CENTRAL INSTITUTE OF TECHNOLOGY
(Centrally Funded Institute Under the Ministry of HRD, Govt. of India)
Bodoland Territorial Council, Kokrajhar, Assam-783370
(B.Tech Syllabus in Electronics and Communication Engineering)

CONTENTS

CENTRAL INSTITUTE OF TECHNOLOGY
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STUDY PLANS

Total Credit Requirements : 222
Total Number of Semesters : 8

1st YEAR: 1st SEMESTER (JULY-DEC)

A. Theory

	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	MA101	Engineering Mathematics -I	3	1	0	4	4
2.	PH101	Engineering Physics	3	1	0	4	4
3.	CS101	Introduction to Computer Programming	3	1	0	4	4
4.	HU101	Communication Skills	3	0	0	3	3
5.	ES101	Environmental Engineering	3	1	0	4	4
Total of theory							19

B. Practicals

	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	PH171	Physics Lab	0	0	3	2	2
2.	CE101	Engineering Graphics	0	1	0	1	1
3.	CE171	Engineering Graphics Lab	0	0	3	2	2
4.	WS171	Workshop Practice -I	0	1	3	3	3
5.	CS171	Computing Lab	0	0	3	2	2
Total of practicals							10

Total of 1st Semester: 29

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1st YEAR: 2nd SEMESTER (JAN-JUNE)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	MA201	Engineering Mathematics -II	3	1	0	4	4
2.	CY201	Engineering Chemistry	3	1	0	4	4
3.	ES201	Basic Electrical Engineering	3	1	0	4	4
4.	ME201	Engineering Mechanics	3	1	0	4	4
5.	EC201	Basic Electronics	3	1	0	4	4
6.	HU201	Professional Ethics and Human value	2	0	0	2	2
Total of Theory							22

B. Practicals							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	CY271	Engineering Chemistry Lab	0	0	3	2	2
2.	WS271	Workshop Practice -II	0	1	3	3	3
3.	EE271	Basic Electrical and Electronics Lab	0	0	3	2	2
Total of Practicals							7

Total of 2nd Semester: 29

***** Approved by GU**

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2nd YEAR: 3rd SEMESTER (JULY-DEC)

A. Theory

	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC301	Electronics Devices and circuits	3	1	0	4	4
2.	EC302	Linear Systems and Signals	3	1	0	4	4
3.	MA301	Engineering Mathematics – III	3	1	0	4	4
4.	IE301	Network Theory	3	1	0	4	4
5.	CS304	Data Structure and Algorithms	3	1	0	4	4
Total of Theory							20

B. Practicals

	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC371	Basic Electronics Lab	0	0	3	3	2
2.	EC372	Linear Signals and Systems Lab	0	0	3	3	2
3.	IE376	Circuit Simulation Lab	0	0	3	3	2
4.	HU370	Language Lab	0	0	3	3	2
Total of Practicals							8

Total of 3rd Semester: 28

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2nd YEAR: 4th SEMESTER (JAN-JUNE)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	HU401	Engineering Economics	3	0	0	3	3
2.	EC401	Digital electronics	3	1	0	4	4
3.	EC402	Analog communication	3	1	0	4	4
4.	EC403	Linear Integrated Circuits	3	1	0	4	4
5.	MA401	Numerical Methods and Computer programming	3	1	0	4	4
6.							
Total of Theory							19

B. Practicals							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC471	Digital electronics Lab	0	0	3	2	2
2.	EC472	Analog communication lab	0	0	3	2	2
3.	EC473	Linear Integrated Circuits Lab	0	0	3	2	2
Total of Practicals							6

Total of 4th Semester: 25

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3rd YEAR: 5th SEMESTER (JULY-DEC)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	HU501	Industrial management and entrepreneurship	3	0	0	3	3
2.	EC501	Electromagnetic Waves	3	1	0	4	4
3.	EC502	Digital Communications	3	1	0	4	4
4.	IE501	Microprocessor and Interfacing	3	1	0	4	4
5.	IE506	Control Theory	3	1	0	4	4
Total of Theory							19

B. Practicals							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	IE571	Microprocessor Lab	0	0	3	2	2
2.	IE573	Control System Lab	0	0	3	2	2
3.	EC573	Digital Communication	0	0	3	2	2
Total of Practicals							6

Total of 5th Semester: 25

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3rd YEAR: 6th SEMESTER (JAN-JUNE)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	HU601	Professional Communication	2	0	0	2	2
2.	EC601	Microwave Engineering	3	1	0	4	4
3.	EC602	VLSI Design	3	1	0	4	4
4.	EC603	Digital Signal Processing	3	1	0	4	4
5.	EC604	Communication Networks	3	1	0	4	4
6.	EC61*	Elective	3	0	0	3	3
Total of Theory							21

B. Practical							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC672	VLSI Design Lab	0	0	3	2	2
2.	EC673	Digital signal processing lab	0	0	3	2	2
3.	EC671	Microwave lab	0	0	3	2	2
Total of Practical							6

Total of 6th Semester: 27

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4th YEAR: 7th SEMESTER (JULY-DEC)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC71*	Elective	3	0	0	3	3
2.	EC71*	Elective	3	0	0	3	3
3.	EC71*	Elective	3	0	0	3	3
4.	EC71*	Elective	3	0	0	3	3
5.	EC71*	Elective	3	0	0	3	3
Total of Theory							15

B. Sessionals							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC791	Major Project –I	0	0	12	12	8
2.	EC792	Report and Presentation on Practical Training – II	-	-	-	-	3
3.	EC770	Seminar	0	0	3	3	2
Total of Practicals							13

Total of 7th Semester: 28

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4th YEAR: 8th SEMESTER (JAN-JUNE)

A. Theory							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC81*	Elective	3	0	0	3	3
2.	EC81*	Elective	3	0	0	3	3
3.	EC81*	Elective	3	0	0	3	3
Total of Theory							9

B. Sessionals							
	Code	Subjects	Contacts (periods per week)				Credit points
			L	T	P	Total	
1.	EC891	Major project -II	0	0	18	18	12
2.	EC892	Project Defense	-	-	-	-	4
3.	EC893	Comprehensive Viva Voce	-	-	-	-	8
Total of Practicals							24

Total of 8th Semester: 33

List of Elective Courses in Electronics and Communication Engineering

1. EC615: MOBILE COMMUNICATION
2. EC616: EMBEDDED SYSTEM
3. IE615: POWER ELECTRONICS
4. EC710: ANTENNA AND WAVE PROPAGATION
5. EC711: CRYPTOGRAPHY
6. EC712: SPREAD SPECTRUM COMMUNICATIONS
7. EC713: WIRELESS SYSTEM
8. EC714: DIGITAL IMAGE PROCESSING
9. EC715: BIOMEDICAL INSTRUMENTATION
10. EC716: OPERATING SYSTEM
11. EC810: RADAR AND ELECTRONIC NAVIGATION SYSTEMS
12. EC811: ARTIFICIAL NEURAL NETWORK
13. EC812: DSP PROCRSSORS AND ARCHITECTURE
14. EC813: DATABASE MANAGEMENT SYSTEMS
15. EC814: SATELLITE COMMUNICATION

DETAIL SYLLABUS

BASIC SCIENCE COURSES

MA301: ENGINEERING MATHEMATICS –III

Code: MA301
Credits: 04
L-T-P: 3-1-0

Partial Differential Equations

Basic concepts, formation of partial differential equations, equation solvable by direct integration, linear and non-linear equations of first order. Homogenous linear equations with constant coefficients, solutions of heat equations, wave equations, transmission line equations and Laplace equations.

Tensor Analysis

Curvilinear coordinates, unit vectors in curvilinear system, representation of a vector in terms of unit base vectors, contravariant and covariant components of F, arc length and volume element in orthogonal curvilinear coordinates. Transformations of coordinates. Definition of tensors, fundamental operations with tensors, Symmetric and skew-Symmetric tensors, Riemannian space and metric tensor, Conjugate tensor, Christoffel symbols.

Calculus of Complex Variables

Analytic functions, C-R equations, conjugate functions, Harmonic functions, orthogonal systems.
Formation of analytic functions, conformal mapping, integration of a complex functions, Cauchy's Integral Theorem, power series representation of complex functions, Laurent's Series, singularities, Residue Theorem.

Transformations

Laplace transformation of elementary functions, inverse Laplace transform, Linearity, Laplace transform of derivatives and integrals, shifting Theorems, Laplace transform of unit step function, Dirac-delta function, Differentiation and integration of transforms, convolution, Application to differential equations.
Definition, properties, Z-transform of some basic sequences, Z-transforms of some basic discrete functions, Shifting theorems.

Texts / References:

1. *B.S. Grewal: Higher Engg. Mathematics, Khanna Publishers*
2. *Gilbert Strang: Linear Algebra and applications, Thomson Books*
3. *P.L. Meyer: Introduction to Probability & Statistics*
4. *Shanti Narayan: Functions of Complex Variables, S. Chand & Co.*
5. *Murray R. Spiegel: Laplace Transforms, Thomson Books*
6. *I.M. Snedon: Elements of Partial Differential Equations, S. Chand & Co.*

MA401: NUMERICAL METHODS & COMPUTER PROGRAMMING

Code: MA401
Credits: 04
L-T-P: 3-1-0

Computer Arithmetic

Floating point Arithmetic, Normalization, Approximations and errors, types of errors in computations

Transcendental and Polynomial Equations

Methods of iteration for finding solution of transcendental and equations: Newton Raphson Method, Regula-Falsi Method, Bisection Method, Secant Method.

Solution of linear simultaneous equations by Gauss Elimination Method & Gauss Siedal Method.

Curve Fitting and Interpolation

Linear and non-linear Regression Analysis. Difference table, Newton's Forward and Backward interpolation formulae, Lagrange's Interpolation Formula, Divided differences and Newton's general formula.

Numerical Differentiation & Integration

Numerical differentiation, Numerical Integration: Trapezoidal and Simpson's Rules. Gaussian Quadrature Formula.

Numerical Solution of Ordinary Differential Equations

Euler method, Modified Euler Method, Taylor Series Method, Runge - Kutta Method and Predictor – Corrector Method.

Lab: Developing C programs for the following methods:

1. Numerical integration by Trapezoidal & Simpson's Rules
2. Various iteration methods for solving transcendental and algebraic equations: viz. Newton Raphson Method, Bisection Method, Regula – Falsi Method, Secant Method
3. Gauss – Siedal Iteration Method
4. Various matrix operations and their uses as sub – routines
5. Use of pointers, data structures, loops, arrays

Texts / References:

1. *E. Balaguruswamy: Numerical Methods, Tata McGraw Hill*
2. *Jain, Iyengar and Jain: Numerical Methods for Scientific and Engineering Computations, New Age International, New Delhi*
3. *Sastry, S.S.: Introductory Methods of Numerical Analysis, PHI*
4. *B.S. Grewal: Numerical Methods for Engineering and Science, Khanna Publishers*
5. *Schaum's Outlines: Numerical Analysis, Tata McGraw Hill*

HUMANITIES & SOCIAL SCIENCE COURSES

HU401: ENGINEERING ECONOMICS

Code: HU401
Credits: 03
L-T-P: 3-0-0

Definition of Economics, Consumer behaviour, Utility analysis and demand analysis, Kinds of Demand, Law of Demand and Law of Supply, Elasticity of Demand: Types and Measurement, Scope of Economics including economics of environment and e-commerce.

Market forms-Perfect and Imperfect markets, Features of Perfect competition, Monopoly and Monopolistic competition. Price and output determination under Perfect Competition, Monopoly, Monopolistic and Oligopoly etc., Concept of Production function, Cost Analysis, Estimation of cost function-Profit and Break Even Analysis.

National Income, GNP and NNP, Per-Capita Income, Source of Public Revenue-Tax Revenue and Non-Tax Revenue, Direct and Indirect Tax. Inflation and Deflation. Banking-Definition - Types of Banks. Concept of Investment Analysis

Features of Indian Economy, Planning in India, Objectives. Economic Reforms in India-Concept of Economic Liberalization, Privatization and Globalization. Unemployment Problem in India-Types, Causes and remedial measures.

International Trade, Gains from International Trade, The World Trading Environment and Multinational Corporations, BPO etc., Function and Role of IMF, World Bank and WTO. Concept of Stock Exchange Market and Market for Securities.

Reference Book:

1. *M.L. Jhingan—Micro Economic Theory*
2. *Sumitra Paul-Managerial Economics*
3. *Joel Dean—Managerial Economics*

HU501: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Code: HU501
Credits: 03
L-T-P: 3-0-0

Meaning and Concept of Management, Principles and function of Management, Concept of Organizational Behaviour, Function of a Manager—Planning, Organizing, Coordinating and Controlling. Motivation—implication of Managers and application. Leadership and Decision Making : Qualities and Styles of Leadership, Decision making process.

Individual Process in Organizations-Perception, attitude and personality, Factors that affect them, How they influence people. Group Process in Organizations, Group formation, Group effectiveness, Group Conflict.

Evolution, Role and Status of Human Resource Management in India. Recruitment and Selection Process in Organization, Job Analysis, Job Specification, Selection Process-Test and Interview. Trade Union and Collective Bargaining

Entrepreneurship-Meaning, Types of entrepreneur, Qualities of an entrepreneur, Role of Entrepreneur, Factors affecting entrepreneurial growth. Entrepreneurship Development Programme-Concept, Objective and Importance, Engineer Entrepreneurship Training Programme Scheme

Small Scale Industry-Definition, Types of Small Scale Industry, How to Set up Small Scale Industry, Role and Problem of Small Scale Industry. Concept of Joint Stock Company, Private and Public Limited Company. Source of Finance for Entrepreneur-Bank, Government and Financial Institutions etc.

Reference Books:

1. *S.S. Khanka-Organizational Behavior.*
2. *S.S. Sarkar, R.K.Sharma and S.K.Gupta – Business Organization and Entrepreneurship Development.*
3. *Cynthia L. Greene – Entrepreneurship.*

HU601: PROFESSIONAL COMMUNICATION

Code: HU601
Credits: 02
L-T-P: 2-0-0

Oral Communication: Aims at improving the oral communication skills. Public speaking skills, features of effective speech – verbal – non-verbal, Presentation skills, Group discussion. Mock Interviews.

Written Communication: Focuses on improving the writing skills. A review of grammar, transformation of sentences; reading comprehension; Precis-writing, skills to express ideas through various kinds of essays; business administrative and E-correspondence, business reports, technical documentation & project proposal writing and CVs/ resumes; Application letters, Notices, Agenda, Minutes & Memos. Case Analysis.

Organization Communication: Attempts to acquaint students with the process and requirements of communication in organizations. It includes the objectives of communication, Channels of communication, Barriers in Communication, Non-verbal & Cross-cultural communication, Meetings, Conferences, Press Conference and Press release. Business Communication Technology: Audio-Visual aids, Internet, e-mail. Creative Communication: Slogan-writing, Advertisement.

Texts / References:

1. *Wren & Martin., English Grammar*
2. *John Metchell., How to write Reports*
3. *Mark McCormack., Communication*
4. *Rajendra Pal & J.S. Korlahalli, Essentials of Business Communication*

PROGRAMME CORE COURSES

EC301: ELECTRONICS DEVICES AND CIRCUITS

Code: EC301
Credits: 04
L-T-P: 3-1-0

Single Stage Amplifiers: Review, Small Signal Analysis of Junction Transistor, Frequency response of Common Emitter Amplifier, Common Base Amplifier, Common Collector Amplifier, JFET Amplifiers, Common Drain (CD) Amplifier, Common Gate Amplifier, Gain Band Width Product.

Multi Stage Amplifiers: Multi Stage Amplifiers Methods of Inter Stage Coupling, n –Stage Cascaded Amplifier, Equivalent Circuits, Miller's Theorem, Frequency Effects, Amplifier Analysis, High Input Resistance Transistor Circuits. Cascode – Transistor Configuration, CE-CC Amplifiers, Two Stage RC Coupled JFET amplifier (in Common Source (CS) configuration), Difference Amplifier.

High Frequency Transistor Circuits: Transistor at High Frequencies, Hybrid-π Common Emitter Tranconductance Model, Determination of Hybrid- π Conductances, Variation of Hybrid Parameters with |IC|, |VCE| and Temperature. The Parameters ¦t, expression for ¦b, Current Gain with Resistance Load, CE Short Circuit Current Gain, Hybrid– π(pi) Parameters, Measurement of ¦t, Variation of Hybrid – π Parameters with Voltage, Current and Temperature, Design of High frequency Amplifier.

Power Amplifiers: Class A Power Amplifier, Maximum Value of Efficiency of Class A Amplifier, Transformer Coupled Amplifier, Transformer Coupled Audio Amplifier, Push Pull Amplifier, Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier), Phase Inverters, Class D Operation, Class S Operation, Heat Sinks.

Tuned Amplifiers-I: Single Tuned Capacitive Coupled Amplifier, Tapped Single Tuned Capacitance Coupled Amplifier, Single Tuned Transformer Coupled or Inductively Coupled Amplifier, CE Double Tuned Amplifier, Application of Tuned Amplifiers.

Tuned Amplifiers-II: Stagger Tuning, Stability Considerations, Tuned Class B and Class C Amplifiers, Wideband Amplifiers, Tuned Amplifiers.

Voltage Regulators: Terminology, Basic Regulator Circuit, Short Circuit Protection, Current Limiting, Specifications of Voltage Regulator Circuits, Voltage Multipliers.

Switching and IC Voltage Regulators: IC 723 Voltage Regulators and Three Terminal IC regulators, DC to DC Converter, Switching Regulators, Voltage Multipliers, UPS, SMPS.

TEXT BOOKS:

1. Integrated Electronics – J. Millman and C.C. Halkias, Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits, Theodore F. Bogart Jr., J.S. Beasley and G. Rico, Pearson Edition, 6th Edition, 2004.

REFERENCES:

1. *Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition,2006.*
2. *Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5th ed.*
3. *Micro Electronic Circuits: Analysis and Design – M.H. Rashid, Thomson PWS Publ., 1999.*
4. *Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 1998.*
5. *Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.*
6. *Electronic Circuit Analysis – K. Lal Kishore, BS Publications, 2004.*

EC 302 LINEAR SYSTEM AND SIGNALS

Code: EC302
Credits: 04
L-T-P: 3-1-0

Signal Analysis: Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Exponential and sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function.

Fourier Series Representation of Periodic Signals : Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

Fourier Transforms: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

Signal Transmission Through Linear Systems: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Convolution and Correlation of Signals: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

Laplace Transforms: Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–Transforms: Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a

discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. *Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.*
2. *Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.*

REFERENCES:

1. *Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.*
2. *Network Analysis - M.E. Van Valkenburg, PHI Publications, 3rd Edn., 2000.*
3. *Signals & Systems Analysis Using Transformation Methods & MAT Lab - Robert:, TMH, 2003.*
4. *Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education., 3rd Edition, 2004.*

CS304 DATA STRUCTURE

Code: CS304
Credits: 04
L-T-P: 3-1-0

Elementary data structures: Arrays and strings; packing; space arrays; algorithm development; complexity; simple example of algorithm development; recursion.

Sequential Search: Divide and conquer binary search; selection and insertion sort; merge-sort; quick sort; complexity of sorting.

Linear lists - stacks; stack use-post fin notation recursion removal. queues-circular queues.
Linked list-definition on Pascal and C; creation and deletion of nodes; circular and deletion of nodes; circular and doubly linked lists; applications of list.

Graphs and representation sets-UNION and FIND operations; graph algorithms; optimisation and greedy method; minimum spanning tree, shortest path.
Trees, A VL trees; threaded trees; heapsort; tries and B-trees; external search.

Tables and information retrieval; hashing; depth first and breadth first search; examples of backtracking. String algorithms-pattern search and text editing.

Structured approach to programming step wise refinement approach.
Reasoning about programs, program specification, pre-and post condition, weakest pre-conditions, program assertions, loop invariants. Programming style-documentation, basic concepts of program testing.

Suggested Text Books & References

1. Wirth Niclaus, "Algorithms +Data Structures = Programs", Prentice Hall Internationa t, 1978.
2. Horwitz, E., and Sahni, S. "Fundamentals of data structures", Computer Science Press. 1978.
3. Knuth, D. "The art of computer programming", Vols. 1-2, Addision-Wesley, 1970-80.
4. Aho A.V., Hopcroft, and Ullman; J.E, "Data Structures and Algorithms", Admission Weseley,1982.
5. Tanonbaum, A.M. and Augenstein, MJ., "Data Structures with Pascal", Prentice II all International, 1985.
6. Trembley and Sorenson, "Data Structures using Pascal McGraw Hill", 1985.
7. Stubbas, D., "Data Structures with Abstract Data Types and Modula 2", Brooks & Cole publications Compo 1987.

IE301: NETWORK THEORY

Code: IE301
Credits: 04
L-T-P: 3-1-0

Basic Circuit Concepts

Lumped circuits – circuit elements, ideal sources (independent and dependent), linear passive parameters R, L and C, V-I relationship of circuit elements – Sinusoidal voltage and current: RMS value, form factor – Kirchoff's Laws – analysis of series and parallel circuits – network reduction: voltage and current division, source transformation, star/delta transformation

Transient Analysis of First & Second Order Circuits

Source free response of RL and RC circuits – forced (step) response of RL and RC circuits – source free response of RLC series circuit – forced (step) response of RLC series circuit – forced response of RL, RC and RLC series circuit to sinusoidal excitation – Time constant and natural frequency of oscillation of circuits – Laplace Transform application to the solution of RL, RC & RLC circuits – Initial and final value theorems and applications – concept of complex frequency – driving point and transfer impedance – poles and zeros of network function.

Sinusoidal Steady State Analysis

Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (voltampere), power factor and energy associated with these circuits – concept of complex power – phasor diagram, impedance triangle and power triangle associated with these circuits – resonance in series and parallel circuits – Q factor, half-power frequencies and bandwidth of resonant circuits.

Multi Dimensional Circuit Analysis & Network Theorems

Node–voltage analysis of multi node circuit with current sources – rules for constructing nodal admittance matrix [Y] for solving matrix equation [Y]V=I - Mesh-current analysis of multi node circuits with voltage sources – rules for constructing mesh impedance matrix[Z] for solving matrix equation [Z]I=V – Super position theorem – Thevenin's theorem – Norton's theorem – Reciprocity theorem – Compensation theorem – Tellegen's theorem – Millman's theorem – maximum power transfer theorem for variable resistance load, variable impedance load and variable resistance and fixed reactance load.

Coupled Circuits and Three Phase Circuits

Coupled circuits: mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits – Three phase circuits: three phase balanced/ unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages & currents – power and power factor measurements in three phase circuits.

REFERENCES:

1. Joseph edminister : Electric circuits, Schaums Outline Series
2. M.L.Soni and J.C Gupta : Electrical Circuit Analysis,Dhanpat Rai and Sons, New Delhi
3. W.H.hayt and J.E.Kemmerly , Engineering Circuit analysis, McGraw-Hill, New york
4. Theodre F.Bogrart, Jr.Electric circuits, Macmillan /McGraw-Hil

ECE401: DIGITAL ELECTRONICS

Code: EC401
Credits: 04
L-T-P: 3-1-0

Combinational Logic Design: Overview of codes and Boolean algebra, simplification of Boolean expressions, Logic gates – Implementation of combinational logic functions – Half adder, full adder – Half subtraction – full subtract or – parallel adder – binary adder – Magnitude comparator – encoder and decoders – multiplexers – code converters – parity generator/checker.

Sequential Circuits: Flip – flops (all types) – Truth table and excitation table, synchronous and Asynchronous Counter design – Up-down counter, BCD Counter – Modulus counters – shift registers – timing sequence – racing problems – Hazards – Hazard free Asynchronous circuits.

Semiconductor memories: Main memory operations, Instructions and instruction sequencing, addressing modes, registers and addressing, stacks and queues, ROM circuits, programmable ROM, static and dynamic RAM using BJT and MOS transceivers.

Digital Integrated Circuits: Performance parameters:- Rise time – fall time – switching speed – Noise margin – propagation delay – Fan in / Fan out. Study of TTL, ECL, I2L, MOS – CMOS families. Comparison of logic families.

System Design Using Digital Integrated Circuits: Designs of combinational and sequential circuits with standard IC's – Display drivers – Frequency counters with display unit - Programmable logic devices– PAL, PLA, FPGA.

TEXT/REFERENCES:

1. *Morris Mano, "Digital Design", Prentice Hall of India.*
2. *Floyd, "Digital Fundamentals", Universal Book Stall, New Delhi.*
3. *Albert Paul Malvino and Donald P Leach, "Digital principles and Applications", McGraw Hill.*
4. *Herbert Taub and Donald Schilling, "Digital Integrated Circuits", McGraw Hill.*

EC402: ANALOG COMMUNICATION

Code: EC402
Credits: 04
L-T-P: 3-1-0

Introduction : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

DSB Modulation: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

SSB Modulation: Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

Angle Modulation: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

Noise: Noise in Analog communication System, Noise in DSB& SSB System Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis.

Transmitters: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Pulse Modulation: Time Divison Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM.

TEXT/REFERENCES:

1. *Electronic Communications – Dennis Roddy and John Coolean , 4th Edition, PEA, 2004*
2. *Communication Systems – B.P. Lathi, BS Publication , 2004.*
3. *Electronic Communications Sys. – Modulation&Transmission-Robert J.Schoenbeck, 2nd Edition, PHI.*
4. *Analog and Digital Communications – Simon Haykin, John Wiley, 2005.*
5. *Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005*
6. *Electronic and Radio Engineering – FE Terman, Mc Graw Hill, 4th edition,1995.*
7. *Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004*

EC403: LINEAR INTEGRATED CIRCUITS

Code: EC403
Credits: 04
L-T-P: 3-1-0

Integrated Circuits: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp specifications, DC and AC characteristics, 741 op-amp & its features, FET input. Op-Amps, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rates, CMRR, PSRR, drift, Frequency Compensation technique.

Linear Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers.

Non-Linear Applications of Op-Amps: Non- Linear function generation, Comparators, Multi-vibrators, Triangular and Square wave generators, Log and Anti log amplifiers, Precision rectifiers.

Oscillators and Waveform Generators: Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Applications of VCO (566).

Timers & Phase Locked Loops: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators.

D to A & A to D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

Analog Multipliers and Modulators: Four Quadrant multiplier, balanced modulator, IC 1496, Applications of analog switches and Multiplexers, Sample & Hold amplifiers.

TEXT/REFERENCES:

1. *Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.*
2. *Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.*
3. *Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.*
4. *Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.*
5. *Micro Electronics – Millman, McGraw Hill,1988.*
6. *Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ. Ltd./ Elsevier, 1971.*

EC710: ANTENNA AND WAVE PROPAGATIONS

Code: EC501
Credits: 04
L-T-P: 3-1-0

Antenna Fundamentals: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters [1] - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Beam Area, Radiation Intensity, Beam Efficiency, Directivty, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Hight. Related Problems.

Thin Linear Wire Antennas [2, 1]: Retarded Potentials, Radiation from Small Electric Dipole, Quarterwave Monopole and Halfwave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Hight. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas [1] : Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and Rr relations for small loops.

Antenna Arrays: 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays [2, 1]. Directivity Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations.

Non-Resonant Radiators: Introduction, Travelling wave radiators – basic concepts, Longwire antennas – field strength calculations and patterns, V-antennas, Rhombic Antennas and Design Relations, Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

VHF, UHF and Microwave Antennas - I: Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics [1, 3]. Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrainian Feeds [1, 3].

VHF, UHF and Microwave Antennas - II: Horn Antennas [1] – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications. Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

Wave Propagation - I [3,2]: Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt, Flat and

Spherical Earth Considerations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance – Calculations for flat and spherical earth cases, Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption.

Wave Propagation – II [3,2] : Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation, Tropospheric Scattering.

TEXT/REFERENCES:

1. *Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, TMHl, 3rd Edn., 2003.*
2. *Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed.,2000.*
3. *Antenna Theory - C.A. Balanis, John Wiley & Sons, 2nd ed., 2001.*
4. *Antennas – John D. Kraus, McGraw-Hill, SECOND EDITION, 1988.*
5. *Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.*

EC502: DIGITAL COMMUNICATION

Code: EC502
Credits: 04
L-T-P: 3-1-0

Pulse Digital Modulation: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Compading in PCM systems. Differential PCM systems (DPCM).

Delta Modulation: Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

Digital Modulation Techniques: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

Data Transmission : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK,QPSK.

Information Theory: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

Source Coding: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

Linear Block Codes: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

Convolution Codes: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT/REFERENCES:

1. *Digital communications - Simon Haykin, John Wiley, 2005 p*
2. *Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003*
3. *Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.*
4. *Digital Communications – John Proakis, TMH, 1983.*
5. *Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.*
6. *Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.*

IE501: MICROPROCESSORS AND MICROCONTROLLERS

Code: IE501
Credits: 04
L-T-P: 3-1-0

Architecture of Microprocessors: General definitions of mini computers, microprocessors, micro controllers and digital signal processors. Overview of 8085 microprocessor. Overview of 8086 microprocessor. Signals and pins of 8086 microprocessor

Assembly language of 8086: Description of Instructions. Assembly directives. Assembly software programs with algorithms

Interfacing with 8086: Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255, 8254, 8279, 8259, 8259 etc. Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

Coprocessor 8087: Architecture of 8087, interfacing with 8086. Data types, instructions and programming

Architecture of Micro controllers: Overview of the architecture of 8051 microcontroller. Overview of the architecture of 8096 16 bit microcontroller.

Assembly language of 8051: Description of Instructions. Assembly directives. Assembly software programs with Algorithms.

Interfacing with 8051: Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs, etc.

High end processors: Introduction to 80386 and 80486

TEXT BOOKS

1. Ramesh S.Gaonkar, “Microprocessor - Architecture, Programming and Applications with the 8085”, Penram International publishing private limited, fifth edition.
2. A.K. Ray & K.M.Bhurchandi, “Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing”, TMH, 2002 reprint.

REFERENCES

1. Douglas V.Hall, “Microprocessors and Interfacing: Programming and Hardware”, TMH, Third edition.
2. Yu-cheng Liu, Glenn A.Gibson, “Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design”, PHI 2003.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, “The 8051 microcontroller and embedded systems”, Pearson education, 2004.

IE506: CONTROL THEORY

Code: IE503
Credits: 04
L-T-P: 3-1-0

Control System Components and Transfer Function

System concept, open loop and closed loop systems, mathematical modeling of mechanical and electrical systems, Transfer function of linear systems, Block diagram representation, and reduction techniques. Signal flow graph. Mason's gain formula, system components, potentiometer, techogenerator, a.c. and d.c. servomotors, synchros, stepper motor**.**

Time Response

Time response of first, second and higher order systems to impulse, step and ramp inputs, Time response specifications, types of systems, steady state error and error constants. Basic control action and automatic controllers, Effect of P, I, D, PI, PD and PID controllers on system performance, Sensitivity of system**.**

Stability Analysis of Linear Systems:

Concept of stability, necessary condition for stability, absolute and relative stability,
Routh Hurwitz criterion, Construction of Root loci and its application, Stability analysis of electrical systems.

Frequency Domain Analysis:

Correlation between time and frequency response, frequency domain analysis, Bode plot, Gain Margin, Phase Margin, Polar plot, Nyquist Criterion, effect of feed back
on frequency domain analysis, constant M circle, N circle.

Design and Compensation

Design consideration of control system, lead, lag, lead-lag compensation, Design of compensating network using bode plots and root locus.

Text/Reference Books:

1. Modern control system – Ogata
2. Automatic control system – B.C.Kuo
3. Modern control system – Nagrath & Gopal
4. Control system design – Graham C.Goodwin
5. Linear control system - Prof. B.S.Manke

EC601: MICROWAVE ENGINEERING

Code: EC601
Credits: 04
L-T-P: 3-1-0

Microwave Transmission Lines

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide. Related Problems.

Circular Waveguides

Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes. Impossibility of TEM mode. Microstrip Lines– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor. Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients. Related Problems.

Waveguide Components and Applications – I

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2 Hole, Bethe Hole types.

Waveguide Components and Applications - II

Ferrites– Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator. Scattering Matrix– Significance, Formulation and Properties. S Matrix Calculations for – 2 port Junction, E plane and H plane Tees, Magic Tee, Directional Coupler, Circulator and Isolator. Related Problems.

Microwave Tubes – I

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

HELIX TWTS

Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations.

M-type Tubes
Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

Microwave Solid State Devices
Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

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

TEXT BOOKS :
1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

REFERENCES :
1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
5. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
6. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998

EC602: VLSI

Code: EC602
Credits: 04
L-T-P: 3-1-0

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance RS and its concept to MOS, Area Capacitance Units, Calculations - τ - Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers

Subsystem Design: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements.

Semiconductor Integrated Circuit Design: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach.

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chiplevel Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

TEXTBOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell,
PHI, 2005 Edition.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.

REFERENCES:

1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson
Learning.
2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
3. Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

EC 603 DIGITAL SIGNAL PROCESSING

Code: EC603
Credits: 04
L-T-P: 3-1-0

Introduction: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

Discrete Fourier Series: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

Fast Fourier Transforms: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency, FFT Algorithms, Inverse FFT, FFT with General Radix.

Realization of Digital Filters: Applications of z-transforms, solution of difference equations of digital filters. System function, stability criterion, frequency response of stable systems. Realization of digital filters – direct, canonic, cascade and parallel forms, Lattice structures.

IIR Digital Filters: Analog filter approximations – Butter worth and Chebshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step and impulse invariance techniques, Spectral transformations.

FIR Digital Filters: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

Multirate Digital Signal Processing: Decimation, interpolation, sampling rate conversion, filter design and implementation for sampling rate conversion.

Introduction To DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, Multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Examples: Features of TMS 320CXX Processors, Internal Architecture, External memory accesses, Pipeline operations, Peripherals.

TEXT BOOKS:

1. Digital Signal Processing : Principals, Algorithms and Applications - Proakis, J.Gard and D.G.Manolakis, 3rd Edn.,,PHI, 1996.
2. Fundamentals of Digital Signal Processing – Robert J. Schilling & Sandra L. Harris, Thomson, 2005.

REFERENCES :

1. Discrete Time Signal Processing – A.V. Oppenheim and R.W. Schaffer, PHI, 1989.
2. Fundamentals of Digital Signal Processing – Loney Luderman.
3. Digital Signal Processing – S. Salivahanan et al., TMH, 2000.
Digital Signal Processing – Thomas J. Cavicchi, WSE, John Wiley, 2004.
4. Digital Signal Processors, Architecture, Programming & Applications, - B. Venkata Ramani, M.
Bhaskar, TMH, 4th reprint, 2004.

EC 604 COMMUNICATION NETWORKS

Code: EC604
Credits: 04
L-T-P: 3-1-0

Communication Networks–An Introduction and Overview: Communication Switching, Circuit Switching, Message and Packet Switching, Connectionless and Connection Oriented Packet Switching.

Communication Process and Layered Architecture: Communication between Two Computers and the Layering Concept, OSI Layers and Protocols.

Standards, Physical Layer: Data link Layer Lesson 11 Network Layer, Network Layer continued, X.25, Transport and Session Layers, Application & Presentation Layers.

Local Area Networks: LAN Topologies, Access Mechanisms and Media, Contention Based LANs, Contention Based LANs Continued, Token Passing LANs.

Metropolitan Area Networks: Distributed Queue Dual Bus (DQDB), Fibre Distributed Data Interface (FDDI).

Internet and Internet Protocol Suite: Internet and IPv4, IP addressing. ICMP, IPv6, Narrowband and Broadband ISDN

ISDN: Data Rates, Access Channels Types, Reference Points, Services and Standards.

Text Books:

1. Computer Networks — Andrew S Tanenbaum,4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

ELECTIVE COURSES

EC501 ELECTROMAGNETIC WAVES

Code: EC615
Credits: 03
L-T-P: 3-0-0

Electromagnetic waves: Electromagnetic wave equation, wave equation, wave equation for free space. Uniform plane wave-characteristic impedance or intrinsic impedancewave propagation in a lossless medium, conducting medium, good dielectric, good conductor-Depth of penetration- Polarization, Linear polarization, circular polarization and elliptical polarization-Reflection and Refraction of plane waves-Surface waves.

Guided waves: Introduction-Waves between parallel planes-Transverse electric waves, Transverse magnetic waves, Transverse electromagnetic waves-characteristics of TE, TM and TEM waves-Wave impedances –Electric field and current flow with conductor waves in coaxial and modes –Strip lines and Micro strip lines.

Rectangular Wave Guides: Rectangular waveguide introduction-TE and Tm waves in rectangular waveguide-Dominant mode-Impossibility of TEM waves in wave guides- Wave impedance and characteristic impedance- Excitation methods for various modes.

Circular Wave Guides: Introduction –TE and TM waves in circular waveguide- Wave impedance-Attenuation factor and Q of wave guides- Wave impedance- Excitation modes in circular wave guides.

Microwave Resonators: Introduction –coaxial resonator- Waveguide, rectangular and circular cavity resonator-cavity excitation and tuning.-Q factor of micro wave cavities-Unloaded Q of Rectangular cavity.

Text Book:

1. Edward C .Jordan and Keith G. Balaman, "Electromagnetic waves and radiating systems", Second Edition, Prentice Hall India,2000.

References:

1. Dananjayan .P, "Electromagnetic waves and waveguides", Lakshmi publications, 1st Edition, 2004.
2. 2.David.K.Cheng, "Field and wave Electromagnetics",Second edition, Pearson Education, 2002.

IE615: POWER ELECTRONICS

Code: IE615
Credits: 03
L-T-P: 3-0-0

Power semiconductor devices: Power diodes-types, power transistors, thyristor family, SCRs, Triac, GTOs, power MOSFETs, IGBTs, MCTs-static and dynamic characteristics, protection circuits, series and parallel connections, turn-on characteristics, turn off characteristics.

Controlled rectifiers- single phase and three phase converters-power factor improvements-design of converter circuits-AC voltage controllers-single phase and three phase-cyclo converters-single phase and three phase, design of AC voltage controller circuits.

DC choppers – principle of step down and step up operations – step down chopper with RL load, Classes of chopper, MOSFET/IGBT choppers.

DC to AC converters: Thyristor inverters, McMurray-McMurray Bedford inverter, current source inverter, voltage control waveform control, inverters using devices other than thyristors, vector control of induction motors.

DC and AC power supplies: Switched mode, resonant, bi-directional and multistage conversions, buck, boost, buck boost regulators. UPS-block diagram, types. Drive requirements and design of simple drive circuits for power BJT, MOSFET and IGBT. Advanced control of power electronic circuits using microprocessors, microcontrollers, isolation amplifier circuits, synchronization circuits.

Books/ References:

1. *M. H. Rashid, Power Electronics: Circuits, Devices and Applications, 3rd ed., Pearson Education, Delhi, 2002*
2. *N. Mohan, T. M. Underland, and W. P. Robbins, Power Electronics: Converter, Applications and Design, John Wiley & Sons, New York, 1995*
3. *P. S. Bimbhra, Power Electronics, Khanna Publishers, New Delhi, 2002*
4. *G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, Thyristorised Power Controllers, New Age International Publishers, New Delhi, 1996*

EC810: RADAR & ELECTRONIC NAVIGATION SYSTEMS

Code: EC710
Credits: 03
L-T-P: 3-0-0

Introduction: Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems.

Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment). Related Problems.

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler Radar.

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar– Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range, Acquisition and Scanning Patterns. Comparison of Trackers.

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers: Noise Figure and Noise Temperature. Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, SECOND EDITION, McGraw-Hill, 1981.
2. Introduction to Radar Systems – Merrill I. Skolnik, THIRD EDITION, Tata McGraw-Hill, 2001.

EC615: WIRELESS MOBILE COMMUNICATION

Code: EC711
Credits: 03
L-T-P: 3-0-0

Cellular Mobile Radio Systems: Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

Interference: Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

Cell Site and Mobile Antennas : Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

Digital Cellular Networks: GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

TEXTBOOKS :

1. Mobile Cellular Telecommunications – W.C.Y. Lee, MC Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

REFERENCES :

1. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.
2. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
3. Cellular & Mobile Communications – Lee, MC Graw Hill.

EC711 CRYPTOGRAPHY

Code: EC712
Credits: 03
L-T-P: 3-0-0

Introduction : Introduction to Security attacks, services and mechanisms, Introduction to cryptology. Conventional Encryption model, classical encryption techniques-substitution ciphers & transposition ciphers, cryptanalysis, stereography, stream & block ciphers.

Modern Block ciphers: Block Ciphers principles, Shandars (DES), Strength of DES, Differential & Linear Cryptanalysis of DES, Block cipher model of operation, triple DES, IDEA encryption & decryption, Strength of IDES, Confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Principles of Public Key Cryptography: principle of public key cryptography, prime and relative prime numbers, modular arithmetic, RSA algorithm, security of RSA key management.

Authentication recruitments, Authentications functions, and Message Authentication codes, Digital Signatures, authentication protocols Digital signatures Standard (DES), proof of digital signatures algorithm.

Electronics mail security: pretty good privacy (PGP), S/MIME IP security: IP security overview, architecture, Authentication header, encapsulating security payloads, combining security association, key management.

Web security: security socket layer & transport layer security, secure electronic transaction (SET)

System security: intruders, viruses and related threads, firewall design principles.

Books and References:

1. *William Stalling " Cryptography and networks security: Principles and Practice," Prentice Hall, New jersey,*
2. *Johannes A Buchmann, "Introduction to cryptography," Spiringer–verlag*
3. *Bruce Schiener, "Applied Cryptography"*.

EC712: SPREAD SPECTRUM COMMUNICATIONS

Code: EC712
Credits: 03
L-T-P: 3-0-0

Introduction: Origins of SS communications – Advantages of Spectrum spreading –Types of techniques used for spread spectrum – Processing gain and other fundamental parameters – Jamming methods – Linear Feedback shift register sequence generation – M-sequence and their statistical properties – Correlation properties – Non-linear sequences – Gold codes – Kasami sequences.

Spread Spectrum Techniques: Coherent direct sequence systems – Model of a DS/BPSK system – Uncoded bit error probability for arbitrary jammer waveforms – Cheruoff bound – Performance under constant power broadband noise jammer – Pulse jammer – Partial band jammer – Multitone jammer – Coded DS/BPSK system.

Frequency Hopping SS System: Non-coherent FH system model – coherent FH systems– Frequency synthesis –Performance of FH/QPSK and FH/DPSK systems in partial band jamming – Time hopping SS technique.

Synchronization of SS Receivers: Acquisition and tracking in DS SS – FH SS receivers – Sequential estimation – Matched filter techniques of acquisition and tracing –Delay locked loop – Tau-Dither loop.

Application: Code division multiple access – Satellite communication – Anti jam military communication – Low probability of intercept communication – Mobile communication.

References:

1. R.C. Dixon, "Spread spectrum systems", John Wiley, 1984.
2. M.K. Simon, J.K.Omura, R.A. Schiltz and B.K.Levitt, "Spread spectrum communication", Vol-I, II & IV, computer science press, USA, 1985.
3. G.R.Cooperand, CD.Mc.Gillem, "Modern communications and spread spectrum", McGraw Hill, 1986.

EC713: WIRELESS SYSTEM

Code: EC714
Credits: 03
L-T-P: 3-0-0

Multiple Access Techniques for Wireless Communication: Introduction, FDMA, TDMA, Spread Spectrum, Multiple accesses, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols

Introduction to Wireless Networking: Introduction, Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks.

Wireless Data Services: CDPD, ARDIS, RMD, Common channel signaling, ISDN, BISDN and ATM, SS7, SS7 user part, signaling traffic in SS7.

Mobile IP and Wireless Access Protocol : Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling, WAP Architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, Wireless datagram protocol.

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

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

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

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

TEXT BOOKS:

1. Wireless Communication and Networking – William Stallings, PHI, 2003.
2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn., 2002.

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

EC714: DIGITAL IMAGE PROCESSING

Code: EC715
Credits: 03
L-T-P: 3-0-0

Introduction: Image representation, 2D systems, linearity and space – variance, Pointspread function and 2-D convolution.

Discrete Images: A simple Image Model; Sampling, Image reconstruction, Aliasing, Practical limitations in sampling and reconstruction, Image Quantization.

Image transforms: Introduction to the Fourier transform; Discrete Fourier transform, some properties of the Two-dimensional FT; FFT; Cosine; Hadamard; Haar; Slant; Karhunern-Heove, Hotelling Transform.

Image Enhancement: Histogram modeling, equalization and modification, Image smoothing – Neighbourhood averaging and median filtering. Image crispening, spatial low pass, high pass and Band pass filtering, concepts of generalized spectrms and homomorphic filtering.

Image restoration: Image observation models, inverse and wiener filtering, FIR wiener filters, Filtering – using Image Transforms ,Constrained Least –Square restoration, SVD and Iterative restoration , Restoration in spatial domain , Bayesian methods.

Image compression: Need for compression of image data, Sub sampling, coarse quantization and frame repetition – Pixel coding – PCM, entropy coding-Run length coding, Bit-Plane coding-Predictive coding – feedback and feed forward prediction. Transform coding of images, Zonal and threshold coding –Adaptive transform coding – Hybrid coding.

Text Books:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI.
2. R.C. Gonzalez, "Digital Image Processing", Addison Wesley.

References:

1. Chanda & Majumder, "Digital Image processing and analysis".
2. Pratt, "Digital Image Processing", John Wiley.

EC616: EMBEDDED SYSTEMS

Code: EC616
Credits: 03
L-T-P: 3-0-0

Introduction: Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

General Purpose Processors: Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

State Machine And Concurrent Process Models: Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

Communication Interface: Need for communication interfaces, RS232 / UART, RS422 /RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

Embedded / RTOS Concepts – I: Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex.

Embedded/RTOS Concepts – II: Mailboxes, Message Queues, Event Registers, Pipes, Signals

Embedded / RTOS Concepts – III : Timers, Memory Management, Priority inversion problem, Embedded operating systems Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

Design Technology: Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

Text Books:

1. Embedded System Design – A Unified Hardware/Software Introduction - Frank Vahid, Tony D.
Givargis, John Wiley, 2002.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.

References:

1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.

EC715: BIO-MEDICAL INSTRUMENTATION

Code: EC717
Credits: 03
L-T-P: 3-0-0

Components of Medical Instrumentation System. Bioamplifier. Static and dynamic characteristics of medical instruments. Biosignals and characteristics. Problems encountered with measurements from human beings.

Organisation of cell. Derivation of Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuro-muscular junction.

Bio Electrodes – Biopotential Electrodes-External electrodes, Internal Electrodes. Biochemical Electrodes.

Mechanical function, Electrical Conduction system of the heart. Cardiac cycle. Relation between electrical and mechanical activities of the heart.

Cardiac Instrumentation Blood pressure and Blood flow measurement. Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Interpretation of ECG waveform with respect to electro mechanical activity of the heart.

Therapeutic equipment. Pacemaker, Defibrillator, Shortwave diathermy. Hemodialysis machine.

Neuro-Muscular Instrumentation Specification of EEG and EMG machines. Electrode placement for EEG and EMG recording. Intrepretation of EEG and EMG.

Respiratory Instrumentation Mechanism of respiration, Spirometry, Pnemuotachograph Ventilators.

Text Books :

1. Biomedical Instrumentation and Measurements – Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, PHI, 2nd Ed, 1980.
2. Medical Instrumentation, Application and Design – John G. Webster, John Wiley, 3rd Ed., 1998.

References :

1. Principles of Applied Biomedical Instrumentation – L.A. Geoddes and L.E. Baker, John Wiley,
1975.
2. Hand-book of Biomedical Instrumentation – R.S. Khandpur, TMH, 2nd Ed., 2003.
3. Biomedical Telemetry – Mackay, Stuart R., John Wiley, 1968.

EC811: ARTIFICIAL NEURAL NETWORKS

Code: EC810
Credits: 03
L-T-P: 3-0-0

Introduction to Artificial Neural Networks: Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Brain and the Computer, Comparison Between Artificial and Biological Neural Networks, Network Architecture, Setting the Weights, Activation Functions, Learning Methods.

Fundamental Models of Artificial Neural Networks: Introduction, McCulloch – Pitts Neuron Model, Architecture, Learning Rules, Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least mean Square (LMS) rule, Competitive Learning Rule, Out Star Learning Rule, Boltzmann Learning, Memory Based Learning.

Feed Forward Networks: Introduction, Single Layer Perception Architecture, Algorithm, Application Procedure, Perception Algorithm for Several Output Classes, Perceptron Convergence Theorem, Brief Introduction to Multilayer Perception networks, Back Propagation Network (BPN), Generalized Delta Learning Rule, Back Propagation rule, Architecture, Training Algorithm, Selection of Parameters, Learning
in Back Propagation, Application Algorithm, Local Minima and Global Minima, Merits and Demerits of Back Propagation Network, Applications, Radial Basis Function Network (RBFN), Architecture, Training Algorithm for an RBFN with Fixed Centers.

Adaline and Madaline Networks: Introduction, Adaline Architecture, Algorithm, Applications, Madaline, Architecture, MRI Algorithm, MRII Algorithm.

Counter Propagation Networks: Winner Take – all learning, out star learning, Kohonen Self organizing network, Grossberg layer Network, Full Counter Propagation Network (Full CPN), Architecture, Training Phases of Full CPN, Training Algorithm, Application Procedure, Forward Only counter Propagation Network, Architecture, Training Algorithm, Applications, Learning Vector Quantizer (LVQ).

Associative Memory Networks - I: Types, Architecture, Continuous and Discrete Hopfield Networks, Energy Analysis, Storage and Retrival Algorithms, Problems with Hopfield Networks.

Associative Memory Networks – II: Boltzman Machine, Bidirectional Associative Memory, Adaptive Resonance Theory Networks Introduction, Architecture, Algorithm.

Applications of Neural Networks: Implementation of A/D Converter using Hopfield Network, Solving Optimization Problems, Solving Simultaneous Linear Equation, Solving Traveling Salesman Problems using Hopfield Networks, Application in Pattern Recognition, Image Processing.

Textbooks:

1. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publishers, 3rd Edition.
2. Introduction to Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, TMH.

References:

1. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, and Sanjay Ranka,
Penram International.
2. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
3. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.
4. Artificial Neural Networks - B. Yegnanarayana, PHI.

EC812: DSP PROCESSORS AND ARCHITECTURE

Code: EC811
Credits: 03
L-T-P: 3-0-0

Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Implementations of Basic DSP Algorithms : The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Text Books:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

References:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani
and M. Bhaskar, TMH, 2004.

2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005

EC812: TV ENGINEERING

Code: EC812
Credits: 03
L-T-P: 3-0-0

Introduction: TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence. Colour signal generation and Encoding**:** Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signals, PAL encoder.

TV Signal Transmission and Propagation: Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

TV Cameras: Camera tube types, Vidicon, Silicon Diode Array Vidicon, Monochrome TV camera, color camera. CCD Image Sensors.

Picture Tubes: Monochromatic Picture tube, Electrostatic focussing, Beam deflection, picture tube characteristics and specifications, colour picture tubes.

TV Standards: American 525 line B&W TV system, NTSC colour system, 625-line monochrome system, PAL colour system, TV standards.

Monochrome TV Receiver: RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits.
PAL-D Colour Receiver: Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Colour Phasors, synchronous demodulators, Subcarrier generation, raster circuits.

TEST BOOKS:

1. Modern Television Practice – Principles, Technology and Service – R.R. Gulati, New Age International Publication, 2002.
2. Monochrome and Colour TV – R.R. Gulati, New Age International Publication, 2002.

REFERENCES:

1. Colour Television Theory and Practice – S.P. Bali, TMH, 1994.
2. Television and Video Engineering - A.M. Dhake, 2nd Edition.
3. Basic Television and Video Systems – B. Grob and C.E. Herndon, McGraw Hill, 1999.

EC716: OPERATING SYSTEMS

Code: EC716
Credits: 03
L-T-P: 3-0-0

Computer System and Operating System Overview: Overview of Computer System hardware – Instruction execution – I/O function – Interrupts – Memory hierarchy – I.O Communication techniques. Operating System Objectives and functions – Evaluation of operating System – example Systems.

Process Description: Process Control-process states – Process and Threads - Examples of Process description and Control.

Concurrency: Principles of Concurrency – Mutual Exclusion – Software and hardware approaches – semaphores – Monitors – Message Passing – Readers Writers Problem.

Principles of deadlock: Deadlock prevention, detection and avoidance dining philosophers' problem – example Systems.

Memory Management: Memory Management requirements – loading programmes in to main memory – virtual memory – hardware and Control structures – OS Software – Examples of Memory Management.

Uniprocessor Scheduling: Types of Scheduling – Scheduling algorithms – I/O management and Disc
Scheduling – I/o devices – organization – of I/O function – OS design issues – I/O buffering – Disk I/O – disk scheduling Policies – examples System.

File Management and Security: Overview of file management – file organization and access – File Directories – File sharing – record blocking – secondary Storage Management – example system.

Security : Security threats – Protection – intruders – Viruses – trusted System.

TEXT BOOKS :

1. Operating Systems' – Internal and Design Principles, Fifth Edition–2005, Pearson education./PHI
2. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne,7th Edition John Wiley

REFERENCES :

1. Operating Systems A design approach- Crowley,TMH.
2. Modern Operating Systems, Andrew S Tanenbaum. 2nd Edition, PHI/PEARSON

EC813: DATABASE MANAGEMENT SYSTEMS

Code: EC814
Credits: 03
L-T-P: 3-0-0

Database System: Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor – History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities,
Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.
Relational Algebra and Calculus: Relational Algebra – Selection and projection set operations – renaming– Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus –Domain relational calculus – Expressive Power of Algebra and calculus.

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values –Comparison using Null values – Logical connectivity's – AND, OR and NOTR – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL 0 Triggers and Active Data bases.

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition– Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – forth Normal Form.

Overview of Transaction Management: ACID Properties – Transactions and Schedules – Concurrent Execution of transaction – Lock Based Concurrency Control – Performance Locking – Transaction Support in SQL – Introduction to Crash recovery.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions – Dealing with Dead Locks – Specialized Locking Techniques – Concurrency without Locking. Crash recovery: Introduction to ARIES – the Log – Other Recovery related Structures – the Write-Ahead Log Protocol – Check pointing – re3covering from a System Crash – Media recovery – Other approaches
and Interaction with Concurrency control.

Overview of Storage and Indexing: Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning.

Storing data: Disks and Files: - The Memory Hierarchy – Redundant Arrays of Independent – Disks – Disk Space Management – Buffer Manager – Files of records – Page Formats – record formats. Tree Structured Indexing: Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.
Hash Based Indexing: Static Hashing – Extendable hashing – Linear Hashing – Exendble vs. Liner hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.
2. Data base System Concepts, Silberschatz, Korth, Mc.Graw Hill, IV edition.

REFERENCES:

1. Introduction to Database Systems, C.J.Date Pearson Education
2. Data base Systems design, Implementation, and Management, Rob & Coronel 5th Edition.Thomson.
3. Data base Management System, Elmasri Navrate Pearson Education.
4. Data base Management System Mathew Leon, Leon Vikas.
5. Data base Systems, Connoley Pearson education.

EC814: SATELLITE COMMUNICATION

Code: EC815
Credits: 03
L-T-P: 3-0-0

Introduction[2]: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers [1]: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

Satellite Subsystems: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment liability and Space qualification.

Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

Multiple Access [1][2] : Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.

Earth Station Technology [3] : Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

Low Earth Orbit and Geo-Stationary Satellite Systems [1] : Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

Satellite Navigation & the Global Positioning System [1]: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy,

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition,2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.