 1T
Credit: 4

Finite difference methods	6L
Variational and Perturbational methods	6L
Methods of Moments for evaluation of capacitance of a conducting and multiple bodies	8L
Methods of Moments for evaluation current on a wire antenna	6L
Finite elements method	6L
Finite difference time domain techniques	8L

Text Books:

1. Numerical Techniques in Eletromagnetics, 2nd Edition by Matthew N. O. Sadiku, Published by CRC Press, Bocca Raton
2. Time domain Electromagnetics, by S. M. Rao Academic Press.
3. HPNEFF JR, Basic Electromagnetic Fields Harper & Row Publishers, New York

EC 704K **Pattern Recognition & Machine Intelligence**

Contact: 3L + 1T
Credit: 4

Introduction	1L
Recognition as a classification process. Decision theoretic classification. Hyper plane properties and decision functions. Minimum distance pattern classification with simple and multiple prototypes. Clustering-K means and isodata algorithm, Pattern classification by likely hood functions, Bayes classifier, Syntactic classification. Learning through clustering, Convex and concave decision regions. Hearing and estimation of mean vector and covariance matrix. Linear and nonlinear seperability.	15L

Trainable pattern classtier-Gradient technique, Robbins-Monre algorithm, Potential functions and least mean square error.	8L
Feature selection by entropy minimization, Karhuner-Lucke expansion and divergence minimization.	4L
Image representation, digitization, quantization, Compression and coding, Transfer for image processing, Restoration, Enhancement, Segmentation, thining. Description of lines and shape. Statistical and syntactic models of image classification. Morphological method of image analysis.	10L
Application of speech recognition, Image understanding and territory planning for mobile robots.	10L

Books:

1. Sonka, Image processing & Machine Vision, Vikas
2. Duda and Hard: Pattern classification and scene analysis, Addison Wesley.
3. Marques, Pattern recognition, Concepts , methods & applications, Springer India
4. Poole, Computational Intelligence, OUP
5. Tou & Gonzalez, Pattern recognition principle, Addison Wesley.
6. E. Hall, Digital Image Processing, Academic Press.
7. A. Reserfeld: Digital Image processing, Vol. I & II, Academic Press.

EC 704L **Computer Vision**

Contact: 3L + 1T
Credit: 4

Discrete geometry & quantisation	2L
Length estimations	1L
Automated visual inspection	2L
Object recognition & matching	3L
Depth perception problems	2L
Stereo geometry & correspondence	4L

Motion analysis	3L
Optical flow	2L
Application of computer vision	4L
Remote sensing	4L
Bio-medical imaging	4L
Document processing	4L
Target tracking	4L

Books:

1. "Machine Vision" by Jain; MGH
2. "Computer Vision- A modern Approach", by Forsyth; Prentice Hall
3. "Three dimensional Computer Vision" by Faugeras; Artificial Intelligence, MIT Press
4. "Introduction Techniques for 3-D Computer Vision" by Trucco, Prentice Hall

Values of Ethics of Profession
Contact: 3L + 0T
Credit: 3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome.
Limits of growth: sustainable development
Energy Crisis: Renewable Energy Resources
Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics
Appropriate Technology Movement of Schumacher; later developments
Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.
Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society
Nature of values: Value Spectrum of a good life
Psychological values: Integrated personality; mental health
Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

References:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

EC 802 Optical Fibre Communication
Contact: 3L + 1T
Credit: 4

Introduction to optical fiber communication – principles and systems 2L

Fiber optic transmitters using LEDs and Laser diodes, Bias stabilization of LEDs and Lasers, Driver circuits for analog and digital modulation, Temperature stabilization of laser diodes, Modulation bandwidths of lasers and LEDs 5L

Fiber optic receivers using PIN and APD photodiodes, photo-diode amplifiers, SNR in PID and APD receivers, Receiver sensitivity, Eye diagram 5L

Coupling mechanisms of optical power from source to fiber and fiber to photodetector, Transmission characteristics of fibers and their effects on system performance, Selection of optical fiber types for short-haul, long-haul and high speed data links, optical power budget calculations of a fiber optic communication link 6L

Fiber optic interconnective devices for fiber optic communication links and 8L

networks :
Optical isolators, polarizers, circulators, attenuators, Bragg grating filters, add/drop multiplexers, WDM MUX / DEMUX, fiber amplifiers, guided wave devices as external optical modulators

Fiber optic analog modulation methods, Sub-carrier multiplexed analog communication principles, IM-DD systems, Fundamentals of optical coherent detection, Optical pulse format for digital communication systems, Performance of a 10 Mb/s digital fiber optic link and a 10 Gb/s data link, Effects of charp and linewidths of lasers on system performance 10L

Fiber optic networks for LAN, MAN and WAN – a brief study 4L

Text books:
[1] John. M. Senior, Optical fiber communications: principles and practice, Prentice Hall of India.
[2] Gerd Keiser, Optical fiber communications, McGraw Hill, 3rd edition.
[3] D. K. Mynbaev, L. L. Scheiner, Fiber optic communication technology, Pearson Technology
[4] R. P. Khare, Fiber optic and optoelectronics, Oxford University press.
[5]John Gowar, Optical Communication Systems, Prentice Hall of India.
[6] Selverajan, Kar, Srinivas, Optical fiber communicaion : principles and systems, Tata McGraw Hill.

EC 803 Wireless Communication
Contact: 3L + 1T
Credit: 4

Introduction to Wireless Communication Systems – evolution of mobile radio communications, mobile radio systems around the world, radio communication systems – paging systems, cordless telephone systems, cellular telephone systems; comparison of common wireless communications, trends in cellular radio and personal communication, second generation (2G) cellular networks, third generation (3G) wireless networks, introduction to radio wave propagation, free space propagation model 4L

Basics of mobile communication – Limitations of conventional mobile system, mobile cellular communication – introduction, concept of frequency reuse, cluster size, cellular system architecture – mobile station, base station, MSC, channel assignment strategies, call handover strategies, interference and system capacity, improving capacity in cellular systems – cell splitting, sectoring, repeaters, microcell zone concept. 8L

Global system for mobile communication – GSM services and features, system architecture, GSM radio subsystem, GSM channel types, location updating and call setup, introduction to CDMA digital cellular standard, comparison between 6L

GSM and CDMA.

Wireless networking – wireless local area network standards, technology – RF and IR wireless LAN, diffuse, quasi-diffuse and point-to-point IR wireless LAN, advantages and applications of Wireless LAN, introduction to WI-FI, Bluetooth, 3G and 4G wireless systems	3L
Introduction to satellite communication - brief history and overview of satellite communication	2L
Orbital mechanics and launchers – equations of the orbit, orbital elements, look angles, sub-satellite points, satellite launching and launch vehicles	2L
Satellite description – communication subsystem, telemetry, command and ranging subsystem, attitude control subsystem, electrical power subsystem	6L
Satellite transponder – Transponder model, channelisation, frequency plan, processing	3L
Satellite link design – basic transmission theory, system noise temperature and G/T ration for earth stations, design of uplink and downlink, atmospheric and ionospheric effects on satellite link	3L
Earth station – description, earth station antenna, low noise amplifier, upconverter, down converter, monitoring and control, VSAT	3L

Text books:

1. Theodore S. Rappaport, Wireless communications: principles and practice, Pearson education.
2. William C. Y. Lee, Mobile cellular telecommunication – analog and digital systems, McGraw Hill, 2nd ed.
3. Wang, Wireless communication System,Pearson Education
4. Tri T. Ha, Digital satellite communication, McGraw Hill
5. Aggarwal,Introduction to Wireless & Mobile Systems,Vikas
6. T. Pratt, Charles Bostian, Satellite communication, John Wiley & Sons , 2nd ed.
7. Robert M. Gagliardi, Satellite communication, CBS publishers and distributors
8. D. C. Agarwal, Satellite communication, Khanna publishers

References:

1. A. Santamaria et al, Wireless LAN systems, Artech House.
2. Stallings,Wireless Communication & Networks,Pearson Education
3. K. Feher, Wireless digital communications, Prentice Hall of India.

4. Roy Balke, Wireless communication technology, Thomson Delmer.

EC 891 Advanced Communication LAB (Sessional)

Contact: 3P
Credit: 2

Students are required to complete minimum 10 experiments, taking at least 4 from each group

A. Optical Communication System:

1. Measurement of numerical aperture of an optical fiber
2. Measurement of propagation loss, bending loss and connector loss in an optical fiber
3. Studies of LASER characteristics
4. Measurement of wavelength of an optical fiber source
5. Setting up a fiber optic analog link, study of PAM
6. Studies of Frequency Division Multiplexing and De multiplexing
7. Setting up a fiber optic data link and study of TDM
8. Setting up a PC to PC communication link using optical fiber

B. Wireless communication System (Experiments are to be performed in simulated platform or in experimental models):

1.
2.
3. Studies on satellite communication system – to set up active and passive satellite communication link, to set up an FM / FDM satellite link, to measure the path loss and propagation delay in a satellite link, to communicate voice signal through satellite link, use different combinations of uplink and downlink frequencies to check the communication link, to transmit and receive various waveforms from a function generator through a satellite link
4.
5. Studies on Blue tooth system – to understand concept of Blue tooth technology, to study RF module, RS-232C serial communication, Blue tooth protocol, different types of Blue tooth network
6. Studies on wireless LAN

EC 892 **Project-II**

Contact: 3P
Credit: 4

Students (preferably not more than four in each group) need to complete one project during 7^{th} & 8^{th} semester together.
It is suggested that the project involves investigative study over & above the routine curriculum and also hardware activity. It should be result oriented and should explore newer topics.
Students will finally prepare a comprehensive project report and give a demonstration & presentation of their project to the class of students and the review committee as nominated by the university.
Total score of 200 (credit = 6) is distributed in 7^{th} & 8^{th} semester. Depending on the progress and quality, each student will be given a score out of 100 at the end of 7^{th} semester, and at the end of 8^{th} semester.

EC 893 **Grand Viva**
Credit: 4
The session of grand viva will be conducted some time during the 8^{th} semester, as suitable for the institute. The institute will form a committee of senior internal/external experts from academia/ Industry/ University for the purpose.
Depending upon his/her performance, each student will be allotted a score out of 100 marks.

EC 894 **Seminar-II**
Contact: 3P
Credit: 4

Tenure – *The duration of this subject covers both 7^{th} & 8^{th} semester. That means, each student will deliver only one seminar in both semesters together. In order to cover all the students, the session needs to start from 7^{th} semester. But marks will be sent to university at the end of 8^{th} semester.*

Objectives:– To encourage investigative study of references, journals and other learning materials beyond the boundary of syllabus.

Each student will prepare for a seminar on some advanced topic beyond the prescribed curriculum under the guidance of a faculty member. The student will deliver the presentation/lecture to his/her class and the board of examiners (including the guide), as nominated by the university/institution. The presentation will be followed by a question answer session. The student will also prepare a report and submit it well in advance.

Evaluation should be based on the following parameters:
- Presentation: Delivery of the speech (20), Depth of the subject matter presented (20), handling questions (20).
- Report: Overall quality of the report (30).
- Attendance during the entire session (10)

EC 804A **Fibre Optic Metrology**

Contact: 3L + 1T
Credit: 4

Measuring Instruments: - Lock-in-Amplifier, Monochromator, Infrared viewer, Optical Spectrum Analyser,

Multi-mode fibre: – Parameters for characterisation, Steady-State Power distribution, mode stripper.

Measurements of attenuation: - Loss Mechanisms in Fibre, Calorimetric Method, Absorption & Scattering lo
attenuation, Cut-Back method, OTDR techniques; Numerical Aperture- trigonometric & Scanning methods.

Refractive Index Profile: - Reflection method, Near Field Scanning, Refracted Near Field methods, Interferor

Dispersion Measurements: - Time-Domain Method & Frequency Domain Method

Geometrical Measurements: - diameter, deformation, eccentricity, ellipticity.

Single–mode Fibre: – Mode Cut-Off wavelength, Mode-field Diameter, Equivalent Step-Index (ESI) Profile,
Measurement

Mechanical Strength of Optical Fibre

International Standards for Measurements: World Bodies, RTM, ATM, Recommendations

Books:

1. Dietrich Marcuse, *Principles of Optical Fibre Measurements*, (Academic Press Inc. NY.)

2. Giovanni Cancellieri & Umberto Ravaioli, *Measurements of Optical Fibres & Devices, - Theory & Experiments*, (Artech House Inc. Dedham, USA)
3. Bishnu Pal, *Fundamentals of Fibre Optics in Telecommunication and Sensor Systems, Chapters 10 & 11*, (Wiley Eastern Limited)
4. J M Senior, *Optical Fibre Communications –Principles and Practice, Chapter 13*, (Prentice-Hall of India Pvt, Ltd.)
5. Giovanni Cancellieri (Editor), *Single-Mode Optical Fibre Measurements, Characterization & Sensing,* (Artech House Inc., Boston)
6. D C Agarwel, *Fibre Optic Communication*, (Wheeler Publications)

EC 804B RF & Microwave Network

Contact: 3L + IT
Credit: 4

Lumped & distributed circuit elements at RF and microwave frequencies	5L
S parameter description of passive & active networks	3L
Network concepts	3L
Obstacles in wave guides e.g. posts, diaphragms etc.	4L
Wave guide junctions	4L
Excitation of wave guides and cavities	5L
Periodic structures & filters	6L
RF & microwave power combiners and dividers	6L

Books:

1. Secrets of RF Circuit Design, Joseph Carr,TMH
2. Microwave Engineering,Das & Das,TMH
3. "Microwave Engineering" by David M Pozar, 2nd ed.; John Willey & Sons Pvt. Ltd.
4. "Foundation of microwave Engineering" by Robert E Collin, 2nd ed; IEEE Press series of Electromagnetic Wave Theory; John Willey & Sons Pvt. Ltd
5. "Handbook of RF/Microwave Components & Engineering" by KaiChang; Interscience, John Willey & Sons INC, Hoboken, NJ.

EC 804C Modern Control Systems

Contact: 3L + 1T
Credit: 4

Fuzzy Control:

Introduction to the concept of fuzzy logic: 2
Why we need fuzzy logic, an introductory example – fuzzy vs. non-fuzzy, when not to use fuzzy logic.

Fuzzy sets and its basic operations: 4
Introduction to classical set, fuzzy set, definition of linguistic values, linguistic hedges, set theoretic operations (union, intersection, complement – different axioms), composition of fuzzy relations – max-min composition, max-product composition.

Logical arguments and propositions: 2
Proposition concept, fuzzy If-Then rules, Modus Ponens, Modus Tolens, hypothetical syllogism

Fuzzy controller: 6
Block diagram of a fuzzy controller and description of its different blocks like fuzzification, rule base, inference mechanism, defuzzification, case study of fuzzy control system – an inverted pendulum on a cart, OR speed control of running train.

Nonlinear Control:

Introduction to nonlinear system: 2
Common physical nonlinearities – saturation, friction, backlash, dead zone, relay

Definitions: 2
Singular points, nodal point, saddle point, focus point, vortex point, limit cycles.

Stability of non linear systems using phase plane method – analytical and graphical methods 4

The describing function method: 4
Derivation of describing function of some common non linearities like dead zone and saturation, relay with dead zone and hysteresis, stability analysis using describing function method

Liapunov's stability criterion: Different stability criteria of Liapunov 2

Digital Control:

Introduction to digital control: 4
Z-transforms, sampling and hold, comparison of analog and digital control system, pulse transfer function

Stability of sampled data system: Jury's test 2

Digital controller and its realization: Series, parallel and cascade. 2

Books:

1
2
3
4
5
6
7
8
9

10
11
12
13

EC 804D **Software Engineering**

Contact: 3L + 1T
Credit: 4

Introduction: - Emergence of Software Engineering; Control Flow-Based Design, Data Structure-Oriented Design, Data Flow-Oriented Design, Object-Oriented Design; Software Life Cycle Models: Classical Waterfall Model, Iterative Waterfall Model, Prototyping Model, Evolutionary Model, Spiral Model; Comparison of Different Life Cycle Models. 7L

Requirements Analysis and Specification: - Requirements Analysis, Software Requirements Specification: SRS Document, Characteristics of a Good SRS Document, Organization of the SRS Document; Techniques for Representing Complex Logic: Decision Trees and Decision Table. 4L

Software Design: - What is a Good Software Design, Cohesion and Coupling, Neat Hierarchy; Function-Oriented Design: Overview of Structured Analysis/Structured Design Methodology, Structured Analysis, Data Flow Diagrams, Shortcomings of the DFD Model; Structured Design, Flow Chart vs. Structure Chart, Transform Analysis, Transaction Analysis; Functional vs. Object-Oriented Approach. 7L

User Interface Design: - Characteristics of a Good User Interface Design; User Guidance, Graphical User Interface, Types of User Interface; Command Language-Based Interface; Menu-Based Interface; Direct Manipulation Interface; Windowing Systems. 3L

Coding, Documentation, Testing: - Coding: Standards and Guidelines, Code Walk-Through, Code Inspection; Software Documentation; Testing: Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Integration Testing, System Testing. 5L

Software Project Management: - Project Planning; Project Size Estimation Metrics: Line of Code, Function Point; Project Estimation Techniques: Empirical Estimation (Expert Judgment, Delphi Cost Estimation), Heuristic (COCOMO), Analytical Estimation (Halstead's Software Science); Staffing Level Estimation; Scheduling: Work Breakdown Structure, Activity Networks, Gantt Charts, PERT Charts; Organization and Team Structures; Risk 7L

Management; Software Configuration Management: Source Code Control System.

Software Reliability and Quality Assurance: - Software Reliability; Software Quality; ISO 9000: What is ISO 9000 Certification, ISO 9000 for Software Industry, Why get ISO 9000 Certification, How to Get ISO 9000 Certification, Summary of ISO 9001 Requirements, Salient Features of ISO 9001 Requirements; SEI Capability Maturity Model. 4L

Computer Aided Software Engineering: - Benefits of CASE; CASE Support in Software Life Cycle; Characteristics of CASE Tools. 3L

Books:

1. *Software Engineering: A Practitioner's Approach* by Roger S. Pressman; Fifth Edition, Tata McGraw-Hill.
2. *Software Engineering* by Ian Sommerville; Sixth Edition, Pearson Education.
3. *Software Engineering Fundamentals,**Behforooz,Oxford University Press***
4. *Software Engineering,Principles & Practices,R.Khurana,**Vikas***
5. *Fundamentals of Software Engineering* by Rajib Mall; Second Edition, Prentice-Hall India.
6. *Software Engineering: Theory and Practice* by Shari Lawrence Pfleeger; Second Edition, Pearson Education.
7. *Fundamentals of Software Engineering* by Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli; Second Edition, Prentice-Hall India

References:

1. *Object-Oriented Analysis and Design* with Applications by Grady Booch; Second Edition, Pearson Education.
2. *Object-Oriented Analysis and Design* by Andrew Haigh; Edition 2001, Tata McGraw-Hill.
3. *Software Engineering,**Jawadekar,TMH***

EC 804E CAD on VLSI

Contact: 3L + 1T

Credit: 4

Introduction: 4 L

Evolution and trends in VLSI CAD.
Design process, representations, flow and methodology. Dealing with complexity CAD Tool types.
Example of a methodology: synchronous design and RTL modeling.

Digital hardware modeling: 4 L
Structure modeling: Logic networks, connectivity & netlists, Hypergraphs. Connectivity data structures. Introduction to logic simulation.

Dynamic verification (Simulators): 4 L
Cycle-based simulation; logic relaxation; event-driven simulator kernels. Value sets.
Zero/unit/variable delay simulation & issues. Coverage metrics; instrumentation.

Simulation Algorithms: Compiled code & event driven 2 L

Static logic verification (Formal): 4 L
Advantages of static vs. dynamic verification; Logic equivalence checking.
Advanced Boolean algebra:
Shannon expansion, cofactors and Unate Recursive computation Paradigm

Logic synthesis: 4 L
2- level minimization: exact vs. Heuristic, Multilevel minimization.
Restructuring heuristics.
Technology mapping; cell libraries

Floor planning & placements: 4 L
Layout elements, representations, methodologies.
Floor plan structures. Placement algorithms – local/random search, force-directed methods.

Routing, compaction, layout verification: 4 L
Global and detailed routing. Steiner trees, Channel routing; area routing; Wire length Estimators. 1-D layout compaction. Principles of layout verification.

Static timing 6 L
Principles of static timing analysis; Delay graphs for combinational logic blocks; Arrival times, required times, slack, Basic algorithms for path analysis in combinational logic. False paths; Flip-flops, latches and delay constraints; Clocking methods; Verifying timing of sequential logic; Delay modeling of gates, interconnect and devices.

Timing & power driven synthesis: 4 L
Timing-driven logic synthesis;
Timing-driven layout synthesis;
Clock skew optimization;
Approaches to the timing convergence problem.

Books:

1. *An Introduction to VLSI Physical Design*, by M. Sarrafzadeh and C.K. Wong, McGraw-Hill.
2. *VLSI Physical Design Automation -- Theory and Practice*, by S.M. Sait and H. Youssef, World Scientific Publication Company.
3. *Algorithms for VLSI Physical Design Automation* by N. Sherwani, 3rd ed., Kluwer Academic Publishers, Boston, MA, 1995.
4. *On Optimal Interconnections for VLSI b*y A. B. Kahng and G. Robins, Kluwer Academic Publishers, Boston, MA, 1995.
5. *Clock Distribution Networks in VLSI Circuits and Systems b*y E.G.Friedman ed, IEEE Press, New York, NY, 1995

EC 804F **Coding Theory and Cryptography**

Contact: 3L + IT
Credit: 4

Introduction: Coding for reliable digital transmission and storage, Types of codes, Types of errors encountered, Error Control Strategies. 5 L

Linear block codes: Definition, Syndrome and Error detection, Minimum distance, Error detecting and Error-correcting capabilities, Standard Array and Syndrome decoding, Probability of an undetected error for linear codes over BSC, Hamming code. 8 L

Cyclic codes: Description, Generator & parity-check matrices of cyclic codes, Encoding of cyclic codes, Syndrome computation and error detection, Decoding, Cyclic Hamming Codes, Shortended cyclic codes. 8 L

BCH codes: Description, Decoding BCH codes, Implementation of error correction, Non binary BCH codes and Reed-solomon codes, Weight distribution and Error detection of Binary BCH codes. 8 L

Convolutional codes: Encoding, Structural properties, Distance properties, Maximum likelihood decoding of convolutional codes, Viterbi algorithm, Performance bound for convolutional codes, Application of viterbi decoding. 8 L

Cryptography: Overview of encryption technique, Encryption algorithm, Symmetric (secret key) cryptography, data encryption standard (DES), International data encryption algorithm (IDEA), RC ciphers, Asymmetric (public key) algorithm, RSA algorithm, Pretty good privacy (PGP), One way hashing structure communication using chaos functions cryptanalysis. 8 L

Text books:

1. Delf,Introduction to Cryptography,Springer
2. Buchman,Introduction to Cryptography,Springer
3. Jones, Information & Coding Theory,Springer
4. Shu Lin & Costello, Jr. D.J., Error Control Coding: Fundamentals and Applications, Prentice Hall.
5. Paterson, W.W. and Weldon, Jr. E.J., Error Correcting Codes; Prentice Hall.
6.
7.

EC 804G **Biomedical Electronics**

Contact: 3L + IT

Credit: 4

Origin of bio-potential: 2L

- Electric activity of excitable cells, resting potential, action potential, Nerst equation, propagation of action potential.
- Surface map of bio-potential- concept.

Biomedical electrodes: 4L

- Electrode theory.
- Working principle & application of different bio-potential electrodes & biochemical transducers-
    - Microelectrodes, surface electrodes, needle electrodes
    - Reference electrode, pH electrode, blood gas electrode
    - Ion electrode.

Cardiovascular measurements: 10L

- Brief description of cardiovascular system.
- Electrocardiography-
    - Sources of cardiac bio-potentials,
    - Methodology & principle of measurement
    - Electrocardiograms & their inferences
- Vector cardiography- concept
- Principles of direct & indirect measurement of blood pressure
- Principles of measurement of blood flow/cardiac rate
- PH & blood gas analyzer

Electroencephalography (EEG): 4L

- Sources of action potentials
- Methodology & principle of measurement
- Electroencephalograms & their inferences

Electromyography: 1L

- Sources of action potentials
- Methodology & principle of measurement
- Electromyograms & their inferences

Respiratory system measurement: 4L

- Respiratory mechanism, parameters of respiratory system
- Principle of measurement of various parameters, impedance pneumograph, spirometer.

Medical imaging systems: 6L

- Working principles of medical X-ray, CT scan, CAT scan, Ultrasound scanning, MRI

Therapeutic & prosthetic devices: 4L
Pacemakers, Defibrillators, ventilators, respirators, heamodialysis machine

Medical application of LASER including safety aspects 2L

Fiber optic application in imaging internal organs 1L

Effect of mm wave and microwave on human body 1L

Electrical safety: 1L
Physiological effect of electricity, micro shock & macro shock hazards, electrical safety standards for human body, basic approaches to shock protection.

Books:

1. J J Carr & J M Brown – "Introduction to Biomedical Equipment Technology" – Pearson Education, Asia
2. Khandpur,Hand book of Biomedical Instrumentation,TMH
3. John G Webster – "Medical Instrumentation, Application & Design" – John Willey & Sons
4. L Cromwell, F J Weibwell & E A Pfeiffer – "Biomedical Instrumentation & Measurements" - PHI
5. Marvin D Weirs – "Biomedical Instrumentation" – Chilton Book Co, London.
6. S K Venkata Ram- "Biomedical Electronics & Instrumentation" – Galgotia Publications Pvt. Ltd.

EC 804H Data-Communication Sytems

Contact: 3L + IT

Credit: 4

Basic data communication concepts: - ˜ı□
Host computers and terminal, modems, parallel and serial transmission, Asynchronomy and Synchronous transmission, Simplex, Half duplex and Duplex communication. Front end processor, Port-sharing device, Line splitters and remote intelligent controllers, Multiplexer: TDM, FDM, WDM. Data compression devices, Demultiplexer.

Data Interfaces and transmission: - 8L
Digital interface standards: RS-232C standard, hand shaking, connecting a DTE in RS-232C, RS-449, RS-422A and RS-432A standards. High-speed desktop serial interfaces. Remote digital transmission: T carrier ISDN, Packet data networks, Digital access, Data Communication Efficiency: Modems, Multi-speed modems, high speed modems, Error Correcting modems Data compression in modems. Short-wave modems, Facsimile and Fax modems.

Data Integrity and Security: - 6L
Data Integrity, Source of error control approaches, Implementation of error control, Echo checking, parity checking and cyclical purity, Hammering code, Checksums, Cyclical Redundancy check, Security and security measuring.

Architectures and Protocols: - 8L
OSI model, Traditional communications architectures: Systems network, architecture and other communication architecture protocols: Polling and selecting, automatic repeat request, common link level protocols. Binary synchronous communications, characters in a BSC frame, Synchronous data link control, Protocols Converters and Code Converters TCP/IP protocols, UDP.

Data transport layer: - 8L
Service provided to the upper layers, Element of transport protocol: Addressing, establishing and releasing connections. Flow control and buffering, Multiphase crash recovery.

Books:

1. Tanenbam: Computer Network, Pearson Education
2. B. A. forouzan, Data communication and networking, TMH, 3rd edition.
3. Bertsekas & Gallanger : Data network, PHI, 2nd Ed.
4. Lack: Computer Network: Protocols, Standards and Interface, PHI, 2nd Ed.
5. Wiliam A, S Hay, Understanding Data Communication Network.
6. Michael, A. Miller, Data & Network Communication, Vikas Publishing.
7. Zheng & Akhtar, Computer Networks for Scientists & Engineers,OUP
8. Stallings, Data & Computer Communication, Pearson Education

EC 804I **Internet Technology**

Contact: 3L + IT
Credit: 4

	2L
Internet connectivity: Dial-up, ISDN, DSL, SONET, ATM, Wireless	2L
Internet Applications: FTP, Telnet, IMAP, POP3, SMTP, WAP, HTTP Mobile IP, VoIP, Multimedia over IP	7L
	12L
Internet Programming: HTML, CGI script, Java Script	16L

Text Books:

1. Practical Unix and Internet Security, by Garfinkel & Spafford, SPD O'Reilly
2. HTML & XHTML: The Definitive Guide, 4th Ed. By Musciano & Kenedy, SPD O' Reilly.
3. Javascript: the Definitive Guide 3rd Ed., by D. Flanagan SPD O' Reilly.

EC 804J **Distributed Computing**

Contact: 3L + IT
Credit: 4

Introduction: - Definition, Goals: Connecting Users and Resources, Transparency, Openness, Scalability; Hardware Concepts; Software Concepts: Distributed Operating Systems, Network Operating Systems, Middleware; The Client-Server Model. 3L

Communication: - Layered Protocols; Remote Procedure Call: Basic RPC Operation, Parameter Passing, Extended RPC Models; Remote Object Invocation; Message-Oriented Communication. 5L

Processes: - Threads; Clients: User Interfaces, Client-Side Software for Distribution Transparency; Servers: General Design Issues, Object Servers; Code Migration; Software Agents. 6L

Naming: - Naming Entities: Names, Identifiers, & Addresses, Name Resolution, The Implementation of a Name Space, The Domain Name System, X.500. 3L

Synchronization: - Clock Synchronization; Logical Clocks; Global State; Election Algorithms: The Bully Algorithm, A Ring Algorithm; Mutual Exclusion: A Centralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Three Algorithms; Distributed Transactions: The Transaction Model, Classification Transactions, Implementation, Concurrency Control. 6L

Consistency and Replication: - Introduction: Reason for Replication, Object Replication; Data-Centric Consistency Models: Strict Consistency, Linearizability and Sequential Consistency, Causal Consistency, FIFO Consistency, Weak Consistency, Release Consistency, Entry Consistency; Client-Centric Consistency Models: Eventual Consistency, Monotonic Reads, Monotonic Writes, Read Your Writes, Writes Follow Reads; Distribution Protocols: Replica Placement, Update Propagation; Consistency Protocols: Primar-Based Protocols, Replicated-Write Protocols. 7L

Fault Tolerance: - Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience: Design Issues, Failure Masking and Replication; Reliable Client-Server Communication: Point-to-Point Communication, RPC Semantics in the Presence of Failures; Reliable Group Communication: Basic Reliable-Multicasting Schemes; Distributed Commit: Two-Phase Commit; Recovery: Check pointing. 6L

Distributed Object-Based Systems: - CORBA; Distributed COM. 4L

Books:

1. *Distributed Systems: Principles and Paradigms* by Andrew S. Tanenbaum and Maarten van Steen; Second Indian Reprint 2003 Edition, Pearson Education.
2. *Distributed Systems: Concepts and Design* by George Coulouris, Jean Dollimore, Tim Kindberg; Third Edition, Pearson Education.
3. *Distributed Computing,Liu,* Pearson Education
4. *Distributed Systems & Networks,**Buchanan,TMH***

References:

1. *Distributed Computing: A Practical Synthesis* by Amjad Umar; Prentice-Hall.
2. *Readings in Distributed Computing Systems* by Thomas S. Casavant and Mukesh Singhal; IEEE Computer Society Press 1994 Edition, IEEE, Los Alamitos, California.

EC 804K Digital Image Processing

Electronics & Communication Engg Old

Contact: 3L + IT
Credit: 4

Digital image fundamentals: - Image digitization	1L
Sampling & quantisation	1L
Image resolution	1L
Colour perception & processing	1L
Image processing: - Pixel based transformation	1L
Geometric transformation	1L
Local processing: - Edge detection, subpixel location estimation Restoration: - Degradation, inverse fitting, Wiener filtering	1L
Binary image processing: - Thresholding, run length encoding	2L
Distance transforms, Medial axis transforms	2L
Morphological operations	1L
Region segmentation & Representation: - Split & merge algorithm	1L
Region growing	1L
Image filtering: - Histogram modification	1L
Linear & Gaussian filters	2L
Contours: - Digital curves	3L
Poly line splitting	2L
Hop along algorithm	2L
Conic & Splines Hough transform	2L
Fourier description	2L
Textures: - Statistical syntactic & model based methods	2L
Image transforms: - Fourier, Hadamard, Discrete Cosine	2L

Wavelets & other orthogonal transforms	2L
Compression of image: - Predictive compression methods, vector quantisation, hierarchical & progressive methods, JPEG, MPEG	3L
Case studies	3L

Books:

1. "Fundamentals of Digital Image Processing" by Jain, Pearson Education
2. "Digital Image Processing",Jahne,Springer
3. "Digital Image Processing" by Gonzalez, 2nd ed., Pearson
4. "Image Processing for Computer Graphics" by Gomes, Springer
5. "Digital Image Processing" by Pratt, 2nd ed., Willey
6. "Algorithms for Image Processing and Computer Vision" by Parker, Willey
7. "Digital Image Processing using MATLAB" by Gonzalez, Pearson Education
8. "Practical Algorithms for Image Analysis" by Seul, Cambridge University Press
9. "Digital Image Processing" by Castleman, Prentice Hall
10. "Pattern Classification" by Duda, 2nd ed., Willey
11. "Image Processing – Analysis & Machine Version" by Sonka, Brooks Cole