ANNA UNIVERSITY :: CHENNAI 600 025

CURRICULUM 2004

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER III

THEORY
MA1201 Mathematics III

EE1211 Electrical Machines

CS1151 Data Structures

EC1201 Digital Electronics

EC1202 Electron Devices

EC1203 Electronic Circuits- I

PRACTICAL
EE1261 Electrical Machines Lab

EC1204 Electronic Devices and Circuits Lab I

CS1152 Data structure Lab

SEMESTER IV

Code No. Course Title
THEORY
MA1254 Random Processes

EC1251 Electronic Circuits II

EC1252 Signals and Systems

EC1253 Electromagnetic Fields

EC1254 Linear Integrated Circuits

EC1255 Measurements and Instrumentation

PRACTICAL
EC1256 Electronics circuits II and simulation lab

EC1257 Linear Integrated Circuit Lab

EC1258 Digital Electronics lab

SEMESTER V

Code No. Course Title
THEORY

GE1301 Professional Ethics and Human Values

EC1301 Communication Theory

EC1302 Digital Signal Processing

EC1303 Microprocessors and Its Applications

EC1304 Control Systems

EC1305 Transmission Lines and Waveguides

GE1302 Communication skills and Seminar**
PRACTICAL
EC1306 Digital Signal Processing Lab

EC1307 Microprocessor and Application Lab

SEMESTER VI

Code No. Course Title
THEORY
MG1351 Principles of Management

EC1351 Digital Communication

CS1302 Computer Networks

EC1352 Antenna and Wave Propagation

CS1251 Computer Architecture

MA1251 Numerical Methods

GE1351 Professional Skill and Seminar**
PRACTICAL
EC1353 Communication System Lab

EC1354 Networks Lab

EC1355 Electronic System Design Lab

SEMESTER VII

Code No. Course Title
THEORY
MG1401 Total Quality Management

EC1401 VLSI Design

EC1402 Optical Communication

EC1403 Microwave Engineering
Elective I
Elective II
PRACTICAL

EC1404 VLSI Lab
EC1405 Optical & Microwave Lab

SEMESTER VIII

Code No. Course Title
THEORY
EC1451 Mobile Communication
Elective III
Elective IV
PRACTICAL
EC1452 Project Work
EC1453 Comprehension**

** No Examinations

MA1201 MATHEMATICS III 3 1 0 100

AIM
The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

OBJECTIVES
At the end of the course the students would
• Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
• Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
• Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
• Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.
• Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z – transform technique bringing out the elegance of the procedure involved.
UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9 + 3
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant

coefficients.

UNIT II FOURIER SERIES 9 + 3
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 9 + 3
Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9 + 3
Fourier integral theorem (without proof) – Fourier transform pair – Sine and
Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.
UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3
Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem
-Formation of difference equations – Solution of difference equations using Z - transform.

TUTORIAL 15

TOTAL : 60
TEXT BOOKS
1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition , Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.
3. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCES
1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians," Macmillen, New York, 1988.
2. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

EE 1211 ELECTRICAL MACHINES 3 0 0 100

AIM
To expose the students to the concepts of various types of electrical machines and transmission and distribution of electrical power .

OBJECTIVES
To impart knowledge on
i. Constructional details, principle of operation, performance, starters and testing of D.C. machines.

ii. Constructional details, principle of operation and performance of transformers.

iii. Constructional details, principle of operation and performance of induction motors.

iv. Constructional details and principle of operation of alternators and special machines.

v. Power System transmission and distribution.

UNIT I D.C. MACHINES 9
Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Principle of operation of D.C. motor – Back emf and torque equation – Characteristics of series, shunt and compound motors - Starting of D.C. motors – Types of starters - Testing, brake test and Swinburne's test – Speed control of D.C. shunt motors.

UNIT II TRANSFORMERS 9
Constructional details – Principle of operation – emf equation – Transformation ratio – Transformer on no load – Parameters referred to HV/LV windings – Equivalent circuit – Transformer on load – Regulation - Testing – Load test, open circuit and short circuit tests.

UNIT III INDUCTION MOTORS 9
Construction – Types – Principle of operation of three-phase induction motors – Equivalent circuit – Performance calculation – Starting and speed control – Single-phase induction motors (only qualitative treatment).

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES 9
Construction of synchronous machines-types – Induced emf – Voltage regulation; emf and mmf methods – Brushless alternators – Reluctance motor – Hysteresis motor – Stepper motor.

UNIT V TRANSMISSION AND DISTRIBUTION 9
Structure of electric power systems – Generation, transmission, sub-transmission and distribution systems - EHVAC and EHVDC transmission systems – Substation layout – Insulators – cables.

L = 45 Total = 45

TEXT BOOKS
1. D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company ltd, second edition, 2002.

2. C.L. Wadhwa, 'Electrical Power Systems', Wiley eastern ltd India, 1985.

REFERENCE BOOKS
1. S.K.Bhattacharya, 'Electrical Machines', Tata McGraw Hill Publishing company ltd, second edition, 1998.

2. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and Company Ltd, third edition, 2003.

CS1151 DATA STRUCTURES 3 1 0 100

AIM
To provide an in-depth knowledge in problem solving techniques and data structures.

OBJECTIVES
- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To learn to program in C
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

UNIT I PROBLEM SOLVING 9
Problem solving – Top-down Design – Implementation – Verification – Efficiency – Analysis – Sample algorithms.

UNIT II LISTS, STACKS AND QUEUES 8
Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT

UNIT III TREES 10
Preliminaries – Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – Hashing – General Idea – Hash Function – Separate Chaining – Open Addressing – Linear Probing – Priority Queues (Heaps) – Model – Simple implementations – Binary Heap

UNIT IV SORTING 9
Preliminaries – Insertion Sort – Shellsort – Heapsort – Mergesort – Quicksort – External Sorting

UNIT V GRAPHS 9
Definitions – Topological Sort – Shortest-Path Algorithms – Unweighted Shortest Paths – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm – Applications of Depth-First Search – Undirected Graphs – Biconnectivity – Introduction to NP-Completeness

TUTORIAL 15
TOTAL : 60
TEXT BOOKS
1. R. G. Dromey, "How to Solve it by Computer" (Chaps 1-2), Prentice-Hall of India, 2002.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd ed, Pearson Education Asia, 2002. (chaps 3, 4.1-4.4 (except 4.3.6), 4.6, 5.1-5.4.1, 6.1-6.3.3, 7.1-7.7 (except 7.2.2, 7.4.1, 7.5.1, 7.6.1, 7.7.5, 7.7.6), 7.11, 9.1-9.3.2, 9.5-9.5.1, 9.6-9.6.2, 9.7)

REFERENCES
1. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education Asia, 2004
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.
3. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson education Asia, 1983.

EC1201 DIGITAL ELECTRONICS 3 1 0 100

AIM
To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

OBJECTIVES
• To introduce number systems and codes
• To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
• To introduce the methods for simplifying Boolean expressions
• To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
• To introduce the concept of memories and programmable logic devices.

UNIT I NUMBER SYSTEMS 9
Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers. Binary Arithmetic- Binary codes: Weighted –BCD-2421-Gray code-Excess 3 code-ASCII –Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Duality- Boolean expression – Boolean function-Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-

Minterm- Maxterm- Canonical forms – Conversion between canonical forms –Karnaugh map Minimization – Don't care conditions.

UNIT II 9
LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR- Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics –Tristate gates.

COMBINATIONAL CIRCUITS:
Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder- BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parity checker – code converters. Implementation of combinational logic using MUX, ROM, PAL and PLA.

UNIT III SEQUENTIAL CIRCUIT 9
Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering –Level Triggering –Realization of one flip flop using other flip flops – Asynchronous / Ripple counters – Synchronous counters –Modulo – n counter –Classification of sequential circuits – Moore and Mealy -Design of Synchronous counters: state diagram- State table –State minimization –State assignment- ASM-Excitation table and maps-Circuit implementation - Register – shift registers- Universal shift register – Shift counters – Ring counters.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9
Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map-cycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT V MEMORY DEVICES 9
Classification of memories –RAM organization – Write operation –Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM –EEPROM –EAPROM –Programmable Logic Devices –Programmable Logic Array (PLA)- Programmable Array Logic (PAL)-Field Programmable Gate Arrays (FPGA).

TUTORIAL 15

TOTAL : 60
TEXT BOOKS
1. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003 – (Unit I, II, V)
2. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas publishing house, New Delhi, 2002. (Unit III, IV)

REFERENCES
1. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004
2. Charles H.Roth. "Fundamentals of Logic Design", Thomson Publication Company, 2003.
3. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
4. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
5. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003
6. Donald D.Givone, Digital Principles and Design, Tata Mc-Graw-Hill Publishing company limited, New Delhi, 2003.

EC1202 ELECTRON DEVICES 3 1 0 100

AIM

The aim of this course is to familiarize the student with the principle of operation, capabilities and limitation of various electron devices so that he will be able to use these devices effectively.

OBJECTIVE

On completion of this course the student will understand

- The basics of electron motion in electric field and magnetic field
- Mechanisms of current flow in semi-conductors
- Diode operation and switching characteristics
- Operation of BJT, FET, MOSFET metal semiconductor rectifying and ohmic contacts and power control devices.

UNIT I ELECTRON BALLISTICS AND INTRINSIC SEMICONDUCTORS 9

Force on charge in electric field – Motion of Charge in uniform and time varying electric fields – Force on a moving charge in a magnetic field – calculation of cyclotron frequency – calculation of electrostatic and magnetic deflection sensitivity.

Energy band structure of conductors, semiconductors and insulators – Density distribution of available energy states in semiconductors – Fermi- Diac probability distribution function at different temperatures – Thermal generation of carriers – Calculation of electron and hole densities in intrinsic semiconductors – Intrinsic concentration – Mass Action Law.

UNIT II EXTRINSIC SEMICONDUCTOR AND PN JUNCTIONS 9

N and P type semiconductors and their energy band structures – Law of electrical neutrality – Calculation of location of Fermi level and free electron and hole densities in extrinsic semiconductors – Mobility, drift current and conductivity – Diffusion current – Continuity equation - Hall effect.

Band structure of PN Junction – Current Component in a PN Junction – Derivation of diode equation – Temperature dependence of diode characteristics.

UNIT III SWITCHING CHARACTERISTICS OF PN JUNCTION AND SPECIAL DIODES 9

Calculation of transition and diffusion capacitance – Varactor diode – charge control description of diode – switching characteristics of diode – Mechanism of avalanche and Zener breakdown – Temperature dependence of breakdown voltages – Backward diode – Tunneling effect in thin barriers Tunnel diode – Photo diode – Light emitting diodes.

UNIT IV BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS 9

Construction of PNP and NPN transistors – BJT current components – Emitter to collector and base to collector current gains – Base width modulation CB and CE characteristics – Breakdown characteristics – Ebers – Moll model – Transistor switching times.

Construction and Characteristics of JFET – Relation between Pinch off Voltage and drain current – Derivation. MOSFETS – Enhancement and depletion types.

UNIT V METAL SEMICONDUCTOR CONTACTS AND POWER CONTROL DEVICES 9

Metal Semiconductor Contacts - Energy band diagram of metal semiconductor junction Schottky diode and ohmic contacts.

Power control devices: Characteristics and equivalent circuit of UJT - intrinsic stand off ratio. PNPN diode – Two transistor model, SCR, Triac, Diac.

TUTORIAL 15

TOTAL : 60

TEXT BOOK

1. Jacob Millman & Christos C.Halkias, “Electronic Devices and Circuits” Tata McGraw–Hill, 1991 .

REFERENCES

1. Nandita Das Gupta and Amitava Das Gupta, Semiconductor Devices – Modelling and Technology, Prentice Hall of India, 2004.

2. Donald A.Neaman," Semiconductor Physics and Devices" 3rd Ed., Tata McGraw-Hill 2002.
3. S.Salivahanan, N.Sureshkumar and A.Vallavaraj, Electronic Devices and Circuits, TMH, 1998.
4. S.M.Sze, Semiconductor Devices – Physics and Technology, 2nd edn. John Wiley, 2002.
5. Ben G.Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education 2000.

EC1203 ELECTRONIC CIRCUITS I 3 1 0 100

AIM

The aim of this course is to familiarize the student with the analysis and design of basic transistor Amplifier circuits and power supplies.

OBJECTIVE

On completion of this course the student will understand

- The methods of biasing transistors
- Design of simple amplifier circuits
- Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers and heat sinks
- Analysis and design of power supplies and power control using SCR.

UNIT I TRANSISTOR BIASING 9

BJT – Need for biasing - Fixed bias circuit, Load line and quiescent point. Variation of quiescent point due to hFE variation within manufacturers tolerance. Stability factors. Different types of biasing circuits. Method of stabilizing the Q point to the extent possible. Advantage of Self bias (voltage divider bias) over other types of biasing. Use of Self bias circuit as a constant current circuit. Source self bias and voltage divider bias for FET. Use of JFET as a voltage variable resistor.

UNIT II MIDBAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS 9

CE, CB and CC amplifiers. Method of drawing small-signal equivalent circuit. Midband analysis of various types of single stage amplifiers to obtain gain, input impedance and output impedance. Miller's theorem. Comparison of CB, CE and CC amplifiers and their uses. Darlington connection using similar and Complementary transistors. Methods of increasing input impedance using Darlington connection and bootstrapping. CS, CG and CD (FET) amplifiers. Multistage amplifiers.

Basic emitter coupled differential amplifier circuit. Bisection theorem. Differential gain. CMRR. Use of constant current circuit to improve CMRR. Derivation of transfer characteristic, Transconductance. Use as Linear amplifier, limiter, amplitude modulator.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS 9

General shape of frequency response of amplifiers. Definition of cut off frequencies and bandwidth. Low frequency analysis of amplifiers to obtain lower cut off frequency Hybrid – pi equivalent circuit of BJTs. High frequency analysis of BJT amplifiers to obtain upper cut off frequency. High frequency equivalent circuit of FETs. High frequency analysis of FET amplifiers. Gain-bandwidth product of FETs. General expression for frequency response of multistage amplifiers. Calculation of overall upper and lower cut off frequencies of multistage amplifiers. Amplifier rise time and sag and their relation to cut off frequencies.

UNIT IV LARGE SIGNAL AMPLIFIERS 9

Classification of amplifiers (Class A, B, AB, C&D), Efficiency of class A, RC coupled and transformer-coupled power amplifiers. Class B complementary-symmetry, push-pull power amplifiers. Calculation of power output, efficiency and power dissipation. Crossover distortion and methods of eliminating it.

Heat flow calculations using analogous circuit. Calculation of actual power handling capacity of transistors with and without heat sink. Heat sink design.

UNIT V RECTIFIERS AND POWER SUPPLIES 9
Half-wave, full-wave and bridge rectifiers with resistive load. Analysis for Vdc and ripple voltage with C, CL, L-C and C-L-C filters. Voltage multipliers Zenerdiode regulator. Electronically regulated d.c power supplies. Line regulation, output resistance and temperature coefficient. Switched mode power supplies. Power control using SCR.

TUTORIAL 15

TOTAL : 60
TEXT BOOKS
1. Millman J. and Halkias .C., " Integrated Electronics ", Tata McGraw-Hill.

REFERENCES
1. Robert L. Boylestad and Louis Nashelsky, 8th edn., PHI, 2002.
2. S.Salivahanan, et.al, "Electronic Devices and Circuits", TMH, 1998.
3. Floyd, Electronic Devices, Sixth edition, Pearson Education, 2003.
4. I.J. Nagrath, Electronics – Analog and Digital, PHI, 1999.

EE 1261 ELECTRICAL MACHINES LABORATORY 0 0 3 100

AIM
To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
2. Load test on D.C. shunt motor.
3. Load test on D.C. series motor.
4. Swinburne's test and speed control of D.C. shunt motor.
5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
6. Regulation of three phase alternator by EMF and MMF methods.
7. Load test on three phase induction motor.
8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
9. Load test on single-phase induction motor.
10. Study of D.C. motor and induction motor starters.

P = 45 Total = 45

EC1204 ELECTRONIC DEVICES AND CIRCUITS LAB -I 0 0 3 100

Ex.1: Diode Forward characteristics.
(i) Determination of ? from the plot of ln I vs V.
(ii) Determinations reverse saturation current.
[Note that reverse characteristics of Diodes cannot be measured using common instruments available in the Lab.]

Ex.2: Input and Output characteristics of BJT.
1. Determination of h parameters from the graph.

Ex.3: Output characteristics of JFET.
(i) Plot of Transfer characteristics from the output characteristics.
(ii) Determination of pinch off voltage and Idss

Ex.4: Fixed Bias amplifier circuits using BJT.
(i) Waveforms at input and output without bias.
(ii) Determination of bias resistance to locate Q-point at center of load line.

(iii) Measurement of hFE and gain.
(iv) Calculation of hie=VT/Ibdc and gain assuming hFE= hfe.
(v) Plot of frequency response.

Ex.5: BJT Amplifier using voltage divider bias (self bias) with unbypassed emitter resistor.
(i) Measurement of input resistance and gain
(ii) Comparison with calculated values.
(iii) Plot of DC collector current as a function of collector resistance (application as constant current circuit).

Ex.6: Source follower with Bootstrapped gate resistance.
(i) Measurement of gain, input resistance and output resistance with and without Bootstrapping .
(ii) Comparison with calculated values.

Ex.7: Class B Complementary symmetry power amplifier
1. Observation of the output wave form with cross over Distortion.
2. Modification of the circuit to avoid cross over distortion.
3. Measurement of maximum power output.
4. Determination of efficiency.
5. Comparison with calculated values.

Ex.8: Differential amplifier using BJT.
1. Construction of the circuit.
2. Measurement of DC collector current of individual transistors.
3. Equalization of DC current using individual emitter resistance (50 – 100 Ohms)
4. Measurement of CMRR.

Ex.9: Power supply Full wave rectifier with simple capacitor filter.
(i) Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
(ii) Measurement of load regulation characteristics (Vout vs Iout).
Comparison with calculated values.

Ex.10: Measurement of UJT and SCR Characteristics.
1. Firing Characteristics of SCR.
2. Measurement of Intrinsic stand off ratio of UJT.

CS1152 DATA STRUCTURES LAB 0 0 3 100

AIM
To teach the principles of good programming practice and to give a practical training in writing efficient programs in C

OBJECTIVES
• To teach the students to write programs in C
• To implement the various data structures as Abstract Data Types
• To write programs to solve problems using the ADTs

Implement the following exercises using C:
1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of List ADT
3. Cursor implementation of List ADT
4. Array implementations of Stack ADT
5. Linked list implementations of Stack ADT

The following three exercises are to be done by implementing the following source files
(a) Program for ‘Balanced Paranthesis’
(b) Array implementation of Stack ADT

(c) Linked list implementation of Stack ADT
(d) Program for 'Evaluating Postfix Expressions'
An appropriate header file for the Stack ADT should be #included in (a) and (d)

6. Implement the application for checking 'Balanced Paranthesis' using array implementation of Stack ADT (by implementing files (a) and (b) given above)
7. Implement the application for checking 'Balanced Paranthesis' using linked list implementation of Stack ADT (by using file (a) from experiment 6 and implementing file (c))
8. Implement the application for 'Evaluating Postfix Expressions' using array and linked list implementations of Stack ADT (by implementing file (d) and using file (b), and then by using files (d) and (c))
9. Queue ADT
10. Search Tree ADT - Binary Search Tree
11. Heap Sort
12. Quick Sort

MA1254 RANDOM PROCESSES 3 1 0 100

AIM
This course aims at providing the necessary basic concepts in random processes. A knowledge of fundamentals and applications of phenomena will greatly help in the understanding of topics such a estimation and detection, pattern recognition, voice and image processing networking and queuing.

OBJECTIVES
At the end of the course, the students would
• Have a fundamental knowledge of the basic probability concepts.
• Have a well – founded knowledge of standard distributions which can describe real life phenomena.
• Acquire skills in handling situations involving more than one random variable and functions of random variables.
• Understand and characterize phenomena which evolve with respect to time in probabilistic manner.
• Be able to analyze the response of random inputs to linear time invariant systems.

UNIT I PROBABILITY AND RANDOM VARIABLE 9 +3
Axioms of probability - Conditional probability - Total probability – Baye's theorem - Random variable - Probability mass function - Probability density functions- Properties –Moments - Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 9 +3
Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.
UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9 + 3
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression - Transformation of random variables - Central limit theorem.
UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9 + 3
Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.
UNIT V CORRELATION AND SPECTRAL DENSITIES 9 + 3
Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

1. Ross, S., "A First Course in Probability", Fifth edition, Pearson Education, Delhi, 2002.
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Pubishers, Fourth Edition, New Delhi, 2002. (Chapters 6, 7 and 8).

REFERENCES

1. Henry Stark and John W. Woods "Probability and Random Processes with Applications to Signal Processing", Pearson Education, Third edition, Delhi, 2002.
2. Veerarajan. T., "Probabilitiy, Statistics and Random process", Tata McGraw-Hill Publications, Second Edition, New Delhi, 2002.
3. Ochi, M.K. , "Applied Probability and Stochastic Process", John Wiley & Sons, New York, 1990.

EC1251 ELECTRONIC CIRCUITS II 3 1 0 100

AIM

The aim of this course is to familiarize the student with the analysis and design of feed back amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators.

OBJECTIVES

On completion of this course the student will understand

- The advantages and method of analysis of feed back amplifiers
- Analysis and design of RC and LC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time based generators.

UNIT 1 FEEDBACK AMPLIFIERS 9

Block diagram. Loop gain. Gain with feedback. Desensitivity of gain. Distortion and cut off frequencies with feedback. The four basic feedback topologies and the type of gain stabilized by each type of feedback. Input and Output resistances with feedback. Method of identifying feedback topology, feedback factor and basic amplifier configuration with loading effect of feedback network taken into account. Analysis of feedback amplifiers. Nyquist criterion for stability of feedback amplifiers.

UNIT II OSCILLATORS 9

Barkhausen Criterion. Mechanism for start of oscillation and stabilization of amplitude. Analysis of Oscillator using Cascade connection of one RC and one CR filters. RC phase shift Oscillator. Wienbridge Oscillator and twin-T Oscillators. Analysis of LC Oscillators, Colpitts, Hartley, Clapp, Miller and Pierce oscillators. Frequency range of RC and LC Oscillators. Quartz Crystal Construction. Electrical equivalent circuit of Crystal. Crystal Oscillator circuits.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits. Analysis of single tuned and synchronously tuned amplifiers. Instability of tuned amplifiers. Stabilization techniques. Narrow band neutralization using coil. Broad banding using Hazeltine neutralization. Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RL & RC Integrator and Differentiator circuits. Diode clippers, clampers and slicers. Collector coupled and Emitter coupled Astable multivibrator. Monostable multivibrator. Bistable multivibrators. Triggering methods. Storage delay and calculation of switching times. Speed up capacitors. Schmitt trigger circuit.

UNIT V BLOCKING OSCILLATORS AND TIMEBASE GENERATORS 9

Monostable and Astable Blocking Oscillators using Emitter and base timing. Frequency control

using core saturation. Pushpull operation of Astable blocking oscillator i.e., inverters. Pulse transformers. UJT sawtooth generators. Linearization using constant current circuit. Bootstrap and Miller saw-tooth generators. Current time base generators.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

1. Millman and Halkias. C., "Integrated Electronics", Tata McGraw-Hill 1991,(I,II).
2. Schilling and Belove, "Electronic Circuits", TMH, Third Edition, 2002 (Unit - III)
3. Millman J. and Taub H., "Pulse Digital and Switching waveform", McGraw-Hill International (UNIT – IV & V)
4. Robert L. Boylestead and Louis Nasheresky, 8th edn., PHI, 2002.

REFERENCES

1. Sedra / Smith, "Micro Electronic Circuits" Oxford university Press, 2004.
2. David A. Bell, " Solid State Pulse Circuits ", Prentice Hall of India, 1992.

EC1252 SIGNALS AND SYSTEMS 3 1 0 100

AIM

To study and analyse characteristics of continuous, discrete signals and systems.

OBJECTIVES

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.

UNIT I REPRESENTATION OF SIGNALS 9

Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – properties of discrete time complex exponential unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting.

Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS 9

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains.

Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems -Analysis and characterization of LTI systems using Laplace transform:

Computation of impulse response and transfer function using Laplace transform.

UNIT III SAMPLING THEOREM AND z-TRANSFORMS 9

Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals

Basic principles of z-transform - z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.

UNIT IV DISCRETE TIME SYSTEMS 9

Computation of Impulse & response & Transfer function using Z Transform. DTFT Properties

and examples – LTI-DT systems -Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

UNIT V SYSTEMS WITH FINITE AND INFINITE DURATION IMPULSE RESPONSE 9
Systems with finite duration and infinite duration impulse response – recursive and non-recursive discrete time system – realization structures – direct form – I, direct form – II, Transpose, cascade and parallel forms.

TUTORIAL 15

TOTAL : 60

TEXT BOOK
1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 1997.

REFERENCES
1. John G.Proakis and Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn., PHI, 2000.
2. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
3. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
4. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
5. Moman .H. Hays," Digital Signal Processing ", Schaum's outlines, Tata McGraw-Hill Co Ltd., 2004.
6. Ashok Amhardar, "Analog and Digital Signal Processing", 2 nd Edition Thomson 2002.

EC1253 ELECTROMAGNETIC FIELDS 3 1 0 100

AIM
To familiarize the student to the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields so that an in depth understanding of antennas, electronic devices, Waveguides is possible.

OBJECTIVES
- To analyze fields a potentials due to static changes
- To evaluate static magnetic fields
- To understand how materials affect electric and magnetic fields
- To understand the relation between the fields under time varying situations
- To understand principles of propagation of uniform plane waves.

UNIT I STATIC ELECTRIC FIELDS 9
Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co-ordinate System – Introduction to line, Surface and Volume Integrals – Definition of Curl, Divergence and Gradient – Meaning of Strokes theorem and Divergence theorem
Coulomb's Law in Vector Form – Definition of Electric Field Intensity – Principle of Superposition – Electric Field due to discrete charges – Electric field due to continuous charge distribution - Electric Field due to charges distributed uniformly on an infinite and finite line – Electric Field on the axis of a uniformly charged circular disc – Electric Field due to an infinite uniformly charged sheet.
Electric Scalar Potential – Relationship between potential and electric field - Potential due to infinite uniformly charged line – Potential due to electrical dipole - Electric Flux Density – Gauss Law – Proof of Gauss Law – Applications.

UNIT II STATIC MAGNETIC FIELD 9
The Biot-Savart Law in vector form – Magnetic Field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere's circuital law and simple applications.

Magnetic flux density – The Lorentz force equation for a moving charge and applications – Force on a wire carrying a current I placed in a magnetic field – Torque on a loop carrying a current I – Magnetic moment – Magnetic Vector Potential.

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9
Poisson's and Laplace's equation – Electric Polarization-Nature of dielectric materials-Definition of Capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law – continuity equation for current. Definition of Inductance – Inductance of loops and solenoids – Definition of mutual inductance – simple examples. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability - magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9
Faraday's law – Maxwell's Second Equation in integral form from Faraday's Law – Equation expressed in point form.
Displacement current – Ampere's circuital law in integral form – Modified form of Ampere's circuital law as Maxwell's first equation in integral form – Equation expressed in point form. Maxwell's four equations in integral form and differential form.
Poynting Vector and the flow of power – Power flow in a co-axial cable – Instantaneous Average and Complex Poynting Vector.

UNIT V ELECTROMAGNETIC WAVES 9
Derivation of Wave Equation – Uniform Plane Waves – Maxwell's equation in Phasor form – Wave equation in Phasor form – Plane waves in free space and in a homogenous material. Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect.
Linear, Elliptical and circular polarization – Reflection of Plane Wave from a conductor – normal incidence – Reflection of Plane Waves by a perfect dielectric – normal and oblique incidence. Dependence on Polarization. Brewster angle.

TUTORIAL 15

TOTAL : 60
TEXTBOOKS
1. William H.Hayt : "Engineering Electromagnetics" TATA 2003 (Unit I,II,III).
2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Prentice Hall of India 2nd edition 2003. (Unit IV, V). McGraw-Hill, 9th reprint

REFERENCES
1. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons (3rd edition 2003)
2 .Narayana Rao, N : "Elements of Engineering Electromagnetics" 4th edition, Prentice Hall of India, New Delhi, 1998.
3. M.N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, Third edition.
4. David K.Cherp: "Field and Wave Electromagnetics - Second Edition-Pearson Edition.
5. David J.Grithiths: "Introduction to Electrodynamics- III Edition-PHI.

EC1254 LINEAR INTEGRATED CIRCUITS 3 0 0 100

AIM
To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

OBJECTIVES
- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.

• To teach the theory of ADC and DAC
• To introduce a few special function integrated circuits.

UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICs 9
Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9
Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator, Integrator, Voltage to current converter, Instrumentation amplifier, Sine wave Oscillator, Low-pass and band-pass filters, Comparator, Multivibrators and Schmitt trigger, Triangular wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL 9
Analysis of four quadrant (Gilbert cell) and variable transconductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators, Frequency synthesizers, Compander ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9
Analog switches, High speed sample and hold circuits and sample and hold ICs, Types of D/A converter, Current driven DAC, Switches for DAC, A/D converter-Flash, Single slope, Dual slope, Successive approximation, Delta Sigma Modulation, Voltage to Time converters.

UNIT V SPECIAL FUNCTION ICs 9
Astable and Monostable Multivibrators using 555 Timer, Voltage regulators-linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optic ICs and Opto-couplers.

TOTAL : 45
TEXT BOOK
1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.
2. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.

REFERENCES
1. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', Wiley International, 1995.
2. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall of India, 1996.
3. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
4. K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.
5. Taub and Schilling, Digital Integrated Electronics, McGraw-Hill, 1997.
6. Millman.J. and Halkias.C.C. 'Integrated Electronics', McGraw-Hill, 1972.
7. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits'. Pearson Education, 2004.

EC1255 MEASUREMENTS AND INSTRUMENTATION 3 0 0 100

AIM
To introduce the concept of measurement and the related instrumentation requirement as a vital ingredient of electronics and communication engineering.

OBJECTIVE

To learn
• Basic measurement concepts
• Concepts of electronic measurements
• Importance of signal generators and signal analysers in measurements
• Relevance of digital instruments in measurements
• The need for data acquisition systems
• Measurement techniques in optical domains.

UNIT I BASIC MEASUREMENT CONCEPTS 9
Measurement systems – Static and dynamic characteristics – units and standards of measurements – error analysis – moving coil, moving iron meters – multimeters – True RMS meters – Bridge measurements – Maxwell, Hay, Schering, Anderson and Wien bridge.

UNIT II BASIC ELECTRONIC MEASUREMENTS 9
Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes – Q meters – Vector meters – RF voltage and power measurements.

UNIT III SIGNAL GENERATORS AND ANALYZERS 9
Function generators – RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

UNIT IV DIGITAL INSTRUMENTS 9
Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

UNIT V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS 9
Elements of a digital data acquisition system – interfacing of transducers – multiplexing – computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domains reflectometer.

TOTAL : 45

TEXT BOOK
1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003.

REFERENCES
1. Joseph J.Carr, Elements of Electronics Instrumentation and Measurement, Pearson education, 2003.
2. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice Hall of India, 2nd edn., 2003.
3. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill-2004.

EC1256 ELECTRONICS CIRCUITS II AND SIMULATION LAB 0 0 3 100

1. Series and Shunt feedback amplifiers:
Frequency response, Input and output impedance calculation
2. Design of RC Phase shift oscillator: Design Wein Bridge Oscillator
3. Design of Hartley and Colpitts Oscilator
4. Tuned Class C
5. Integrators, Differentiators, Clippers and Clampers
6. Design of Astable and Monostable and Bistable multivibrators

SIMULATION USING PSPICE:
1. Differentiate amplifier
2. Active filter : Butterworth IInd order LPF
3. Astable, Monostable and Bistable multivibrator - Transistor bias
4. D/A and A/D converter (Successive approximation)

5. Analog multiplier
6. CMOS Inventor, NAND and NOR

EC1257 LINEAR INTEGRATED CIRCUITS LAB 0 0 3 100
Design and testing of:
1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active lowpass and bandpass filter.
5. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wien bridge oscillator using op-amp.
7. Astable and monostable using NE555 Timer.
8. PLL characteristics and Frequency Multiplier using PLL.
9. DC power supply using LM317 and LM723.
10. Study of SMPS control IC SG3524 / SG3525.

EC1258 DIGITAL ELECTRONICS LAB 0 0 3 100

1. Design and implementation of Adders and Subtractors using logic gates.
2. Design and implementation of code converters using logic gates
(i) BCD to excess-3 code and voice versa
(ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483
4. Design and implementation of2Bit Magnitude Comparator using logic gates 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC 74154
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
9. Design and implementation of 3-bit synchronous up/down counter
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flopss

GE1301 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 100

OBJECTIVE
• To create an awareness on Engineering Ethics and Human Values.
• To instill Moral and Social Values and Loyalty
• To appreciate the rights of Others

1. HUMAN VALUES 10
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

2. ENGINEERING ETHICS 9
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

3. ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4. SAFETY, RESPONSIBILITIES AND RIGHTS 9
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

5. GLOBAL ISSUES 8
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL : 45
TEXT BOOKS
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES
1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

EC1301 COMMUNICATION THEORY 3 1 0 100

AIM
To study the various analog communication fundamentals viz., Amplitude modulation and demodulation, angle modulation and demodulation. Noise performance of various receivers and information theory with source coding theorem are also dealt.

OBJECTIVE
- To provide various Amplitude modulation and demodulation systems.
- To provide various Angle modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

UNIT I AMPLITUDE MODULATIONS 9
Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters – Superhetrodyne receiver, AM receiver.

UNIT II ANGLE MODULATION 9
Angle modulation, frequency modulation, Narrowband and wideband FM, transmission bandwidth of FM signals, Generation of FM signal – Direct FM – indirect FM, Demodulation of FM signals, FM stereo multiplexing, PLL – Nonlinear model and linear model of PLL, Non-linear effects in FM systems, FM Broadcast receivers, FM stereo receives.

UNIT III NOISE PERFORMANCE OF DSB, SSB RECEIVERS 9
Noise – Shot noise, thermal noise, White noise, Noise equivalent Bandwidth, Narrowband noise, Representation of Narrowband noise in terms of envelope and phase components, Sinewave plus Narrowband Noise, Receiver model, Noise in DSB-SC receiver, Noise in SSB receiver

UNIT IV NOISE PERFORMANCE OF AM AND FM RECEIVERS 9

Noise in AM receivers threshold effect, Noise in FM receivers capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and de-emphasis in FM, Comparison of performance of AM and FM systems.

UNIT V INFORMATION THEORY 9
Uncertainty, Information and entropy, Source coding theorem, Data compaction, Discrete memory less channels, mutual information, channel capacity, channel coding theorem, Differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, Compression of information.

TUTORIAL 15

TOTAL : 60
TEXT BOOK
1. Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001.

REFERENCES
1. Roddy and Coolen, Electronic communication, PHI, New Delhi, 4th Edition, 2003.
2. Taub and Schilling, Principles of communication systems, TMH, New Delhi, 1995.
3. Bruce Carlson et al, Communication systems, McGraw-Hill Int., 4th Edition, 2002.

EC1302 DIGITAL SIGNAL PROCESSING 3 1 0 100

AIM
To study the signal processing methods and processors.

OBJECTIVES
- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

UNIT I FFT 9
Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Use of FFT algorithms in Linear Filtering and correlation.

UNIT II DIGITAL FILTERS DESIGN 9
Amplitude and phase responses of FIR filters – Linear phase filters – Windowing techniques for design of Linear phase FIR filters – Rectangular, Hamming, Kaiser windows – frequency sampling techniques – IIR Filters – Magnitude response – Phase response – group delay - Design of Low Pass Butterworth filters (low pass) - Bilinear transformation – prewarping, impulse invariant transformation.

UNIT III FINITE WORD LENGTH EFFECTS 9
Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling – analytical model of sample and hold operations.

UNIT IV POWER SPECTRUM ESTIMATION 9
Computation of Energy density spectrum – auto correlation and power spectrum of random signals. Periodogram – use of DFT in power spectrum estimation – Non parametric methods for power spectral estimation: Bartlett and Welch methods – Blackman and Tukey method.

UNIT V DIGITAL SIGNAL PROCESSORS 9
Introduction to DSP architecture – Harvard architecture - Dedicated MAC unit - Multiple ALUs,

Advanced addressing modes, Pipelining, Overview of instruction set of TMS320C5X and C54X.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

1. John G Proakis, Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, PHI, 3rd Edition, 2000,
2. B.Venkataramani & M. Bhaskar, Digital Signal Processor Architecture, Programming and Application, TMH 2002. (UNIT – V)

REFERENCES

1. Alan V Oppenheim, Ronald W Schafer, John R Back, Discrete Time Signal Processing, PHI, 2nd Edition 2000,
2. Avtar singh, S.Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX -Thamson / Brooks cole Publishers, 2003
3. S.Salivahanan, A.Vallavaraj, Gnanapriya, Digital Signal Processing, McGraw-Hill / TMH, 2000
4. Johny R.Johnson :Introduction to Digital Signal Processing, Prentice Hall, 1984.
5. S.K.Mitra, "Digital Signal Processing- A Computer based approach", Tata McGraw-Hill, 1998, New Delhi.

EC1303 MICROPROCESSORS AND ITS APPLICATIONS 3 0 0 100

AIM

To learn the architecture programming and interfacing of microprocessors and microcontrollers.

OBJECTIVES

- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture and programming of 8086 microprocessor.
- To introduce the architecture, programming and interfacing of 8051 micro controller.

UNIT I 8085 CPU 9

8085 Architecture – Instruction set – Addressing modes – Timing diagrams – Assembly language programming – Counters – Time Delays – Interrupts – Memory interfacing – Interfacing, I/O devices.

UNIT II PERIPHERALS INTERFACING 9

Interfacing Serial I/O (8251)- parallel I/O (8255) –Keyboard and Display controller (8279) – ADC/DAC interfacing – Inter Integrated Circuits interfacing (I2C Standard)-
Bus: RS232C-RS485-GPIB

UNIT III 8086 CPU 9

Intel 8086 Internal Architecture – 8086 Addressing modes- Instruction set- 8086 Assembly language Programming–Interrupts.

UNIT IV 8051 MICROCONTROLLER 9

8051 Micro controller hardware- I/O pins, ports and circuits- External memory –Counters and Timers-Serial Data I/O- Interrupts-Interfacing to external memory and 8255.

UNIT V 8051 PROGRAMMING AND APPLICATIONS 9

8051 instruction set – Addressing modes – Assembly language programming – I/O port programming -Timer and counter programming – Serial Communication – Interrupt programming –8051 Interfacing: LCD, ADC, Sensors, Stepper Motors, Keyboard and DAC.

TOTAL : 45

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000. (Unit I, II)
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3. Mohammed Ali Mazidi and Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003. (Unit IV, V)
REFERENCES
1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

EC1304 CONTROL SYSTEMS 3 1 0 100

AIM
To familiarize the students with concepts related to the operation analysis and stabilization of control systems

OBJECTIVES
• To understand the open loop and closed loop (feedback) systems
• To understand time domain and frequency domain analysis of control systems required for stability analysis.
• To understand the compensation technique that can be used to stabilize control systems

UNIT I CONTROL SYSTEM MODELLING 9
System concept, differential equations and transfer functions. Modelling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems.
Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason's gain formula – Examples.

UNIT II TIME DOMAIN ANALYSIS 9
Test signals – time response of first order and second order systems – time domain specifications – types and order of systems – generalised error co-efficients – steady state errors – concepts of stability – Routh-Hurwitz stability – root locus.

UNIT III FREQUENCY DOMAIN ANALYSIS 9
Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart and Nyquist stability criterion – Gain margin – phase margin.

UNIT IV COMPENSATORS 9
Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot and Root locus. Introduction to P, PI and PID controllers.

UNIT V CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS 9
Stepper motors – AC servo motor – DC servo motor – Synchros – sensors and encoders – DC tacho generator – AC tacho generator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.

TUTORIAL 15

TOTAL : 60
TEXT BOOKS
1. Ogata.K, Modern Control Engineering, Prentice Hall of India, 4th Edition, 2003 (UNIT I – IV)
2. Nagrath & Gopal, Control System Engineering, 3rd Edition, New Age International Edition, 2002. (UNIT V)

REFERENCES

1. Benjamin.C.Kuo, Automatic Control Systems, 7th Edition – Prentice Hall of India, 2002.
2. M.Gopal, Control Systems, Tata McGraw-Hill, 1997

EC1305 TRANSMISSION LINES AND WAVEGUIDES 3 1 0 100

AIM

To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.

OBJECTIVES

- To become familiar with propagation of signals through lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

UNIT I TRANSMISSION LINE THEORY 9

Different types of transmission lines – Definition of Characteristic impedance – The transmission line as a cascade of T-Sections - Definition of Propagation Constant.
General Solution of the transmission line – The two standard forms for voltage and current of a line terminated by an impedance – physical significance of the equation and the infinite line – The two standard forms for the input impedance of a transmission line terminated by an impedance – meaning of reflection coefficient – wavelength and velocity of propagation.
Waveform distortion – distortion less transmission line – The telephone cable – Inductance loading of telephone cables.
Input impedance of lossless lines – reflection on a line not terminated by Zo - Transfer impedance – reflection factor and reflection loss – T and ? Section equivalent to lines.

UNIT II THE LINE AT RADIO FREQUENCIES 9

Standing waves and standing wave ratio on a line – One eighth wave line – The quarter wave line and impedance matching – the half wave line.
The circle diagram for the dissipationless line – The Smith Chart – Application of the Smith Chart – Conversion from impedance to reflection coefficient and vice-versa. Impedance to Admittance conversion and viceversa – Input impedance of a lossless line terminated by an impedance – single stub matching and double stub matching.

UNIT III GUIDED WAVES 8

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation – component uniform plane waves between parallel planes – Attenuation of TE and TM waves in parallel plane guides – Wave impedances.

UNIT IV RECTANGULAR WAVEGUIDES 9

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – Cutoff wavelength and phase velocity – Impossibility of TEM waves in waveguides – Dominant mode in rectangular waveguide – Attenuation of TE and TM modes in rectangular waveguides – Wave impedances – characteristic impedance – Excitation of modes.

UNIT V CIRCULAR WAVE GUIDES AND RESONATORS 10

Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator, semicircular cavity resonator, Q factor of a cavity resonator for TE101 mode.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS
1. J.D.Ryder "Networks, Lines and Fields", PHI, New Delhi, 2003. (Unit I & II)
2. E.C. Jordan and K.G.Balmain "Electro Magnetic Waves and Radiating System, PHI, New Delhi, 2003. (Unit III, IV & V)

REFERENCES
1. Ramo, Whineery and Van Duzer: "Fields and Waves in Communication Electronics" John Wiley, 2003.
2. David M.Pozar: Microwave Engineering – 2nd Edition – John Wiley.
3. David K.Cheng,Field and Waves in Electromagnetism, Pearson Education, 1989.

EC1306 DIGITAL SIGNAL PROCESSING LABORATORY 0 0 3 100

AIM
To introduce the student to various digital Signal Processing techniques using TMS 320c5x family processors and MATLAB.

OBJECTIVES:
• To implement the processing techniques using the instructions of TMS320c5x.
• To implement the IIR and FIR filter using MATLAB.

LIST OF EXPERIMENTS

USING TMS320C5X
1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display
3. Implementation of FIR filter
4. Calculation of FFT

USING MATLAB
1. Generation of Signals
2. Linear and circular convolution of two sequences
3. Sampling and effect of aliasing
4. Design of FIR filters
5. Design of IIR filters
6. Calculation of FFT of
a signal

EC1307 MICROPROCESSOR AND APPLICATIONS LAB 0 0 3 100

1. Programs for 8/16 bit Arithmetic operations (Using 8085).
2. Programs for Sorting and Searching (Using 8085, 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Interfacing ADC and DAC.
6. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
7. Interfacing and Programming 8279, 8259, and 8253.
8. Serial Communication between two MP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor Speed control.
10. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051microcontroller.
11. Programming and verifying Timer, Interrupts and UART operations in 8031 microcontroller.
12. Communication between 8051 Microcontroller kit and PC.

MG1351 PRINCIPLES OF MANAGEMENT 3 0 0 100

OBJECTIVE
Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

1. HISTORICAL DEVELOPMENT 9
Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2. PLANNING 9
Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

3. ORGANISING 9
Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

4. DIRECTING 9
Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

5. CONTROLLING 9
System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL : 45
TEXT BOOKS
1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill,1998
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES
1. Tripathy PC And Reddy PN, " Principles of Management", Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, "Engineering Management", Addison Wesley,-2000.

EC1351 DIGITAL COMMUNICATION 3 1 0 100

AIM
To introduce the basic concepts of Digital Communication modulation to baseband, passband modulation and to give an exposure to error control coding and finally to discuss about the spread spectrum modulation schemes.

OBJECTIVES
• To study pulse modulation and discuss the process of sampling, quantization and coding that

are fundamental to the digital transmission of analog signals.
• To learn baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
• To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

UNIT I PULSE MODULATION 9
Sampling process –PAM- other forms of pulse modulation –Bandwidth –Noise trade off – Quantization –PCM- Noise considerations in PCM Systems-TDM- Digital multiplexers-Virtues, Limitation and modification of PCM-Delta modulation –Linear prediction –differential pulse code modulation – Adaptive Delta Modulation.

UNIT II BASEBAND PULSE TRANSMISSION 9
Matched Filter- Error Rate due to noise –Intersymbol Interference- Nyquist's criterion for Distortionless Base band Binary Transmission- Correlative level coding –Baseb and M-ary PAM transmission –Adaptive Equalization –Eye patterns

UNIT III PASSBAND DATA TRANSMISSION 9
Introduction – Pass band Transmission model- Generation, Detection, Signal space diagram, bit error probability and Power spectra of BPSK, QPSK, FSK and MSK schemes –Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Carrier and symbol synchronization.

UNIT IV ERROR CONTROL CODING 9
Discrete memoryless channels – Linear block codes - Cyclic codes - Convolutional codes – Maximum likelihood decoding of convolutional codes-Viterbi Algorithm, Trellis coded Modulation, Turbo codes.

UNIT V SPREAD SPECTRUM MODULATION 9
Pseudo- noise sequences –a notion of spread spectrum – Direct sequence spread spectrum with coherent binary phase shift keying – Signal space Dimensionality and processing gain – Probability of error – Frequency –hop spread spectrum –Maximum length and Gold codes.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS
1. Simon Haykins, "Communication Systems" John Wiley, 4th Edition, 2001

REFERENCES
1. Sam K.Shanmugam "Analog & Digital Communication" John Wiley.
2. John G.Proakis, "Digital Communication" McGraw Hill 3rd Edition, 1995
3. Taub & Schilling , "Principles of Digital Communication " Tata McGraw-Hill" 28th reprint, 2003
4. Bernard's

CS1302 COMPUTER NETWORKS 3 0 0 100

AIM
To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

OBJECTIVES
• To introduce the students the functions of different layers.
• To introduce IEEE standard employed in computer networking.
• To make students to get familiarized with different protocols and network components.

UNIT I DATA COMMUNICATIONS 8

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences.

UNIT II DAT LINK LAYER 12
Error – detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – go back N ARQ – selective repeat ARQ- sliding window techniques – HDLC.
LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

UNIT III NETWORK LAYER 10
Internetworks - Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT IV TRANSPORT LAYER 8
Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.

UNIT V APPLICATION LAYER 7
Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

TOTAL : 45
TEXT BOOKS
1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

REFERENCES
1. James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring", Pearson Education.
2. Larry L.Peterson & Peter S. Davie, "COMPUTER NETWORKS", Harcourt Asia Pvt. Ltd., Second Edition.
3. Andrew S. Tannenbaum, "Computer Networks", PHI, Fourth Edition, 2003.
4. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000.

EC1352 ANTENNAS AND WAVE PROPAGATION 3 1 0 100

AIM
To enable the student to study the various types of antennas and wave propagation.

OBJECTIVES
- To study radiation from a current element.
- To study antenna arrays
- To study aperture antennas
- To learn special antennas such as frequency independent and broad band antennas.
- To study radio wave propagation.

UNIT I RADIATION FIELDS OF WIRE ANTENNAS 9
Concept of vector potential. Modification for time varying, retarded case. Fields associated with Hertzian dipole. Power radiated and radiation resistance of current element. Radiation resistance of elementary dipole with linear current distribution. Radiation from half-wave dipole and quarter-wave monopole. Assumed current distribution for wire antennas. Use of capacity hat and loading coil for short antennas.

UNIT II ANTENNA FUNDAMENTALS AND ANTENNA ARRAYS 9
Definitions: Radiation intensity. Directive gain. Directivity. Power gain. Beam Width. Band Width. Gain and radiation resistance of current element. Half-wave dipole and folded dipole.

Reciprocity principle. Effective length and Effective area. Relation between gain effective length and radiation resistance.
Loop Antennas: Radiation from small loop and its radiation resistance. Radiation from a loop with circumference equal to a wavelength and resultant circular polarization on axis.
Helical antenna. Normal mode and axial mode operation.
Antenna Arrays: Expression for electric field from two and three element arrays. Uniform linear array. Method of pattern multiplication. Binomial array. Use of method of images for antennas above ground.

UNIT III TRAVELLING WAVE (WIDEBAND) ANTENNAS 9
Radiation from a traveling wave on a wire. Analysis of Rhombic antenna. Design of Rhombic antennas.
Coupled Antennas: Self and mutual impedance of antennas. Two and three element Yagi antennas. Log periodic antenna. Reason for feeding from end with shorter dipoles and need for transposing the lines. Effects of decreasing a.

UNIT IV APERTURE AND LENS ANTENNAS. 9
Radiation from an elemental area of a plane wave (Huygen's Source). Radiation from the open end of a coaxial line. Radiation from a rectangular aperture treated as an array of Huygen's sources. Equivalence of fields of a slot and complementary dipole. Relation between dipole and slot impedances. Method of feeding slot antennas. Thin slot in an infinite cylinder. Field on the axis of an E-Plane sectoral horn. Radiation from circular aperture. Beam Width and Effective area.
Reflector type of antennas (dish antennas). Dielectric lens and metal plane lens antennas. Lumeberg lens. Spherical waves and Biconical antenna.

UNIT V PROPAGATION 9
The three basic types of propagation; ground wave, space wave and sky wave propagation.
Sky wave propagation: Structure of the ionosphere. Effective dielectric constant of ionized region. Mechanism of refraction. Refractive index. Critical frequency. Skip distance. Effect of earth's magnetic field. Energy loss in the ionosphere due to collisions. Maximum usable frequency. Fading and Diversity reception.
Space wave propagation: Reflection from ground for vertically and horizontally polarized waves. Reflection characteristics of earth. Resultant of direct and reflected ray at the receiver. Duct propagation.
Ground wave propagation: Attenuation characteristics for ground wave propagation. Calculation of field strength at a distance.

TUTORIAL 15

TOTAL : 60
TEXTBOOK
1. E.C.Jordan and Balmain, "Electro Magnetic Waves and Radiating Systems", PHI, 1968, Reprint 2003.

REFERENCES
1. John D.Kraus and Ronalatory Marhefka, "Antennas", Tata McGraw-Hill Book Company, 2002.
2. R.E.Collins, 'Antennas and Radio Propagation ", McGraw-Hill, 1987.
3. Ballany , "Antenna Theory " , John Wiley & Sons, second edition , 2003.

CS1251 COMPUTER ARCHITECTURE 3 0 0 100

AIM
To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

OBJECTIVES
• To have a thorough understanding of the basic structure and operation of a digital computer.

• To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
• To study in detail the different types of control and the concept of pipelining.
• To study the hierarchical memory system including cache memories and virtual memory.
• To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTERS 10
Functional units- Basic Operational Concepts, Bus Structures, Software Performance – Memory locations & addresses – Memory operations – Instruction and instruction sequencing – addressing modes – assembly language – Basic I/O operations – stacks and queues.

UNIT II ARITHMETIC 8
Addition and subtraction of signed numbers – Design of fast adders – multiplication of positive numbers- signed operand multiplication and fast multiplication – Integer division – floating point numbers and operations.

UNIT III BASIC PROCESSING UNIT 9
Fundamental concepts – Execution of a complete Instruction – Multiple bus organization – Hardwired control – microprogrammed control.
Pipelining – Basic concepts – data hazards – instruction hazards – influence on Instruction sets – Data path and control consideration – Superscalar operation.

UNIT IV MEMORY SYSTEM 9
Basic concepts – semiconductor RAMs, ROMs – Speed, size and cost – cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage.

UNIT-V I/O ORGANIZATION 9
Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface Circuits – Standard I/O Interfaces (PCI, SCSI, USB).

TOTAL : 45
TEXT BOOKS
1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization" 5th Ed, McGraw Hill, 2002.

REFERENCES
1. William Stallings, "Computer Organization & Architecture – Designing for Performance", 6th Ed., Pearson Education, 2003 reprint.
2. David A.Patterson and John L.Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Ed, Morgan Kaufmann, 2002 reprint.
3. John P.Hayes, "Computer Architecture & Organization", 3rd Ed, McGraw-Hill, 1998.

MA1251 NUMERICAL METHODS 3 1 0 100

AIM
With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES
At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

• The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigenvalue problem of a matrix can be obtained numerically where analytical methods fail to give solution.

• When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
• The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
• Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3
Linear interpolation methods (method of false position) – Newton's method – Statement of Fixed Point Theorem – Fixed point iteration: x=g(x) method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION AND APPROXIMATION 9+ 3
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+ 3

Derivatives from difference tables – Divided differences and finite differences –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+ 3
Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+ 3
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS
1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

REFERENCES
1. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

EC1353 COMMUNICATION SYSTEMS LABORATORY 0 0 3 100

LIST OF EXPERIMENTS

1 Radiation pattern of Halfwave dipole Antenna
2. Radiation pattern of yagi Antenna
3. Radiation pattern of loop Antenna
4. Characteristics of AM receiver (Selectivity & Sensitivity)
5. Characteristics of FM receiver (Selectivity & Sensitivity)
6. Sampling & time division multiplexing
7. Pulse modulation- PAM / PWM /PPM
8. Pulse code modulation
9. Line coding & Decoding
10. Delta modulation / Differential pulse code modulation
11. Digital modulation –ASK, PSK, QPSK, FSK

EC1354 NETWORKS LABORATORY 0 0 3 100

1. PC to PC Communication
Parallel Communication using 8 bit parallel cable
Serial communication using RS 232C
2. Ethernet LAN protocol
To create scenario and study the performance of CSMA/CD protocol ethrol simulation
3. Token bus and token ring protocols
To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols
To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol
6. Implementation and study of Goback-N and selective ret protocols
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Implementation of Data encryption and decryption
10. Transfer of files from PC to PC using Windows / Unix socket processing

EC1355 ELECTRONIC SYSTEM DESIGN LAB 0 0 3 100

1. DC power supply design using buck – boost converters
Design the buck-boost converter for the given input voltage variation, load current and output voltage. Plot the regulation characteristics.

2. DC power supply design using fly back converter (Isolated type)
Design the fly back converter using ferrite core transformer for the given input voltage variation load current and output voltage.
Plot the regulation characteristics.

3. Design of a 4-20mA transmitter for a bridge type transducer.
Design the Instrumentation amplifier with the bridge type transducer (Thermistor or any resistance variation transducers) and convert the amplified voltage from the instrumentation amplifier to 4 – 20 mA current using op-amp. Plot the variation of the temperature Vs output current.

4. Design of AC/DC voltage regulator using SCR
Design a phase controlled voltage regulator using full wave rectifier and SCR, vary the conduction angle and plot the output voltage.

5. Design of process control timer
Design a sequential timer to switch on & off at least 3 relays in a particular sequence using timer IC.

6. Design of AM / FM modulator / demodulator
ii. Design AM signal using multiplier IC for the given carrier frequency and modulation index and demodulate the AM signal using envelope detector.
iii. Design FM signal using VCO IC NE566 for the given carrier frequency and demodulate the same using PLL NE 565.

7. Design of Wireless date modem.
Design a FSK modulator using 555 and convert it to sine wave using filter and transmit the same using IR LED and demodulate the same PLL NE 565.

8. PCB layout design using CAD
Drawing the schematic of simple electronic circuit and design of PCB layout using CAD

9. Microcontroller based systems design
Design of microcontroller based system for simple applications like security systems combination lock etc. using 89c series flash micro controller.

10. DSP based system design
Design a DSP based system for simple applications like echo generation, etc. using TMS 320 DSP kit.

MG1401 TOTAL QUALITY MANAGEMENT 3 0 0 100

OBJECTIVE
• To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
• To understand the statistical approach for quality control.
• To create an awareness about the ISO and QS certification process and its need for the industries.

1. INTRODUCTION 9
Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES 9
Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC) 9
The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS 9
Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS 9
Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

EC1401 VLSI DESIGN 3 0 0 100

AIM

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

OBJECTIVES

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

UNIT I CMOS TECHNOLOGY 9

An overview of Silicon semiconductor technology, Basic CMOS technology : nwell, P well, Twin tub and SOI Process. Interconnects, circuit elements: Resistors, capacitors, Electrically alterable ROMs, bipolar transistors, Latch up and prevention.
Layout design rules, physical design: basic concepts, CAD tool sets, physical design of logic gates: Inverter, NAND, NOR, Design Hierarchies.

UNIT II MOS TRANSISTOR THEORY 9

NMOS, PMOS Enhancement transistor, Threshold voltage, Body effect, MOS DC equations, channel length modulation, Mobility variation, MOS models, small signal AC characteristics, complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time, power dissipation, transmission gate, tristate inverter.

UNIT III SPECIFICATION USING VERILOG HDL 9

Basic Concepts: VLSI Design flow, identifiers, gate primitives, value set, ports, gate delays, structural gate level and switch level modeling, Design hierarchies, Behavioral and RTL modeling: Operators, timing controls, Procedural assignments conditional statements, Data flow modeling and RTL.
Structural gate level description of decoder, equality detector, comparator, priority encoder, D-latch, D-ff, half adder, Full adder, Ripple Carry adder.

UNIT IV CMOS CHIP DESIGN 9

Logic design with CMOS: MOSFETS as switches, Basic logic gates in CMOS, Complex logic gates, Transmission gates: Muxes and latches, CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channelless and structured GA, Programmable logic structures; 22V10, Programming of PALs, Programmable Interconnect, Reprogrammable GA: Xilinx programmable GA, ASIC design flow.

UNIT V CMOS TESTING 9
Need for testing, manufacturing test principles, Design strategies for test, Chip level and system level test techniques.

TOTAL : 45
TEXT BOOKS
1. Weste & Eshraghian: Principles of CMOS VLSI design (2/e) Addison Wesley, 1993 for UNIT I through UNIT IV.
2. Samir Palnitkar; Verilog HDL - Guide to Digital design and synthesis, III edition, Pearson Education, 2003 for UNIT V

REFERENCES
1. M.J.S.Smith : Application Specific integrated circuits, Pearson Education, 1997.
2. Wayne Wolf, Modern VLSI Design, Pearson Education 2003.
3. Bob Zeidmin ; Introduction to verilog, Prentice Hall, 1999
4. J . Bhaskar : Verilog HDL Primer, BSP, 2002.
5. E. Fabricious , Introduction to VLSI design, McGraw-Hill 1990.
6. C. Roth, Digital Systems Design Using VHDL, Thomson Learning, 2000.

EC1402 OPTICAL COMMUNICATION 3 0 0 100

AIMS
• To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
• To study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.

OBJECTIVES
• To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
• To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
• To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
• To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
• To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

UNIT I INTRODUCTION TO OPTICAL FIBERS 9
Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9
Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9
Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition – Rate equations –External Quantum efficiency –Resonant frequencies –Laser Diodes,

Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre –to- Fibre joints, Fibre splicing.

UNIT IV FIBER OPTICAL RECEIVERS 9
PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT V DIGITAL TRANSMISSION SYSTEM 9
Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network. .

TOTAL : 45

TEXT BOOK
1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000

REFERENCES
1. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

EC1403 MICROWAVE ENGINEERING 3 0 0 100

AIM
To enable the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.

OBJECTIVES
- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

UNIT I 9
Microwave Frequencies, Microwave Devices, Microwave Systems, Microwave Units of Measure, Microwave Hybrid Circuits, Waveguide Tees, Magic Tees (Hybrid Trees), Hybrid Rings (Rat-Race Circuits), Waveguide Corners, Bends and Twists, Directional Couplers, Two-Hole Directional Couplers, Z & ABCD Parameters- Introduction to S parameters, S Matrix of a Directional Coupler, Hybrid Couplers, Circulators and Isolators, Microwave Circulators, Microwave Isolators.

UNIT II 9
Transit time limitations in transistors, Microwave bipolar transistors, power frequency limitations microwave field effect transistors, HEMT, Gunn effect – RWH theory, high – field domain and modes of operation microwave amplification – Avalance transit time devices – IMPATT and TRAPATT diodes and comparison parametric amplifiers.

UNIT III TRANSFERRED ELECTRON DEVICES (TEDs) and AVALANCHE TRANSIT-TIME DEVICES 9
Introduction, Gunn-Effect Diodes – GaAs Diode, Background, Gunn Effect, Ridely-Watkins-Hilsun (RWH) Theory, Differential Negative Resistance, Two-Valley Model Theory, High-Field Domain, Modes of Operation, LSA Diodes, InP Diodes, CdTe Diodes, Microwave Generation and Amplification, Microwave Generation, Microwave Amplification, AVALANCHE TRANSIT-TIME DEVICES, Introduction, Read Diode, Physical Description, Avalanche Multiplication, Carrier Current Io(t) and External Current I¬e¬(t), Output Power and Quality Factor, IMPATT Diodes, Physical Structures, Negative Resistance, Power Output and Efficiency, TRAPATT Diodes, Physical Structures, Principles of Operation, Power Output and Efficiency, BARITT Diodes, Physical Description, Principles of Operation, Microwave Performance, Parametric Devices,

Physical Structures, Nonlinear Reactance and Manley – Rowe Power Relations, Parametric Amplifiers, Applications.

UNIT III MICROWAVE LINEAR-BEAM TUBES (O TYPE) and MICROWAVE CROSSED-FIELD TUBES (M TYPE) 9
Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process, Output Power and Beam Loading, State of the Art, Multicavity Klystron Amplifiers, Beam-Current Density, Output Current Output Power of Two-Cavity Klystron, Output Power of Four-Cavity Klystron, Reflex Klystrons, Velocity Modulation, Power Output and Efficiency, Electronic Admittance, Helix Traveling-Wave Tubes (TWTs), Slow-Wave structures, Amplification Process, Convection Current, Axial Electric Field, Wave Modes, Gain Consideration, MICROWAVE CROSSED-FIELD TUBES , Magnetron Oscillators, Cylindrical Magnetron, Coaxial Magnetron, Tunable Magnetron, Ricke diagram.

UNIT IV STRIP LINES and MONOLITHIC MICROWAVE INTEGRATED CIRCUITS 9
Introduction, Microstrip Lines, Characteristic Impedance of Microstrip Lines, Losses in Microstrip Lines, Quality Factor Q of Microstrip Lines, Parallel Strip Lines, Distributed Lines, Characteristic Impedance, Attenuation Losses, Coplanar Strip Lines, Shielded Strip Lines, References, Problems, MONOLITHIC MICROWAVE INTEGRATED CIRCUITS, Introduction, Materials, Substrate Materials, Conductor Materials, Dielectric Materials, Resistive Materials, Monolithic Microwave Integrated-Circuit Growth, MMIC Fabrication Techniques, Fabrication Example.

UNIT V MICROWAVE MEASUREMENTS: 9
Slotted line VSWR measurement, VSWR through return loss measurements, power measurement, impedance measurement insertion loss and attenuation measurements-measurement of scattering parameters – Measurement of 1 dB, dielectric constant measurement of a solid using waveguide

TOTAL : 45
TEXT BOOKS
1. Samuel Y.LIAO : Microwave Devices and Circuits – Prentice Hall of India – 3rd Edition (2003)
2. Annapurna Das and Sisir K.Das: Microwave Engineering – Tata McGraw-Hill (2000) (UNIT V)

REFERENCES
1. R.E. Collin : Foundations for Microwave Engg. – IEEE Press Second Edition (2002)
2. David M.POZAR : Microwave Engg. – John Wiley & Sons – 2nd Edition (2003)
3. P.A.RIZZI – Microwave Engg. (Passive ckts) – PH1

EC1404 VLSI LABORATORY 0 0 3 100

1. Study of Simulation using tools
2. Study of Synthesis tools
3. Place and Root and Back annotation for FPGAs
4. Study of development tool for FPGAs for schematic entry and verilog
5. Design of traffic light controller using verilog and above tools
6. Design and simulation of pipelined serial and parallel adder to add/ subract 8 number of size, 12 bits each in 2's complement
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant
8. Study of FPGA board (HTTP://www.xess.com) and testing on board LEDs and switches using verilog codes
9. Testing the traffic controller design developed in SI. NO.5 on the FPGA board
10. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.

EC1405 OPTICAL & MICROWAVE LAB 0 0 3 100

Experiments pertaining to Fiber optics, Optical Communication and Fiber optic sensors:

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibres – SM Fibres.
3. Coupling Fibers to Semi-Conductor Sources – Connectors & Splices.
4. Fiber optic communication links.
5. LED & Photo Diode Characteristics.

Microwave experiments
1. VSWR Measurements – Determination of terminated impedance
2. Determination of guide wavelength, frequency measurement.
3. Radiation Pattern of Horns, Paraboloids.
4. Microwave Power Measurement.
5. Characteristics of Gunn diode Oscillator.

EC1451 MOBILE COMMUNICATIONS 3 0 0 100

AIM
To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

OBJECTIVES
• It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
• It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
• It provides idea about analog and digital modulation techniques used in wireless communication. It also deals with the different types of equalization techniques and diversity concepts.
• It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques are presented. This unit also describes the time, frequency code division multiple access techniques as well as more recent multiple access technique such as space division multiple access.
• It deals with second generation and third generation wireless networks and worldwide wireless standards.

UNIT I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9
Introduction to wireless communication: Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications.
Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

UNIT II MOBILE RADIO PROPAGATION 9
Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

UNIT III MODULATION TECHNIQUES AND EQUALIZATION 9
Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels. Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Algorithms for Adaptive Equalization. Diversity Techniques, RAKE receiver.

UNIT IV CODING AND MULTIPLE ACCESS TECHNIQUES 9
Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT V WIRELESS SYSTEMS AND STANDARDS 9
Second Generation and Third Generation Wireless Networks and Standards, WLL, Blue tooth. AMPS, GSM, IS-95 and DECT

TOTAL : 45
TEXT BOOK
1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.

REFERENCES
1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003.
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.
3. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003.