SRI KRISHNA COLLEGE OF TECHNOLOGY (AUTONOMOUS)

KOVAIPUDUR, COIMBATORE - 641 042

REGULATIONS FOR FOUR YEAR BE / BTech DEGREE PROGRAMMES - 2013

(For the batches of candidates admitted in 2013 - 2014 and subsequently)

NOTE: The regulations, hereunder, are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the programme) as may be decided by the Academic Council.

DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i. "**Programme**" means BE / BTech Degree Programme.

ii. "**Course**" means a Theory or Practical subject that is normally studied in a semester, like Material Science, Engineering Thermodynamics, etc.,.

iii. "**Controller of Examinations"** means the Authority of the College who is responsible for all activities of the assessment process.

iv. "**Head of the Institution**" means the Principal of the College who is responsible for all academic activities of the College and for implementation of relevant rules of this Regulation.

v. **"Head of the Department"** means Head of the concerned Department of the College.

vi. "**University**" means the affiliating university, viz., Anna University, Chennai.

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1. BE / BTech PROGRAMMES OFFERED AND MODES OF STUDY

1.1. Programmes: The following are the branches of study under BE / BTech degree programme.

BE	Branch I	Civil Engineering
	Branch II	Mechanical Engineering
	Branch III	Electronics and Communication Engineering
	Branch IV	Computer Science and Engineering
	Branch V	Electrical and Electronics Engineering
	Branch VI	Instrumentation and Control Engineering
BTech	Branch I	Information Technology

1.2 MODES OF STUDY

1.2.1 Full -Time: All the programmes are full-time programmes and Candidates admitted should be available in the College during the complete working hours for curricular, co-curricular and extra-curricular activities.

2. ADMISSION REQUIREMENTS

Candidates for admission to the BE / BTech degree programme will be required to satisfy the conditions of admission thereto prescribed by the affiliating university and Government of Tamil Nadu.

3. DURATION OF THE PROGRAMME

i. Minimum Duration: The programme will extend over a period of four years leading to the Degree of Bachelor of Engineering (BE) / Bachelor of Technology (BTech) of the Anna University, Chennai. The four academic years will be divided into eight semesters with two semesters per year.

Provision is made for lateral entry of candidates in the third semester of the programme in one of the branches of study and they will be required to satisfy the conditions of admissions thereto prescribed by the affiliating university and Government of Tamil Nadu.

Each semester shall normally consist of 90 working days or 450 hours (or 490 periods of 55 minutes duration each).

ii. Maximum Duration: The candidate shall complete all the passing requirements of the BE / BTech degree programme within a maximum period of 7 years (6 years for lateral entry). These periods will be reckoned from the commencement of the first semester (third semester in the case of lateral entry) to which the candidate was first admitted to the programme.

4. STRUCTURE OF PROGRAMMES

4.1 Medium:

The medium of instruction shall be English for all Courses, Examinations, Seminar presentations and Project / Thesis / Dissertation.

The curriculum will comprise courses of study as given in curriculum section 22 infra in accordance with the prescribed syllabi.

4.2 Curriculum:

Every Programme will have a Curriculum and Syllabi consisting of core courses, elective courses and project work. The Programme may also include Seminar / Practical / Practical Training, if they are specified in the curriculum as given section 22 infra.

4.3 Electives:

Every candidate will be required to opt for one elective in VI semester and two electives each in VII & VIII semesters from the list of electives relating in his/her branch of study as given in section 22 infra. However, a candidate may be permitted to take one elective from the list of electives from other branches of BE/BTech programme during his/her course of study with specific permission from the respective head of the department.

Acceleration of Electives: A Student may be permitted to take Electives IV and V in the 6^{th} and 7^{th} semesters respectively instead of the 8^{th} semester normal course of study with specific permission from the concerned Head of the department, in order to do Project work phase II during the full period of semester 8.

4.4. One- Credit Courses:

Students can opt for one credit industry oriented courses of 15 hours duration which will be offered by experts from industry/other Institution, subject to the approval by the Head of the department. Grades for the course should be submitted by the expert to Controller of Examinations

after the course work is completed. There will not be any Semester End Examination for such One credit courses. Students can complete such one credit courses during the semesters 3 to 7 as and when the courses are offered by the department. "Elective V" can be waived if a student successfully completes three such one credit courses.

4.5 Project Work:

Every candidate will be required to undertake a suitable project in department / industry / research organization in consultation with the Head of the Department and the faculty guide and submit the project report thereon at the end of the semesters 7 and 8 on dates announced by the College/Department. Also he/she will be required to present two seminars on the progress of the project work during each of semesters 7 and 8.

4.6 Comprehensive Viva- voce:

Comprehensive viva-voce shall be conducted during seventh semester covering all the department courses of the previous semesters.

4.7 Personality development:

All candidates shall enroll, on admission, in any one of the Community Service & Extension activities (NSS / YRC / RRC/ Sports & Games) and participate actively for a minimum of 20 hours during the first four semesters of study.

National Service Scheme (NSS) will have social service activities in and around the College.

Youth Red Cross (YRC) society activities will include peace time activities like health & hygiene, international friendship, awareness camps etc.

Red Ribbon Club (RRC) activities will include the conduct of awareness and education programmes on health related issues.

Sports & Games activities will include preparation for inter-collegiate sports events.

While the training activities will normally be held during week ends, the camps will normally be held during vacation period.

4.8 Credit assignment:

Normally one credit for one period of Lecture per week, 0.5 credit for one period of Tutorial per week and one credit for three periods of Practical/Project Work per week are assigned for each course. The exact number of credits assigned to the different courses is as shown in section 22 infra.

4.8.1 Minimum credits:

The minimum number of credits to be earned through successful completion of the courses of study in the respective branches listed in section 1 supra, by a candidate to qualify for the award of degree is provided below:

TOTAL CREDITS: 181

SEMESTER – I

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EN101	Technical English - I	3	0	0	3	40	60	100	HUM
13MA102	Linear Algebra, Calculus and Applications	3	1	0	4	40	60	100	BS
13PY103	Engineering Physics	3	0	0	3	40	60	100	BS
13CS105	Fundamentals of Computing and C programming	4	0	0	4	40	60	100	EAS
13CE106	Basics of Civil and Mechanical Engineering	4	0	0	4	40	60	100	EAS
13CH108	Engineering Chemistry for Electrical Sciences	3	0	0	3	40	60	100	BS
PRACTICAL									
13CS111	Fundamentals of Computing and C Programming Laboratory	0	0	3	1	60	40	100	EAS
13ME113	Engineering Practices	0	0	3	1	60	40	100	EAS
13PY211	Physics/Chemistry Laboratory*	0	0	3	Refer Sem. II and footnote #				BS
Total		**20**	**2**	**9**	**23**				

SEMESTER – II

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EN201	Technical English-II	3	0	0	3	40	60	100	HUM
13MA202	Transform Techniques and Integral Calculus	3	1	0	4	40	60	100	BS
13CH204	Environmental Science	3	0	0	3	40	60	100	EAS
13EE205	Electric Circuit Analysis	4	0	0	4	40	60	100	EAS
13EC206	Electron Devices	3	0	0	3	40	60	100	DC
13PY208	Materials Science for Electrical Sciences	3	0	0	3	40	60	100	BS
PRACTICAL									
13PY211	Physics/Chemistry Laboratory*	0	0	3	2	60	40	100	BS
13ME212	Engineering Graphics	1	0	3	2	60	40	100	EAS
13EC213	Electron Devices and Circuits Laboratory	0	0	3	1	60	40	100	DC
Total		**20**	**2**	**9**	**25**				

SEMESTER - III

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EC301	Digital System Design with VHDL	4	0	0	4	40	60	100	DC
13MA302	Discrete Transforms and Fourier Analysis	3	1	0	4	40	60	100	BS
13EC304	Measurements and Instrumentation	3	0	3	4	40	60	100	DC
13CS305	Data Structures and Algorithms	3	0	0	3	40	60	100	EAS
13EC306	Electronic Circuits - I	4	0	0	4	40	60	100	DC
13EE308	Electrical Machines	3	0	0	3	40	60	100	EAS
PRACTICAL									
13EC311	Digital Electronics Laboratory	0	0	3	1	60	40	100	DC
13EC312	Electronic Circuits - I Laboratory	0	0	3	1	60	40	100	DC
13CS314	Data Structures Laboratory	0	0	3	1	60	40	100	EAS
Total		**20**	**1**	**12**	**25**				

SEMESTER - IV

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EC401	Electronic Circuits - II	4	0	0	4	40	60	100	DC
13MA402	Probability Theory and Random Processes	3	1	0	4	40	60	100	BS
13EC403	Signals and Systems	3	1	0	4	40	60	100	DC
13EC404	Linear Integrated Circuits	3	0	0	3	40	60	100	DC
13EC405	Computer Architecture	3	0	0	3	40	60	100	EAS
13EC406	Electromagnetics	3	1	0	4	40	60	100	DC
PRACTICAL									
13EE411	Electrical Machines Laboratory	0	0	3	1	60	40	100	EAS
13EC412	Electronic Circuits - II and Simulation Laboratory	0	0	3	1	60	40	100	DC
13EC413	Linear Integrated Circuits Laboratory	0	0	3	1	60	40	100	DC
Total		**19**	**3**	**9**	**25**				

SEMESTER - V

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EC501	Transmission Lines and Waveguides	4	0	0	4	40	60	100	DC
13MB502	Principles of Management	3	0	0	3	40	60	100	HUM
13EC503	Analog Communication	4	0	0	4	40	60	100	DC
13EC504	Digital Signal Processing	4	0	0	4	40	60	100	DC
13EC505	Microprocessors and Microcontrollers	3	0	0	3	40	60	100	DC
13EC506	Control Systems	3	1	0	4	40	60	100	DC
PRACTICAL									
13EC511	Digital Signal Processing Laboratory	0	0	3	1	60	40	100	DC
13EN512	Communication Skills Laboratory	1	0	3	2	60	40	100	HUM
13EC513	Microprocessors and Microcontrollers Laboratory	0	0	3	1	60	40	100	DC
Total		**22**	**1**	**9**	**26**				

SEMESTER - VI

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EC601	Embedded Systems	3	0	0	3	40	60	100	DC
13EC602	VLSI Design	3	0	0	3	40	60	100	DC
13EC603	Digital Communication	4	0	0	4	40	60	100	DC
13EC604	Computer Networks	3	0	0	3	40	60	100	DC
13EC605	Antennas and Wave Propagation	4	0	0	4	40	60	100	DC
13ECXXX	Elective I	3	0	0	3	40	60	100	DE
PRACTICAL									
13EC611	Communication Systems Laboratory	0	0	3	1	60	40	100	DC
13EC612	Embedded Systems Design Laboratory	0	0	3	1	60	40	100	DC
13EC613	VLSI Design Laboratory	0	0	3	1	60	40	100	DC
Total		**20**	**0**	**9**	**23**				

SEMESTER - VII

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13EC701	Optical Communication	3	0	0	3	40	60	100	DC
13EC702	Wireless Communication	3	0	0	3	40	60	100	DC
13EC703	Satellite Communication	3	0	0	3	40	60	100	DC
13EC704	RF and Microwave Engineering	3	0	0	3	40	60	100	DC
13ECXXX	Elective II	3	0	0	3	40	60	100	DE
13ECXXX	Elective III	3	0	0	3	40	60	100	DE
PRACTICAL									
13EC711	Computer Networks Laboratory	0	0	3	1	60	40	100	DC
13EC712	Microwave and Optical Laboratory	0	0	3	1	60	40	100	DC
13EC721	Comprehensive Viva-Voce	0	0	0	1	-	100	100	DC
13EC751	Project Work - Phase I	0	0	3	1	60	40	100	DC
Total		**18**	**0**	**9**	**22**				

SEMESTER - VIII

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13ECXXX	Elective IV	3	0	0	3	40	60	100	DE
13ECXXX	Elective V	3	0	0	3	40	60	100	DE
PROJECT WORK									
13EC851	Project Work - Phase II	0	0	18	6	60	40	100	DC
Total		**6**	**0**	**18**	**12**				

L - Lecture
T - Tutorial
P - Practical
C - Credits
CA - Continuous Assessment
SEE - Semester End Examination
BS - Basic Science
HUM - Humanities
EAS - Engg. Arts & Science
CAT - Category
DC - Department Core
DE - Department Elective

- Continuous Assessment marks are awarded for performance in both semesters (I and II) as given in section 13 supra. Semester End Examination is in second semester only.

***** - Laboratory classes for Physics and Chemistry are held in alternate weeks.

LIST OF ELECTIVES

COMMUNICATION ENGINEERING

Course Code	Course Title
13EC001	Information Theory and Coding
13EC002	Engineering Acoustics
13EC003	Electromagnetic Interference and Compatibility
13EC004	High Speed Networks
13EC005	Radar and Navigational Aids
13EC006	RF and MEMS
13EC007	Microwave Integrated Circuits
13EC008	Wireless Networks
13EC009	Telecommunication Switching and Networks
13EC010	Remote Sensing
13EC011	CDMA Systems

ELECTRONICS ENGINEERING

Course Code	Course Title
13EC021	Medical Electronics
13EC022	Power Electronics
13EC023	Television and Video Engineering
13EC024	Advanced Electronic System Design
13EC025	Opto Electronic Devices
13EC026	Nano Electronics
13EC027	Hardware Description Languages

GENERAL ENGINEERING

Course Code	Course Title
13CS019	Artificial Intelligence
13CS033	Object Oriented Programming and C++
13EC043	Fuzzy and Neural Networks
13CS047	Soft Computing

MICROPROCESSORS, MICROCONTROLLERS AND APPLCATIONS

Course Code	Course Title
13EC051	Advanced Microprocessors
13EC052	Computer Hardware and Interfacing
13EC053	Robotics
13EC054	Reconfigurable Computing
13EC055	Hardware-Software Co-design

MANAGEMENT SCIENCES

Course Code	Course Title
13GE001	Intellectual Property Rights
13GE003	Indian Constitution and Society
13MA006	Operations Research

SIGNAL AND IMAGE PROCESSING

Course Code	Course Title
13EC071	Advanced Digital Signal Processing
13EC072	Speech Processing
13EC073	Digital Image Processing

SEMESTER III

13EC301 DIGITAL SYSTEM DESIGN WITH VHDL 4 0 0 4

OBJECTIVES

- To study the concept of Boolean algebra and its implementation using basic gates
- To learn the design of combinational and sequential circuits using logic gates.
- To design synchronous and asynchronous sequential circuits using flip-flops.
- To learn the hardware description language.

OUTCOMES

At the end of the course the student should be able to

- Analyze Boolean expressions using K-maps and implementation in basic gates.
- Design adders, subractors, multiplexers ,counters and shift registers
- Design of digital synchronous circuits using state diagrams from moore and mealy model
- Analyze the problem of hazards due to racing in asynchronous circuits
- Implementation of basic logic circuits in VHDL

UNIT I BOOLEAN ALGEBRA 12

Number systems-Logic gates-Boolean postulates and laws –De-Morgan's Theorem- Principle of Duality-Boolean expression -Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)- Conversion between canonical forms - Karnaugh map Minimization – Quince Mcclusky Method. NAND/NOR implementations.

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS 12

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. Flip flops : SR, JK, T, D and Master slave – Characteristic table and equation –Excitation table – Edge/Level/Pulse Triggering –Realization of one flip flop using other flip flops – Counters - Asynchronous Ripple counters – Synchronous Modulo n Counters, Special counters, Shift registers.

UNIT III DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUIT 12

Moore and Mealy machine- Design and analysis of synchronous circuits-Design of Synchronous counters- state diagram- State table –State minimization –State assignment- Excitation table and maps-Circuit implementation.

UNIT IV DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUIT 12

Design and analysis of Fundamental mode Asynchronous circuits – primitive flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- Cycles, Races and Hazards– Hazard free design

UNIT V INTRODUCTION TO VHDL 12

Complete VLSI design flow, Behavioral, Data flow, and Structural Modeling. Functions, Procedures, attribute, Test bench, Packages and configurations.

VHDL implementation of Adder, comparator, MUX, Decoder, parity checker, flip flops, Counters, Shift register.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Combinational circuit design using PLDs, Introduction to FPGAs and its block diagram.

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 2004.
2. Charles H.Roth. "Fundamentals of Logic Design", Thomson Publication Company, 2005
3. VHDL Primer, J. Bhaskar, Pearson / PHI, New Delhi, 2003.

REFERENCES

1. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004.
2. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003.
3. Digital Systems Design Using VHDL, - Thomson Learning - Charles H. Roth. Jr: Inc, 2002.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
5. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.

13MA302 DISCRETE TRANSFORMS AND FOURIER ANALYSIS 3 1 0 4

OBJECTIVES

- To study the concept of mathematical formulation of certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- To understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- To learn the working procedure of formulating and identifying certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
- To learn the concept of evaluating the complex integration in terms of residue theorem.
- To understand the basics of Z – transform in its applicability to discretely varying functions.

OUTCOMES

At the end of the course the student should be able to

- Solve the engineering problems using PDE
- Find Fourier series solution to the engineering problems
- Find the derivatives of the complex numbers and to evaluate complex integrals.
- Design and formulate certain problems in terms of difference equations and solve them using Z-transform technique

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9

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 homogeneous partial differential equations of second and higher order with constant co-efficient

UNIT II FOURIER SERIES 9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Change of interval- Parseval's identity- harmonic analysis.

UNIT III BOUNDARY VALUE PROBLEMS 9

Classification– Solution of one dimensional wave equation – one dimensional heat equation – steady state solution of two dimensional heat equations (excluding insulated edges) – Fourier series solution in Cartesian coordinates.

UNIT IV ANALYTIC FUNCTIONS AND COMPLEX INTEGRATION 9

Functions of a complex variable–Analytic functions–Necessary conditions, Cauchy-Riemann equation and Sufficient conditions (excluding proofs) – Harmonic conjugate – Construction of analytic functions - Complex integration–Singular points – Residues – Residue theorem statement – Application of residue theorem to evaluate real Integrals.

UNIT V Z- TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform- Properties – Inverse Z- transform- Convolution theorem- Formation of difference equations – Solution of difference equations using Z-transform

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Modeling of heat and mass transfer equation using PDE – Discrete Fourier transform in the field of Digital Signal Processing and Spectral analysis – Analytic continuation – Special functions.

TUTORIAL: 15
TOTAL: 60

TEXT BOOK

1. Grewal B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).
2. Kreyszig. E, "Advanced Engineering Mathematics", tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2011.

REFERENCES

1. Veerarajan.T., "Engineering Mathematics" (for semester III), third edition, Tata McGraw-Hill Pub. Co., New Delhi, 2005.
2. Venkataraman. M.K, "Engineering Mathematics", Volume I & II Revised Enlarged Fourth Edition", National Pub. Co., Chennai, 2005.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 2007.

13EC304 MEASUREMENTS AND INSTRUMENTATION 3 0 3 4

OBJECTIVES

- To study the concepts of electronic measurements
- To understand the importance of signal generators and signal analyzers in measurements.
- To learn the relevance of digital instruments in measurements.
- To learn the usage in virtual instrumentation for measurements.

OUTCOMES

At the end of the course the student should be able to

- Understand the different methods of measurements.
- Understand the concepts of analog recorders
- Exposure to various signal generators, wave analyzers, storage and display devices
- Understand the concepts of digital recording techniques
- Design and implement simple experiment using LabView

UNIT I BASIC MEASUREMENT CONCEPTS **9**

Measurement systems – Static and Dynamic characteristics – units and standards of measurements – Moving coil METERS – Principles of operation and construction of PMMC, Moving iron meters – Analog Multimeters. Bridge measurements – Maxwell, Hay, Schering, Anderson and Wien bridge

UNIT II OSCILLOSCOPES AND ANALOG RECORDERS **9**

Cathode Ray Tubes, Cathode Ray oscilloscopes – block schematic – applications. Special oscilloscopes:Dual Trace oscilloscopes and Dual Beam Oscilloscopes, Digital storage Oscilloscopes and advantages. Vector voltmeter- vector impedance meters – RF voltage and power measurements. Recorders: Graphic recorders and Magnetic recorders.

UNIT III SIGNAL GENERATORS AND ANALYZERS **9**

Function generators – RF signal generators – Sweep generators – Frequency synthesizer, wave analyzer-frequency selective wave analyzer - heterodyne wave analyzer. Distortion analyzer – fundamental suppression distortion analyzer- Heterodyne Harmonic Distortion analyzer. Spectrum analyzer.

UNIT IV DIGITAL INSTRUMENTS AND DIGITAL RECORDERS **9**

Digital Data Acquisition system- single and multi channel data acquisition system– digital voltmeter – digital multimeters – frequency counters – measurement of frequency and time interval. Instrumentation interface bus: IEEE 488 bus. Digital data recording-PC based recording

UNIT V VIRTUAL INSTRUMENTATION **9**

Advantages over conventional instrumentation. LabVIEW- overview, Data flow programming concepts. Lab VIEW Graphical User interface – Block diagram and Front Panel controls. Tutorial programs using Lab VIEW

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Advanced spectrum analyzer, Implementing the microprocessor/ microcontroller based detection and monitoring system.

LAB COMPONENT:45
TOTAL:90

TEXT BOOKS

1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003.
2. H. S Kalsi -Electronic Instrumentation, McGraw-Hill-2010.

REFERENCES

1. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice Hall of India, 2nd Edition. 2003.
2. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill-2004.
3. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

BUILT IN LABORATORY COMPONENT

1. Introduction to Lab VIEW Programming (Creating, Editing and debugging a VI)
2. Programming Techniques in Lab VIEW.
3. Basic Concepts of Data Acquisition and Terminology.
4. Signal Conditioning
5. Thermocouple Measurement
6. Multiplexed and Parallel Measurement
7. Vibration Measurement
8. Analog Input, Analog Output, and Digital I/O based Data Acquisition

13CS305 DATA STRUCTURES AND ALGORITHMS 3 0 0 3

OBJECTIVES

- To learn problem solving techniques.
- To understand the different methodologies of organizing data.
- To learn different sorting and searching techniques.
- To study the implementation of different data structures for specific problems

OUTCOMES

At the end of the course the student should be able to

- Solve problems involving data structures.
- Design algorithms for different problems.
- Analyze the algorithms developed.
- Use the applications of data structures in different fields of Engineering and Science.

UNIT I FUNDAMENTALS OF DATA STRUCTURES **9**

Introduction to Time and Space Complexity - Asymptotic Notations - Running Time Calculation, Data Structures: Introduction to Array and Pointer Implementation - Structures in C - Array Implementation of list, Recursion: Definition - Examples.

UNIT II LISTS, STACKS AND QUEUES **9**

Abstract Data Type (ADT) - The List ADT: Singly, Doubly, Circular Linked List - Cursor Implementation of Linked List. Stack ADT: Array and Pointer Implementation - Applications. Queue

ADT: Array and Pointer Implementation - Circular Queue - Applications.

UNIT III TREES AND HASHING **9**

Preliminaries - Binary Trees - Expression trees - Tree Traversals - The Search Tree ADT - Binary Search Trees - AVL Trees. Hashing: - Separate Chaining - Open Addressing - Priority Queues: Binary heap.

UNIT IV SORTING AND SEARCHING **9**

Sorting: Types, Internal Sorting: Selection - Insertion - Bubble - Shell - Radix - Quick - Heap. External Sorting: Merge - Multiway Merge - Polyphase Merge. Searching: Linear - Binary.

UNIT V GRAPHS **9**

Definitions - Searching Techniques - Topological Sort - Shortest Path Algorithms - Unweighted Shortest Paths - Dijkstra's Algorithm - Minimum Spanning Tree: Prim's and Kruskal's Algorithm - Applications of Depth-First Search - Undirected Graphs - Bi-Connectivity.

UNIT VI STATE OF THE ART/ADVANCES(NOT FOR EXAMINATION)

Network flow - Optimization and Graph Clustering - Splay trees - Red Black trees - Deaps - Min-Max heaps - Hill Climbing.

TOTAL: 45

TEXT BOOK

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Asia, 2007.

REFERENCES

1. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education Asia, 2009.
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 2004.
3. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson Education Asia, 2009.
4. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms/C++", University Press, 2007.

13EC306 ELECTRONIC CIRCUITS - I 4 0 0 4

OBJECTIVES

- To understand the different types of biasing transistors
- To understand the small signal amplifier for mid band analysis.
- To understand the Low and High frequency analysis of BJT & FET.
- To design power supplies with and without filters

OUTCOMES

At the end of the course the student should be able to

- Design various transistor biasing circuits.
- Analyze the various configurations of BJT and FET.
- Determine the frequency response of BJT and FET.
- Determine the efficiency for large signal amplifiers.
- Design different types of power supplies

UNIT I TRANSISTOR BIASING **12**

Introduction - Load line Analysis and Q point- Need for biasing - Different types of biasing circuits for BJT- Method of stabilizing the Q point - Different types of biasing circuits for FET- Bias compensation , Diode and thermistor compensations

UNIT II MIDBAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS **12**

Two Port Network- small signal circuit for CE, CB and CC amplifiers- Midband analysis - Comparison of CB, CE and CC amplifiers - Analysis of RC coupled amplifier- Darlington Amplifiers using BJT - small signal circuit for CS, CG and CD (FET) amplifiers.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS **12**

Low and high frequency analysis of BJT amplifiers -Gain Bandwidth Product - High frequency analysis of FET amplifiers - Gain-bandwidth product of FETs - Amplifier rise time and sag time and their relation to cutoff frequencies.

UNIT IV LARGE SIGNAL AMPLIFIERS **12**

Classification of amplifiers- Class A, Class B, Class C, - Transformer coupled class A amplifier, efficiency of Class A amplifiers -Class B amplifier - efficiency - Class B push pull amplifier - complementary symmetry (Class B) push pull amplifier, Class C amplifier and Class D amplifier - MOSFET power amplifier.

UNIT V RECTIFIERS AND POWER SUPPLIES **12**

Rectifiers - Half-wave, full-wave and bridge rectifiers- Analysis of ripple voltage with C, L, LC and CLC filters, Voltage regulators-series and shunt voltage regulators -Zener diode ,principles of obtaining a regulated power supply, Switched mode power supply (SMPS), Power control using SCR.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Insulated Gate Bipolar Transistor(IGBT) , voltage regulator using IC

TOTAL: 60

TEXT BOOKS

1. Millman J and Halkias .C., Integrated Electronics, TMH, 2007.
2. FLoyd, Electronic Devices, Sixth Edition, Pearson Education, 2009

REFERENCES

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2009
2. David A. Bell, Electronic Devices & Circuits, 4th Ediion, PHI, 2007
3. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2011.
4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007.

13EE308 ELECTRICAL MACHINES 3 0 0 3

OBJECTIVES

- To learn constructional details, principle of operation, performance, starters and testing of D.C. machines.
- To learn constructional details, principle of operation and performance of transformers.
- To learn constructional details, principle of operation and performance of induction motors.
- To learn constructional details and principle of operation of alternators and special machines.
- To learn power system transmission and distribution.

OUTCOMES

At the end of the course the student should be able to

- Design and conduct experiments on d.c. motor and generators, transformers as well as to interpret the data.
- Understand the operation and analysis of synchronous motor and generator.
- Understand the operation and analysis of single and three phase induction motor.
- Appreciate advantages and disadvantages of different machines.

UNIT I D.C. MACHINES **10**

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 **10**

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

UNIT IV SYNCHRONOUS MACHINES **7**

Construction of synchronous machines - types – Induced emf – Voltage regulation; emf and mmf methods – Synchronous generator

UNIT V TRANSMISSION AND DISTRIBUTION **9**

Structure of electric power systems – Generation, transmission, sub-transmission and distribution systems - EHVAC and EHVDC transmission systems.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Study of special machines - Brushless alternators – Reluctance motor – Hysteresis motor – Stepper motor - Substation layout – Insulators – cables.

TOTAL: 45

TEXT BOOKS

1. D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company Ltd, second edition, 2007
2. C.L. Wadhwa, 'Electrical Power Systems', Wiley eastern ltd India, 2006

REFERENCES

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, 2004

13EC311 DIGITAL ELECTRONICS LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To design combinational circuits
- To design sequential circuits
- To simulate circuits using HDL

LIST OF EXPERIMENTS

1. Design and implementation of Adders and Subtractors
2. Design and implementation of different types of code converters
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483.
4. Design and implementation of 2Bit Magnitude Comparator using logic gates and 8 Bit Magnitude Comparator using IC 7485.
5. Design and implementation of odd/even parity check generator using logic gates and IC's

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. Design and implementation of counters
9. Implementation of shift registers using Flip- flops.
10. Simulate all the experiments using VHDL.

TOTAL: 45

13EC312 ELECTRONIC CIRCUITS - I LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- Low frequency amplifiers
- Large signal amplifiers
- Power amplifiers
- Power supply with and without filters

LIST OF EXPERIMENTS

1. Design and implementation of the three types of biasing circuits for BJT
2. Design and implementation of CE Amplifier.
3. Design and implementation of CC Amplifier.
4. Design and implementation of RC Coupled Amplifier
5. Design and implementation of Darlington Amplifier using BJT.
6. Design and implementation of Source followers with Bootstrapped gate resistance
7. Design and implementation of Class B Power Amplifier
8. Design and implementation of Complementary symmetry Power Amplifier
9. Implementation of Half wave rectifier with simple capacitor filter
10. Implementation of Full wave rectifier and Bridge Rectifier with simple capacitor filter
11. Design and implementation of series and shunt regulators using zener diodes.

TOTAL: 45

13CS314 DATA STRUCTURES LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To understand the concepts of different data structures and implement the operations associated with them.
- To study and develop programs for different sorting techniques.
- To learn the implementation of programs for various applications of data structures.
- To understand and implement the concepts of Binary Search Tree.

LIST OF EXPERIMENTS

1. Implementation of List ADT - Array, Pointer, Cursor.
2. Implementation of Stack ADT- Array, Pointer.
3. Implementation of the application of Stack ADT using Arrays and Pointers - Balancing Parenthesis, Evaluation of Postfix Expressions.
4. Implementation of Queue ADT- Array, Pointer.
5. Implementation of Search Tree ADT - Binary Search Tree, Tree traversal.
6. Implementation of Sorting Techniques - Insertion Sort, Merge Sort, Heap Sort, Quick Sort.
7. Implementation of Shortest path and Spanning tree algorithms in a graph.

TOTAL: 45

SEMESTER IV

13EC401 ELECTRONIC CIRCUITS - II 4 0 0 4

OBJECTIVES

- To study the concept of amplifier using hybrid parameters.
- To understand advantages and analysis of feedback amplifiers.
- To learn the design and working of LC and RC oscillators, tuned amplifiers, wave shaping circuits and multivibrators.

OUTCOMES

At the end of the course the student should be able to

- Design feedback amplifiers.
- Design RC and LC oscillators.
- Design tuned amplifiers.
- Design waveshaping circuits and multivibrators.
- Design blocking oscillators.

UNIT I FEEDBACK AMPLIFIERS 12

Block diagram -Effects of negative feedback - Types of negative feedback topology – voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback - Method of identifying feedback topology and feedback factor - Nyquist criterion for stability of feedback amplifiers.

UNIT II OSCILLATORS 12

Barkhausen Criterion - Analysis of LC oscillators - Hartley, Colpitts and Clapp oscillator -RC oscillators - phase shift oscillator ,Wien bridge oscillator - Quartz Crystal Construction, Electrical equivalent circuit of Crystal - frequency stability of oscillators.

UNIT III TUNED AMPLIFIERS 12

Quality factor Q of tank circuits, small signal tuned amplifiers - single tuned amplifier, double tuned amplifier - effect of cascading - Stagger tuned amplifiers - large signal tuned amplifiers – Class C tuned amplifier.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 12

Wave Shaping circuits - integrator and differentiator -Transistor Switching Time – Clippers and Clampers – Multivibrators - Astable multivibrator, Monostable multivibrator, Bistable multivibrator - Schmitt trigger circuit using BJT.

UNIT V BLOCKING OSCILLATORS 12

UJT sawtooth generator, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with emitter timing.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Recent wave shaping circuits in function generators. High frequency crystal oscillators for high speed processors.

TOTAL: 60

TEXT BOOKS

1. Sedra / Smith, Micro Electronic Circuits Oxford University Press, 2010.
2.. Schilling and Belove, Electronic Circuits, 3rd Edition, TMH, 2002.
1. Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2009

REFERENCES

1. Millman J. and Taub H., Pulse Digital and Switching Waveforms, TMH,2008

2. David A. Bell, Solid State Pulse Circuits, Prentice Hall of India,2007
3. Millman and Halkias. C., Integrated Electronics, TMH, 2008
4. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2011.

13MA402 PROBABILITY THEORY AND RANDOM PROCESSES 3 1 0 4

OBJECTIVES

- To study the basic probability concepts.
- To understand and have a well – founded knowledge of standard distributions which can describe real life phenomena.
- To understand the skills in handling situations involving more than one random variable.
- To study the concept of probabilistic model used for characterizing a random signal and the nature of dependence relationship existing among the members of the family of the random variables.

OUTCOMES

At the end of the course the students should be able to

- Use distribution in cluster analysis of similar binary variables.
- Analyse standard score from a given set of data.
- Use the concepts of random processes in signals and systems

UNIT I PROBABILITY AND RANDOM VARIABLE 9

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density function – Properties

UNIT II STANDARD DISTRIBUTIONS 9

Binomial – Poisson – Geometric - Uniform – Exponential – Gamma - Weibull - Normal distributions - properties

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions – Covariance – Correlation and Regression - Central limit theorem.

UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9

Definition and examples - first order and second order random processes - strictly stationary processes - wide – sense stationary processes - Ergodic processes - Markov process - Markov Chain - Transition probabilities - Limiting distributions - Poisson process - Gaussian process

UNIT V CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Birth - Death Process – Kendall's notation – Basic characteristics of a queuing model - Steady state solutions - M/M/1: FIFO) queuing model - M/M/C: FIFO) queuing model

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & sons, 2000
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. Ross, S., "A First Course in Probability", Fifth edition, Pearson Education, Delhi, 2009

2. Henry Stark and John W. Woods "Probability and Random Processes with Applications to Signal Processing", Pearson Education, Third edition, Delhi, 2002.
3. Veerarajan., T., "Probability, Statistics and Random Processes", Tata McGraw-Hill,Second Edition, New Delhi, 2010.
4. Palaniammal, S., "Probability and Random Processes", Prentice hall of India, New Delhi, 2012.
5. Lbe, O.C, "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P, 1st Indian Reprint, 2007.

13EC403 SIGNALS AND SYSTEMS 3 1 0 4

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.

OUTCOMES

At the end of the course the student should be able to

- Analyse and differentiate the types of signals and its nature
- Understand the importance of laplace transform in signals and systems.
- Analyse the use of sampling for discrete time system
- Analyse the different forms of in realization of 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 – Signal representations using simulation software.

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. Convolution integral. 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 transforms.

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.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Stability analysis techniques for continuous and discrete time signals and systems**.**

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 1997.
2. John G.Proakis and Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn., PHI, 2007

REFERENCES

1. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH, 2007
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 2008
3. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
4. Moman .H. Hays," Digital Signal Processing ", Schaum's outlines, Tata McGraw-Hill Co Ltd., 2004.
5. Ashok Amhardar, "Analog and Digital Signal Processing", 2nd Edition Thomson 2002.
6. J.B. Gurung, "Signals and Systems", PHI edition.

13EC404 LINEAR INTEGRATED CIRCUITS 3 0 0 3

OBJECTIVES

- To understand the basic building blocks of linear integrated circuits.
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the theory and applications of analog multipliers and PLL.
- To learn the theory of ADC and DAC.
- To learn a few special functions integrated circuits.

OUTCOMES

At the end of the course the student should be able to

- Analyze how the biasing of transistor play a role in Integrated Circuits design
- Complete knowledge in applications of Integrated Circuits
- Design ADC and DAC
- Design PLL for phase comparators
- Experiment the applications where the special function ICs are used.

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

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Latest Low power VLSI Technology used in Fabrication of ICs. About Soc and Noc.

TOTAL: 45

TEXT BOOKS

1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 2008
2. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd.,2010

REFERENCES

1. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', Wiley International, 2010
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, 2008
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.

13EC405 COMPUTER ARCHITECTURE 3 0 0 3

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**.**

OUTCOMES

At the end of the course the student should be able to

- Understand the merits and pitfalls in computer performance measurements.
- Design and analyze the fixed and floating point arithmetic units
- Analyze and redesign the alternative methods of tasks execution to improve efficiency
- Understand the memory hierarchy and memory architectures

UNIT I BASIC STRUCTURE OF COMPUTERS **9**

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 **9**

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 – micro-programmed control.

UNIT IV PIPELINING **9**

Pipelining – Basic concepts – data hazards – instruction hazards – influence on Instruction sets – Data path and control consideration – Superscalar operation.

UNIT V MEMORY SYSTEM **9**

Basic concepts – semiconductor RAMs, ROMs – Speed, size and cost – cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage– Direct Memory Access

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Multi-core processor architecture- Low Power and high speed design – Processor architectures for portable applications

TOTAL 45

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization" 5th Ed, McGraw Hill, 2002.
2. William Stallings, "Computer Organization & Architecture – Designing for Performance", 6th Ed., Pearson Education, 2003 reprint.

REFERENCES

1. David A.Patterson and John L.Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Ed, Morgan Kaufmann, 2002 reprint.
2. John P.Hayes, "Computer Architecture & Organization", 3rd Ed, McGraw-Hill, 1998.

13EC406 ELECTROMAGNETICS 3 1 0 4

OBJECTIVES

- To study the concepts of fields potentials due to static charges.
- To evaluate static magnetic fields.
- To understand the effect of dielectric materials in electric and magnetic fields.
- To understand the relation between the different modes..
- To understand principles of propagation of uniform plane waves

OUTCOMES

At the end of the course the student should be able to

- Analyse the basic concepts of electric and magnetic fields
- Analyse the various polarization

UNIT I STATIC ELECTRIC FIELDS **12**

Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical – Introduction to line, Surface and Volume Integrals – Definition of Curl, Divergence and Gradient – Stokes theorem and Divergence theorem

Coulomb's Law in Vector Form – Definition of Electric Field Intensity – Principle of Superposition – Electric Field due to continuous and discrete charges distribution – Uniformly distributed electric field for circular disc and plane surface Electric Scalar Potential - Potential due to infinite uniformly charged line and electrical dipole - Electric Flux Density – Gauss Law –proof-Applications

UNIT II STATIC MAGNETIC FIELD **9**

Biot-Savart's Law in vector form – Magnetic Field intensity for finite and infinite wire Magnetic field intensity for circular and rectangular loop – Ampere's circuital law and simple applications.

Magnetic flux density – The Lorentz force equation -Force on a wire in magnetic field – Torque on a loop carrying a current I – Magnetic moment – Magnetic Vector Potential.

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 6

Poisson's and Laplace's equation – Electric Polarization-Nature of dielectric materials- Definition of Capacitance – Capacitance of various geometries– Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law – continuity equation for current.

Inductance – Inductance of loops and solenoids –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 from Faraday's Law –. Displacement current – Ampere's circuital law– Modified form of Ampere's circuital law–Maxwell's Equation-. 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

Wave Equation – Uniform Plane Waves – Maxwell's equation– Wave equation– Plane waves

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 in a conductor in dielectric – Reflection of Plane Waves by a perfect dielectric-. Dependence on Polarization. Brewster angle.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

MEMs and its applications.

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. William H. Hayt , "Engineering Electromagnetics" , TATA 2012.
2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Prentice Hall of India 2nd edition 2003, McGraw-Hill.

REFERENCES

1. Sathaiah D, Anitha M, "Electromagnetic Field Theory", Scitech Publications, Second Edition, 2008
2. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons (3rd edition 2003)
3. Narayana Rao, N : "Elements of Engineering Electromagnetics" 4th edition, Prentice Hall of India, New Delhi,2009
4. M.N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, Third edition.2000
5. David K.Cherp: "Field and Wave Electromagnetics - Second Edition-Pearson Edition.
6. David J.Grithiths: "Introduction to Electrodynamics- III Edition-PHI.

WEBSITE

1. www.ocw.mit.edu/resources/res-6-002-electromagnetic-field-theory-a-problem-solving-pproach-spring-2008

13EE411 ELECTRICAL MACHINES LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To study the characteristics of DC Motors.
- To study the characteristics of AC Motors.
- To learn performance of motors.
- Various test analysis of A.C and D.C motors.

LIST OF EXPERIMENTS

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.

TOTAL: 45

13EC412 ELECTRONIC CIRCUITS - II AND SIMULATION LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- design different types of feedback amplifiers.
- design different types of oscillators
- design wave shaping and multivibrator circuits

LIST OF EXPERIMENTS

1. Implementation of voltage and current (series and shunt) feedback amplifier.
2. Design and Implementation of RC phase shift oscillator and Wien bridge oscillator.
3. Design and Implementation of Hartley and Colpitts Oscillator.
4. Implementation of Class C tuned amplifier.
5. Implementation of clipper, clamper and wave shaping circuits.
6. Implementation of Astable Multivibrator.
7. Implementation of Monostable Multivibrator.
8. Implementation of Bistable Multivibrator.
9. Implementation of Schmitt trigger circuit.
10. Implementation of UJT relaxation oscillator.
11. Simulation of differential amplifier, High Pass Filter, Low Pass Filter and multivibrators using PSPICE.

TOTAL: 45

13EC413 LINEAR INTEGRATED CIRCUITS LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To learn the characteristics of operational amplifiers
- To design multivibrators, oscillators and filters using OP-AMP.

LIST OF EXPERIMENTS

1. Applications of operational amplifier
2. Instrumentation amplifier.
3. Active low pass and band pass filter.
4. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
5. Phase shift and Wien bridge oscillator using op-amp.
6. Astable and monostable multivibrator using NE555 Timer.
7. PLL characteristics and Frequency Multiplier using PLL.

8. DC power supply using LM317 and LM723.
9. Study of SMPS control IC SG3524 / SG3525.

TOTAL: 45

SEMESTER V

13EC501 TRANSMISSION LINES AND WAVEGUIDES 4 0 0 4

OBJECTIVES

- To become familiar with propagation of signals through lines.
- To understand signal propagation at Radio frequencies.
- To understand radio propagation in guided systems
- To know about the planar transmission lines

OUTCOMES

At the end of the course the student should be able to

- Gain Knowledge about Transmission line parameters, Characteristic impedance and input impedance.
- Analyze various parameters of Transmission line Theory.
- Able to plot the different parameters of transmission lines using Smith Chart
- Understanding guided waves and different modes of operation.

UNIT I TRANSMISSION LINE PARAMETERS & THEORY 12

Transmission line Parameters – Characteristic impedance –as a cascade of T- Sections - Propagation Constant.- General Solution of the transmission line –Standard forms for voltage and current terminated by an impedance –Standard forms for the input impedance - reflection coefficient – wavelength and velocity of propagation. Waveform distortion – distortion less transmission line –Input impedance of lossless lines – Transfer impedance – reflection factor and reflection loss – T and ∏ Section .

UNIT II THE LINE AT RADIO FREQUENCIES 12

Parameter s--coaxial line-Standing waves and standing wave ratio–Impedance matching- 1/8,1/4 and ½ wave length line –circle diagram–Smith Chart – Application of the Smith Chart –Impedance to reflection coefficient and vice-versa. Impedance to Admittance and vice versa – Input impedance of a lossless line -single stub matching and double stub matching.

UNIT III GUIDED WAVES 12

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 12

Transverse Electric and Magnetic Waves in Rectangular Wave guides –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 PLANAR TRANSMISSION LINES 12

Introduction- Microstrip Lines- Characteristic Impedance - Losses Quality Factor Q - Substrate materials-surface wave excitation- Parallel Strip Lines- Characteristic Impedance- Attenuation Losses- Coplanar and shielded Strip Lines- Slotted line-Coplanar wave guide- Problems

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Smart antennas

TOTAL: 60

TEXTBOOKS

1. John D.Ryder "Networks, Lines and Fields", PHI, New Delhi, 2003.
2. E.C. Jordan and K.G.Balmain "Electro Magnetic Waves and Radiating System, PHI, New Delhi, 2008.
3. Samuel Y-Liao : Microwave Devices and Circuits – Pearson/Prentice Hall of India – 3rd Edition 2008

REFERENCES

1. B. Somanathan Nair, Transmission Lines and Wave guides, Sanguine Technical publishers,2007.
2. David M.Pozar: Microwave Engineering – 2nd Edition – John Wiley 2008

13MB502/13MB602 PRINCIPLES OF MANAGEMENT 3 0 0 3

(Vide Mechanical Engineering**)**

13EC503 ANALOG COMMUNICATION 4 0 0 4

OBJECTIVES

- To provide knowledge on various Amplitude modulation and demodulation systems.
- To provide knowledge on various Angle modulation and demodulation systems.
- To analyse noise performance in receivers.

OUTCOMES

At the end of the course the student should be able to

- Design the amplitude and angle modulator and demodulator circuits
- Analyse the operation and performance of AM and FM transmitters and receivers.
- Analyse the importance of noise performance in communication systems..
- Gain knowledge on pulse modulation techniques.

UNIT I MODULATION TECHNIQUES 12

Introduction to modulation – need for modulation – Modulation techniques – Amplitude Modulation, Angle Modulation- FM, PM, Modulation index, Frequency spectrum of AM waves, AM wave representation, Power relation in AM waves – SSB and VSB, Mathematical representation of FM, Modulation index, Frequency spectrum of FM waves, Wide band and narrow band FM, PM, FM from PM and PM from FM relation.

UNIT II AM TRANSMITTERS AND RECEIVERS 12

AM modulators, high level and low level transmitter , Generation of DSBFC, DSBSC and SSB.
Receiver Characteristics, Tuned radio frequency (TRF) receiver, Superheterodyne receiver, AM Detection, automatic Gain control (AGC), delayed AGC, Demodulation of SSB, Diode balanced modulator, Pilot carrier and suppressed carrier receiver.

UNIT III FM TRANSMITTERS AND RECEIVERS 12

Generation of FM, FM modulation methods, Direct and Indirect methods, Pre-emphasis, AFC, disadvantage of direct method. Limiters, single and double tuned demodulator, balanced slope detector, Foster-Seeley or phase discriminator , ratio detector, de-emphasis , FM receiver, Frequency Division Multiplexing.

UNIT IV NOISE IN ANALOG SYSTEMS 12

Introduction to noise, types of noise, narrow band noise, representation of narrow band noise in terms of inphase and quadrature components, representation of narrow band noise in terms of envelope and phase components, Receiver model, Noise in receivers with coherent detection, Noise in receivers using envelope detection, Noise in FM receivers.

UNIT V PULSE MODULATION 12

Sampling theorem, Natural and Flat top sampling, Sampling circuit, Generation and detection of Pulse

Amplitude Modulation, Pulse Width Modulation and Pulse Position Modulation, Comparison of PAM, PWM and PPM, Time Division Multiplexing.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Multi carrier modulation techniques, Orthogonal Frequency Division multiplexing..

TOTAL: 60

TEXT BOOK

1. Simon Haykin, Communication Systems, John Wiley & sons, NY, 3rd Edition, 2008
2. George Kennedy and Bernard Davis, Electronic Communicatioin Systems, TMH, 4th edition, 2007

REFERENCES

1. Wayne Tomasi, "Electronic Communication Systems – Fundamentals Through Advanced", Pearson , 3rd edition,2009.
2. Taub and Schilling, Principles of communication systems, TMH, New Delhi, 2008.
3. Bruce Carlson et al, Communication systems, McGraw-Hill Int., 4th Edition, 2002.

13EC504 DIGITAL SIGNAL PROCESSING 4 0 0 4

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.

OUTCOMES

At the end of the course the student should be able to

- Analyze Fourier Transforms and its applications
- Experience the complete knowledge of Various Digital Filters
- Ability to demonstrate digital signal processors.

UNIT I FAST FOURIER TRANSFORM **12**

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 **12**

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 **12**

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 **12**

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 Tukey method.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING **12**

Introduction to multirate DSP – Decimation – Interpolation – Sampling rate conversion – Direct form FIR filters – Polyphase filters – Applications of multirate signal processing – Subband coding – Quadrature mirror filter – Introduction digital signal processors - Harvard architecture – Pipelining.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

DSP for audio, video and wireless applications.

TOTAL: 60

TEXTBOOKS

1. John G Proakis, Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, PHI, 3rd Edition, 2009.
2. B.Venkataramani & M. Bhaskar, Digital Signal Processor Architecture, Programming and Application, TMH 2011.

REFERENCES

1. Alan V Oppenheim, Ronald W Schafer, John R Back, Discrete Time Signal Processing, PHI, 2nd Edition, 2007.
2. Avtar singh, S.Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX -Thomson / Brooks cole Publishers, 2004.
3. S.Salivahanan, A.Vallavaraj, Gnanapriya, Digital Signal Processing, McGraw-Hill / TMH, 2011.
4. Johny R.Johnson: Introduction to Digital Signal Processing, Prentice Hall, 1992.
5. S.K.Mitra, "Digital Signal Processing- A Computer based approach", Tata McGraw-Hill, 2006., New Delhi.

13EC505 MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

OBJECTIVES

- To introduce the architecture and programming of 8085 – 8 Bit microprocessor.
- To introduce the architecture and programming of 8086 - 16 Bit microprocessor.
- To introduce the architecture, programming of 8051 – 8 Bit microcontroller.
- To introduce interfacing peripherals with microprocessors and microcontrollers.
- To introduce the architecture, programming and interfacing of PIC microcontroller.

OUTCOMES

At the end of the course the student should be able to

- Analyse the 8 bit and 16-bit processors for real time applications
- Gain complete knowledge about interfacing units.
- Understand about PIC micro controller and its applications

UNIT I 8085 - 8 BIT MICROPROCESSOR **9**

8085 Architecture –Addressing modes - Instruction set – Timing diagrams – Assembly language programming – Counters – Time Delays – Interrupts

UNIT II 8086 - 16 BIT MICROPROCESSOR **9**

Intel 8086 Internal Architecture – 8086 Addressing Modes - Instruction set - 8086 Assembly Language Programming – Minimum mode operation – Maximum mode operation - Interrupts.

UNIT III PERIPHERAL INTERFACING **9**

Memory Interfacing – I/O devices Interfacing - Serial I/O (8251) – Parallel Peripheral Interfacing (8255) – Keyboard and Display Controller (8279) –timer, DMA controller ADC/DAC Interfacing – Inter Integrated Circuits interfacing (I2C Standard) - Bus: RS232C - RS485 - GPIB.

UNIT IV 8051 – 8 BIT MICROCONTROLLER **9**

8051 Microcontroller: Overview of 8051 family - architecture of 8051 - Program counter – RAM - ROM - data types and directives - PSW register - register bank and stack - Addressing modes - Instruction set – I/O ports – Interrupts – Timers – Assembly Language Programming.

UNIT V PIC MICROCONTROLLER **9**

PIC microcontroller - Architecture of PIC 16c6x/7x - FSR – Reset - Oscillatory connection - Memory organization – Addressing modes - Instruction set - I/O ports – Interrupts – Timers – ADC - Assembly language programming.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Recent microprocessor for Pentium computing machines, PIC microcontroller fro robotics

TOTAL: 45

TEXTBOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2002.
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2006.
3. Mohammed Ali Mazidi and Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2011.
4. John Peatman, Design with PIC microcontroller, Pearson Education, 2003

REFERENCES

1. Douglas V. Hall, Microprocessors and Interfacing: Programming and Hardware, McGraw-Hill Inc., US (June 1, 1992)
2. Raj Kamal," Embedded Systems – Architecture, Programming and Design", II Edition, Tata McGraw Hill, 2008
3. K. Ray and K. M. Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000.
4. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
5. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

13EC506 CONTROL SYSTEMS 3 1 0 4

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.

OUTCOMES

At the end of the course the student should be able to

- Good understanding of comparison methods in control systems.
- Exposure to various plots
- Find information on and select the proper compensators

UNIT I CONTROL SYSTEM MODELLING **9**

System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, and 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 – generalized error co-efficient – steady state errors.

UNIT III FREQUENCY DOMAIN ANALYSIS **9**

Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart - concepts of stability – Routh-Hurwitz stability – root locus - 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 APPLICATIONS **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

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Simulation using MATLAB – Open loop first order systems – Second order systems – Tuning of PID controller using SIMULINK – Stability analysis using Root locus.

TUTORIAL: 15
TOTAL: 60

TEXTBOOKS

1. Ogata.K, Modern Control Engineering, Prentice Hall of India, 4th Edition, 2010.
2. Nagrath & Gopal, Control System Engineering, Third Edition, New Age International Edition, 2008.

REFERENCES

1. Benjamin.C.Kuo, Automatic Control Systems, 7th Edition – Prentice Hall of India, 2009.
2. M.Gopal, Control Systems, Tata McGraw-Hill, 2012.

13EC511 DIGITAL SIGNAL PROCESSING LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To implement the digital signal 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 filters.
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.

TOTAL: 45

13EN512/13EN612 COMMUNICATION SKILLS LABORATORY 1 0 3 2
(Vide Civil Engineering)

13EC513 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY 0 0 3 1

OBJECTIVES
At the end of the course the student should be able
- To acquaint the students with the following skills in Assembly Language Programming (ALP) based on the microprocessors 8085 and 8086.
- Assembly language programming based on the microcontroller 8051.
- Programming and Interfacing with 8085/8086 and 8051.

LIST OF EXPERIMENTS

Assembly language programming based on 8085/8086/8051 Kit
1. Array Programming – Arranging in Largest Number and Smallest Number
2. Sorting of an array – in Ascending and Descending order
3. Code conversion – BCD to Binary, Binary to BCD
4. Square Root - Factorial
5. Average of n Numbers

Interfacing Programs based on 8085/8086/8051 Kits.
1. ADC and DAC.
2. Stepper Motor Interfacing - Forward and Reverse Rotation.
3. Hex key pad Interfacing.
4. Seven Segment Display Interfacing.
5. 8251 USART Interfacing.

TOTAL: 45

SEMESTER VI

13EC601 EMBEDDED SYSTEMS 3 0 0 3

OBJECTIVES
- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.

OUTCOMES
At the end of the course the student should be able to
- Analyze processors and its applications in real time.
- Design hardware accelerators and networks.
- Gain knowledge on embedded architecture and how to use it in networks

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9
Definition and Categories – Characteristics and Challenges in Embedded computing -Overview of Processors - Hardware and software architecture – Process of generating an executable image – Development/Testing tools.

UNIT II EMBEDDED COMPUTING PLATFORM 9
CPU bus- Memory devices- I/O devices- Component interfacing- Designing with Microprocessors- Development and Debugging- Design patterns- Dataflow graphs- Assembly and Linking- Basic compilation techniques- Analysis and Optimization.

UNIT III ARM PROCESSOR **9**

ARM Embedded Systems – The ARM architecture -- ARM7 Processor Fundamentals – ARM Instruction Set – The Thumb Instruction Set- – ARM Development tools.

UNIT IV HARDWARE ACCELERATORS & NETWORKS **9**

Accelerators – Accelerated system design – Distributed Embedded Architecture –Networks for Embedded Systems – Network based design – Internet enabled systems

UNIT V REAL-TIME OPERATING SYSTEM CONCEPTS **9**

Architecture of the Kernel-Task and task scheduler-Interrupt Service Routines-Semaphores-Mutex – Mailboxes- Message- Queues- Event Registers, Pipes-Signals-Timers-Memory Management-Priority Inversion Problem-Embedded operating System – Real time operating System .

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Embedded for wireless and automobile applications

TOTAL: 45

TEXT BOOKS

1. Raj Kamal," Embedded Systems – Architecture, Programming and Design", II Edition, Tata McGraw Hill, 2008
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers, 2008.

REFERENCES

1. David E Simon, "An embedded software primer", Pearson education Asia, 2003
2. K.V.K.K.Prasad "Embedded /Real-Time Systems:Concepts,Design and Programming"Dream tech,Wiley 2003.
3. Steve Furber "ARM System-on-chip-architecture "2nd edition Addison Wesley 2009.

13EC602 VLSI DESIGN 3 0 0 3

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.

OUTCOMES

At the end of the course the student should be able to

- Understanding of VLSI design issues
- Evaluation of the performances in CMOS circuits
- Use of different design abstractions and hierarchical design concepts
- Use of modern EDA tools
- communicating effectively (Lab and projects) and work as part of team (project work)

UNIT I MOS TRANSISTOR THEORY **9**

Introduction – Ideal I-V characteristics – Non ideal I-V effects – DC transfer characteristics – switch level RC delay models – MOS Transistors - CMOS Logic – latches & Flip flops

UNIT II CMOS PROCESSING TECHNOLOGY **9**

Introduction - CMOS technologies – Layout Design Rules – CMOS Process Enhancements – Technology related CAD issues – Manufacturing issues

UNIT III CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION 9

Introduction – delay estimation – logical effort and transistor sizing – power dissipation – design margin – reliability

UNIT IV CIRCUIT SIMULATION 9

Introduction – A SPICE tutorial – Device models – device characterization – circuit characterization – interconnect simulation

UNIT V COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN 9

Introduction – circuit families – low power logic design – comparison of circuit families – sequential static circuits – circuit design of latches and flip-flops

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Historical perspective – design issues in nanoscale CMOS circuits – mini project.

TOTAL: 45

TEXT BOOKS

1. Neil H.E Weste, David Harris, Ayan Banerjee, CMOS VLSI Design – A circuits and systems perspective, Third edition, Pearson Education, 2009
2. Weste & Eshraghian: Principles of CMOS VLSI design (2/e) Addison Wesley, 2010
3. Samir Palnitkar; Verilog HDL - Guide to Digital design and synthesis, III edition, Pearson Education, 2003.

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, 2000
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.

13EC603 DIGITAL COMMUNICATION 4 0 0 4

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.

OUTCOMES

At the end of the course the student should be able to

- Analyze the digital modulation schemes employed in communication system
- Calculate the noise levels in pulse transmission
- Know the concepts of spread spectrum techniques used in communication

UNIT I PULSE MODULATION 12

PCM- Uniform and non uniform Quantization- Quantization error-Companding- SNR for PCM-Need for prediction-DPCM-Delta modulation-slope overload error- Adaptive Delta modulation, SVDM- TDM-Digital Hierarchies

UNIT II BASEBAND PULSE TRANSMISSION 12

Matched filter,properties-Inter Symbol Interference- Ideal Nyquist channel- Raised Cosine Channels-Correlative Coding- Eye patterns- Adaptive Equalization for Data Transmission

UNIT III PASSBAND DATA TRANSMISSION **12**

Gram – Schmt orthgonalisation- 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.

UNIT IV ERROR CONTROL CODING **12**

Discrete memoryless channels – Linear block codes - Cyclic codes - Convolutional codes – Maximum likelihood decoding of convolutional codes-Viterbi Algorithm, Trellis coded Modulation.

UNIT V SPREAD SPECTRUM MODULATION AND SYNCHRONIZATION **12**

Pseudo- noise sequences – Direct sequence spread spectrum– Signal space Dimensionality and processing gain –Probability of error – Frequency hop spread spectrum –Maximum length and Gold codes, OFDMA

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

PCM Radio control of model aircraft, boats, cars and mobiles, MIMO system

TOTAL: 60

TEXT BOOKS

1. Simon Haykins, "Digital Communication" John Wiley, 4th Edition, 2009
2. Taub & Schilling , "Principles of Digital Communication " Tata McGraw-Hill 28th reprint, 2008.

REFERENCES

1. Sam K.Shanmugam "Analog & Digital Communication" John Wiley,2008
2. John G.Proakis, "Digital Communication" McGraw Hill 3rd Edition, 2008

13EC604 COMPUTER NETWORKS 3 0 0 3

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.

OUTCOMES

At the end of the course the student should be able to

- Use network layer concept in real time
- Solve the problems due to network congestion and rectify the control process
- Gain depth knowledge about the routing protocol and switches
- Experience the application of cryptography in the network

UNIT I APPLICATION LAYER **9**

The Network Edge- The Network Core- Delay, Loss and Throughput in Packet-Switched Networks- Protocol Layers and Their Service Models- Networks UnderAttack - Principles of Network Applications -The Web and HTTP - File Transfer: FTP- Electronic Mail in the Internet: DNS - The Internet's Directory Service-Peer-to-Peer Applications

UNIT II TRANSPORT LAYER **9**

Introduction and Transport Layer Services-Multiplexing and Demultiplexing-Connectionless Transport: UDP-Principles of Reliable Data Transfer-Connection-Oriented Transport: TCP-Principles of Congestion Control-TCP Congestion Control

UNIT III THE NETWORK LAYER **9**

Introduction-Virtual Circuit and Datagram Networks- Inside a Router- The InternetProtocol (IP): Forwarding and Addressing in the Internet-Routing Algorithms Routing in the Internet-Broadcast and Multicast Routing- Mobile IP

UNIT IV THE DATA LINK LAYER AND LOCAL AREA NETWORKS **9**

Link Layer: Introduction and Services- Error Detection and Correction Techniques-Multiple Access Protocols- Link Layer Addressing-Ethernet Switches- The Point-to-Point Protocol- Link Virtualization: A Network as a Link Layer- Wireless LANs: IEEE 802.11

UNIT V NETWORK SECURITY AND MANAGEMENT **9**

Principles of Cryptography- Message Integrity- End-Point Authentication- Securing Email- Securing TCP Connections: SSL-Network-Layer Security: IPsec- Securing Wireless LANs- Operational Security: Firewalls and Intrusion Detection Systems elements of QOS

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Next generation networks

TOTAL: 45

TEXT BOOK

1. James .F.Kurose & W.Ross ”Computer Networking: A Top down approach ”-Pearson education Limited,2012

REFERENCES

1. Andrew S.Tannenbaum-”Computer Networks”- PHI/Pearson – 4/Edition2009.
2. Behrouz A.Forouzan- “Data communication and Networking”- Tata McGraw-Hill- 4/E-2007.
3. Larry L-Peterson &Peter s-Davie-”Computer Networks ”-Harcourt Asia Pvt-Ltd- 2/E.
4. Dougles comer ‘Computer networks with Internet applications” Pearson edition 2009

13EC605 ANTENNAS AND WAVE PROPAGATION 4 0 0 4

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.

OUTCOMES

At the end of the course the student should be able to

- Analyze the relation between the fields and to familiar with antenna arrays.
- Investigate signal propagation at Radio frequencies
- Evaluate the performance of aperture and Reflector antennas.
- Explore the basics of Microstrip Patch Antenna and effect of propagation of radio waves in actual environment.

UNIT I ELECTROMAGNETIC RADIATION AND ANTENNA FUNDAMENTALS **12**

Review of electromagnetic theory: Vector potential, Solution of wave equation, retarded case, Hertizian dipole. Antenna characteristics: Radiation pattern, Beam solid angle, Directivity, Gain, Input impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation patterns, Equivalence of Impedances, Effective aperture, Vector effective length, Antenna temperature.

UNIT II WIRE ANTENNAS AND ANTENNA ARRAYS **12**

Wire antennas: Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Small loop antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-element Array, Uniform Array, Polynomial representation, Array with non-uniform Excitation-Binomial Array

UNIT III APERTURE ANTENNAS **12**

Aperture Antennas: Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle,

Duality principle, Method of Images, Pattern properties, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna.

UNIT IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS 12

Special Antennas: Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas.

Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

UNIT V RADIO WAVE PROPAGATION 12

Calculation of Great Circle Distance between any two points on earth, Ground Wave Propagation, Free-space Propagation, Ground Reflection, Surface waves, Diffraction, Wave propagation in complex Environments, Tropospheric Propagation, Tropospheric Scatter. Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere, Effects of earth's magnetic fields, Faraday rotation, Whistlers.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Design, implement and testing of multiple conductors microwave antennas, Micro machined Antennas

TOTAL: 60

TEXT BOOKS

1. E. C. Jordan and Balmain, "Electro Magnetic Waves and Radiating Systems", PHI, 1968, Reprint 2003.
2. K. D. Prasad, "Antennas and Wave Propagation", Satya Prakashan, 1999

REFERENCES

1. John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications", Tata McGraw-Hill Book Company, 3 ed, 2010.
2. G.S.N.Raju, Antenna Wave Propagation, Pearson Education, 2009.
3. Constantine A. Balanis, Antenna Theory Analysis and Desin, John Wiley, 2nd Edition,2009.
4. R.E.Collins, "Antenna and Radiowave propagation", Singapore,McGraw Hill 1985
5. W.L Stutzman and G.A. Thiele, "Antenna analysis and design", John Wiley, 2000.

13EC611 COMMUNICATION SYSTEMS LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To know about the antenna radiation pattern.
- To obtain the output waveforms of various types of analog and digital modulation techniques.

LIST OF EXPERIMENTS

1. Amplitude modulation and demodulation
2. Frequency modulation and demodulation
3. Sampling & time division multiplexing
4. Pulse modulation- PAM / PWM /PPM
5. Pulse code modulation
6. Line coding & decoding
7. Delta modulation / Differential pulse code modulation
8. Digital modulation –ASK, PSK, QPSK, FSK
9. Error control code generation using MATLAB
10. Linear block code generation Using MATLAB.
11. Convolution code generation using MATLAB
12. Frequency hopping and direct sequence spread spectrum using MATLAB

TOTAL: 45

13EC612 EMBEDDED SYSTEMS DESIGN LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To study the basic programming concepts of Netsim
- To learn about the performance of protocols and routing algorithms

LIST OF EXPERIMENTS

1. 89C51 Programming with Keil
    a) In Circuit Debugger – LED
    b) LCD Interfacing
    c) Generating delay using timer and interrupts
    d) ADC
2. PIC 16F877 Programming with MPlab
    a) LED Interfacing
    b) LCD Interfacing
    c) Generating delay using timer and interrupts
3. MSP430 programming with IAR
    a) LED Interfacing
    b) LCD Interfacing
    c) Generating delay using timer and interrupts
    d) Timer and PWM
4. ARM Programming with IAR
    a) LED Interfacing
    b) LCD Interfacing
5. Serial port communication
6. Stepper Motor

TOTAL: 45

13EC613 VLSI DESIGN LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- 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

LIST OF EXPERIMENTS

I - Design and simulation of Combinational Logic Circuit using VHDL

1. Adder
2. Multiplexer and Demultiplexer
3. Encoder and Decoder
4. Multiplier

II - Design and simulation of Sequential logic circuit using VHDL

5. Flip Flops
6. Counter
7. Shift registers
8. Frequency Divider

III - CMOS Circuit design using SPICE and MICROWIND (DC and Transient Analysis)

9. CMOS Inverter
10. CMOS NAND and NOR Gates
11. CMOS D Latch

IV - FPGA Implementation

12. 4 bit Adder
13. Real Time Clock

Equipment / Tools Required

1. HDL Simulation Tool
2. FPGA Synthesis Tool
3. Any SPICE simulator
4. At least 500K Gate density FPGA trainer boards with adequate peripherals

TOTAL: 45

SEMESTER VII

13EC701 OPTICAL COMMUNICATION 3 0 0 3

OBJECTIVES

- To learn the optical fiber transmission, modes and configuration.
- To understand the different kind of losses, signal distortion and signal degradation factors.
- To learn the optical sources,LED, Laser diodes and photo detectors.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

OUTCOMES

At the end of the course the student should be able to

- Understand the working concepts of optical sources and recievers
- Determine the delay and probability of error in the receivers
- Analyze transmitter and receiver system of optical communication

UNIT I INTRODUCTION TO OPTICAL FIBERS **9**

Evolution of fiber optic system- Elements of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Fiber fabrication-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 – modulation of Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre –to- Fibre joints, Fibre splicing , connectors.

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-Eye pattern-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basics on concepts of SONET/SDH Network.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Optical Nwtworks, OTDM WDM

TOTAL: 45

TEXT BOOKS

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2008.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 2009.

REFERENCE

1. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

13EC702 WIRELESS COMMUNICATION 3 0 0 3

OBJECTIVES

- To understand the fundamental cellular radio concepts
- To learn radio propagation models for indoor and outdoor.
- To learn, equalization techniques, diversity concepts used in wireless communication.
- To know the second generation and third generation wireless networks and worldwide wireless standards.

OUTCOMES

At the end of the course the student should be able to

- Analyse the radio propagation methods
- Evaluate the performance of fading channels
- Understand the various access technologies.

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, Gaussian 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.

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Body Sensor networks-Zig bee –beyond 4G,Li Fi Network

TOTAL: 45

TEXT BOOKS

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian 2009
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.

REFERENCES

1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003.
2. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003.

WEBSITES

1. www.networktutorials.info
2. www.wiley.com
3. www.informaworld.com

13EC703 SATELLITE COMMUNICATION 3 0 0 3

OBJECTIVES

- To know various satellite systems
- To know satellite orbits and launching.
- To understand earth segment and space segment components
- To know satellite access techniques for various applications..

OUTCOMES

At the end of the course the student should be able to

- Analyses various satellites for applications
- Perform link budget analysis

UNIT I OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS **9**

Frequency Allocations– Intelsat – U.S.Domsats – Polar Orbiting Satellites –Kepler's Laws – Definitions -Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee– Orbital Perturbations – Inclined Orbits – Calendars – Universal Time – Julian Dates – Sidereal Time – The Orbital Plane – The Geocentric-Equatorial Coordinate System – Earth Station Referred to the IJK Frame – The Topcentric-Horizon Co-ordinate System – The Sub-satellite Point – Predicting Satellite Position.

UNIT II GEOSTATIONARY ORBIT & SPACE SEGMENT **9**

Introduction to Geo satellites-Antenna Look Angles – The Polar Mount Antenna – Limits of Visibility – Earth Eclipse– Sun Transit Outage – Launching Orbits –Power Supply – Altitude Control –Satellite Stabilization –Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver –Morelos – Anik-E – Advanced Tiros-N Spacecraft.

UNIT III EARTH SEGMENT & SPACE LINK **9**

Receive Only Home TV Systems – Outdoor Unit – Indoor Unit for Analog (FM) TV – Master Antenna TV System – Community Antenna TV System – Transmit-Receive Earth Stations – Equivalent Isotropic Radiated Power – Transmission Losses – Link Power Budget Equation – System Noise – Noise Factor – Noise Temperature– Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output – Effects of Rain – Combined Uplink and Downlink C/N Ratio – Intermodulation Noise.

UNIT IV SATELLITE ACCESS **9**

Single Access –FDMA, SPADE System. TWT amplifier, FDMA downlink analysis.TDMA : Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission.

Companion of, FDMA ,TDMA. And CDMA On-board signal Processing , Satellite switched TDMA .and CDMA – DSSS – Acquisition and trackling – Spectrum spreading and despreading – CDMA throughput – Satellite in network Layers – TCP Link – Enhancing TCP Over Satellite Channels Using Standard Mechanisms (RFC-2488) .

UNIT V DIRECT BROADCAST SATELLITE SERVICES **9**

Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television – MPEG Compression Standards – Forward Error Correction – Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink– Uplink - Satellite Mobile Services – VSATs – Radarsat GPS satellite

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Advanced satellite launching.

TOTAL: 45

TEXT BOOKS

1. Dennis Roddy, Satellite Communications, McGraw-Hill Publication Third edition 2001.
2. M.Richharia : Satellite Communication Systems (Design Principles Macmillan Press Ltd., Second Edition 2003.

REFERENCES

1. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd. 2004
2. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.

WEBSITES

1. members.tripod.com/
2. www.abc-directory.com
3. www.wirelessdictionary.com

13EC704 RF AND MICROWAVE ENGINEERING 3 0 0 3

OBJECTIVES

- To study multi- port RF networks and RF transistor amplifiers, oscillator and mixer
- To understand passive microwave components and their S- Parameters.
- To know t Microwave semiconductor devices & applications.
- To know Microwave sources and amplifiers.

OUTCOMES

At the end of the course the student should be able to

- Analyse microwave techniques and its applications
- Understand the concept of active and passive RF devices
- Experience the use of semiconductor devices and RF measuring instruments

UNIT I RF DESIGN AND MATCHING NETWORKS **9**

Frequency spectrum-Importance of RF Design-RF Behaviour of passive components-Chip components and circuit board considerations-Impedence matching using discrete components-Microstrip line matching networks-Applications of RF.

UNIT II RF ACTIVE DEVICES **9**

High Electron Mobility Transistor (HEMT)-Characteristics of Amplifiers-Amplifier power relations-Broad band, High power, and Multi stage amplifiers-Basic oscillator model-High frequency oscillator configuration-Basic characteristics of mixer.

UNIT III MICROWAVE NETWORK CHARACTERIZATION AND PASSIVE COMPONENTS **9**

Circuit and S parameter representation of N ports- Losses in terms of s parameters- Properties of S parameters - ABCD parameters-Cascaded networks- Reciprocity Theorem -Relations between Z,Y and ABCD parameters with S parameters- - Directional Coupler- Microwave Hybrid circuits-Circulator and isolator- Matched loads and movable shorts.

UNIT IV MICROWAVE TUBES **9**

Two cavity klystron-Re-entrant cavities-velocity modulation-current modulation-Bunching process-Efficiency of Klystron-Reflex Klystron-Velocity modulation-power output and efficiency-Travelling Wave Tube (TWT)-Slow wave structures-Amplification process-Convection Current-Axial Electric Field-Wave modes-Gain consideration-Magnetron-Cylindrical magnetron-Equations of electron trajectory-Resonant modes-Mechanism of oscillations-Power output and efficiency.

UNIT V MICROWAVE SEMICONDUCTOR DEVICES AND MEASUREMENTS **9**

Gunn-Effect – Gunn Diode- Differential Negative Resistance- Modes of Operation- Amplification-Microwave Generation- - Avalanche Multiplication- IMPATT Diodes- TRAPATT Diode- BARITT Diode- Principles of Operation- Physical Structures- Parametric Amplifiers -Nonlinear Reactance and Manley – Rowe Power Relations. Slotted line VSWR measurement- impedance measurement, Introduction to vector network analyzer and its uses, insertion loss and attenuation measurements

UNIT VI STATE OF THE ART / ADVANCES (NOT FOR EXAMINATION)

Wimax and UWB.

TOTAL: 45

TEXT BOOKS

1. Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2009
2. Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2008
3. Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc 2009.
4. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Inc., 2007.

REFERENCES

1. D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2008.
2. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.

13EC711 COMPUTER NETWORKS LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To study the basic programming concepts of Netsim
- To learn about the performance of protocols and routing algorithms

LIST OF EXPERIMENTS

1. PC to PC Communication
2. Parallel Communication using 8 bit parallel cable
3. Serial communication using RS 232C

4. Ethernet LAN protocol
5. To create scenario and study the performance of CSMA/CD protocol Ethernet simulation
6. Token bus and token ring protocols
7. To create scenario and study the performance of token bus and token ring protocols through simulation
8. Wireless LAN protocols
9. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
10. Implementation and study of stop and wait protocol
11. Implementation and study of Go back-N and selective repeat protocols
12. Implementation of distance vector routing algorithm
13. Implementation of Link state routing algorithm
14. Implementation of Data encryption and decryption
15. Transfer of files from PC to PC using Windows / UNIX socket processing

TOTAL: 45

13EC712 MICROWAVE AND OPTICAL LABORATORY 0 0 3 1

OBJECTIVES

At the end of the course the student should be able

- To learns the characteristics of optical sources and optical fiber.
- To determine the parameters of microwave devices and antennas

LIST OF EXPERIMENTS

MICROWAVE EXPERIMENTS:

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter measurement
5. Attenuation and Power measurement
6. S - Matrix Characterization of E-Plane T, H-Plane T and Magic T.
7. Radiation Pattern of Antennas.
8. Antenna Gain Measurement

OPTICAL EXPERIMENTS:

9. DC characteristics of LED and PIN Photo Diode.
10. Mode Characteristics of Fibers
11. Measurement of Connector and Bending Losses.
12. Fiber Optic Analog and Digital Link
13. Numerical Aperture Determination for Fibers
14. Attenuation Measurement in Fibers

TOTAL: 45

ELECTIVES

COMMUNICATION ENGINEERING

13EC001 INFORMATION THEORY AND CODING 3 0 0 3

OBJECTIVES

- To understand the concepts of entropy, mutual information and channel capacity.
- To know about the different types of communication channels.
- To learn about different types of source coding techniques.

OUTCOMES

At the end of the course the student should be able to

- Analyze the statistical nature of communication systems
- Solve and design coding techniques to improve the efficiency of transmission
- Use probability theory and its applications in communication systems

UNIT I PROBABILITY THEORY AND RANDOM PROCESS **9**

Review of fundamental concepts of probability-Random variables-functions of random variable-covariance and correlation coefficient-concept of stationarity-Ergodicity-first order markov process-correlation-Auto and cross correlation functions-power spectral density

UNIT II OPTIMUM FILTERING **9**

I/O relations of linear systems subjected to random inputs-transmission of Gaussian process through linear system-Linear mean square filtering-Physically realizable optical system

UNIT III DISCRETE CHANNELS **9**

Uncertainity principle-measure of information-self information-Entropy- Definitions and property-Channel capacity-Calculation of channel capacity for different channels

UNIT IV CONTINUOUS CHANNELS **9**

Continuous channels-channel capacity-Entropy maximization problems(AWGN channels)-Hartley Shannon's law- Trade-off between bandwidth and SNR-comparison of different modulation methods

UNIT V ELEMENTS OF ENCODING **9**

Typical noiseless coding schemes-shanon's binary coding –shanon Fano coding-Gilbert Moore coding-Huffman's coding

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Matlab simulation of different noiseless coding schemes, Various simulation of digital modulation techniques.

TOTAL: 45

TEXT BOOKS

1. Reza F M,"An Introduction to Information Theory",TMH,New Delhi,2000
2. Peebles P Z, "Probability,Random Variables and Random Signal Principles", 4th edition,TMH,NewDelhi,2008.

REFERENCES

1. B.P.Lathi,Modern digital &Analog communication systems, , 3rd Edition,1998.
2. Simon Haykins, "Communication Systems" John Wiley, 5th Edition,2008.
3. Rong Li X,"Probability,Random Signals and Statistics", CRC Press,1st edition 1999.

WEBSITES

1. www.nptel.com
2. www.ocw.mit.edu

13EC002 ENGINEERING ACOUSTICS 3 0 0 3

OBJECTIVES

- To study the mathematical basis for acoustics waves
- To introduce the concept of radiation reception absorption and attenuation of acoustic waves.
- To learn the characteristic behavior of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To study in detail about loud speakers and microphones.

OUTCOMES

At the end of the course the student should be able to

- Analyze the functional concept of acoustic waves
- Design and analyze the radiation and reception of acoustic waves.
- Learn and use architecture and environmental inclusive of reverberation and noise

UNIT I INTRODUCTION **9**

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence – method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES **9**

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source - radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS **9**

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – detection threshold – the ear – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS **9**

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design.

Environmental Acoustics: Weighted sound levels speech interference – highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION **9**

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker – loudspeaker cabinets – horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Musical acoustics, Noise, Signal detection, Hearing and speech

TOTAL: 45

TEXT BOOK

1. Lawerence E.Kinsler, Austin, R.Frey, Alan B.Coppens, James V.Sanders, Fundamentals of Acoustics, 4ht edition, Wiley, 2009.

REFERENCE

1. L.Berarek , “Acoustics” - McGraw-Hill,2012.

WEBSITES

1. en.wikibooks.org
2. www.acoustics-engineering.com

13EC003 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY 3 0 0 3

OBJECTIVES

- To understand EMI Sources, EMI problems and their solution methods in PCB level /Subsystem and system level design.
- To study the emission, immunity level from different systems to couple with the prescribed EMC standards.

OUTCOMES

At the end of the course the student should be able to

- Design the EMI and EMC components
- Analyse EMI measures and standards
- Solve the issues related to EMI

UNIT I BASIC CONCEPTS **9**

Definition of EMI and EMC with examples, Classification of EMI/EMC - CE, RE, CS, RS, Units of Parameters, Sources of EMI, EMI coupling modes - CM and DM, ESD Phenomena and effects, Transient phenomena and suppression.

UNIT II EMI MEASUREMENTS **9**

Basic principles of RE, CE, RS and CS measurements, EMI measuring instruments- Antennas, LISN, Feed through capacitor, current probe, EMC analyzer and detection t6echnique open area site, shielded anechoic chamber, TEM cell.

UNIT III EMC STANDARD AND REGULATIONS **9**

National and Intentional standardizing organizations- FCC, CISPR, ANSI, DOD, IEC, CENEEC, FCC CE and RE standards, CISPR, CE and RE Standards, IEC/EN, CS standards, Frequency assignment - spectrum conversation.

UNIT IV EMI CONTROL METHODS AND FIXES **9**

Shielding, Grounding, Bonding, Filtering, EMI gasket, Isolation transformer, opto isolator.

UNIT V EMC DESIGN AND INTERCONNECTION TECHNIQUES **9**

Cable routing and connection, Component selection and mounting, PCB design- Trace routing, Impedance control, decoupling, Zoning and grounding.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Pcb Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Controlling Differential Mode Radiation-Board Layout, Multilayer Boards

TOTAL: 45

TEXT BOOKS

1. Prasad Kodali.V – Engineering Electromagnetic Compatibility – S.Chand&Co – New Delhi – 2001.
2. Clayton R.Paul – Introduction to Electromagnetic compatibility – Wiley & Sons – 2006

REFERENCES

1. Keiser – Principles of Electromagnetic Compatibility – Artech House – 3rd Edition –1987
2. Donwhite Consultant Incorporate – Handbook of EMI / EMC – Vol I – 1985.

WEBSITES

1. www.powermag.com
2. www.wiley.com

13EC004 HIGH SPEED NETWORKS 3 0 0 3

OBJECTIVES

- To study about ATM and Frame relay.
- To provide an up-to-date survey of developments in High Speed Networks.
- To learn the techniques involved to support real-time traffic and congestion control.
- To understand the different levels of quality of service (Q.S) to different applications.

OUTCOMES

At the end of the course the student should be able to

- Design the wireless LANs
- Analyze the congestion control measures applied to real time
- Understanding services provided by networks

UNIT I HIGH SPEED NETWORKS **9**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL.High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel. Wireless LANs: Applications, requirements – Architecture of 802.11.

UNIT II CONGESTION AND TRAFFIC MANAGEMENT **9**

Queuing Analysis- Queuing Models – Single Server Queues.Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III TCP AND ATM CONGESTION CONTROL **9**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES **9**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.

UNIT V PROTOCOLS FOR QOS SUPPORT **9**

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details. RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Green Networking And Computing, Broadband Multimedia Sensor Networks In Healthcare Applications, Self-Stabilizing Systems, Network Attacks, Intrusion And Anomaly Detection, Intelligent Firewall Solutions.

TOTAL: 45

TEXT BOOKS

1. William Stallings, "High Speed Networks And Internet", Pearson Education, Second Edition, 2002.
2. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001

REFERENCE

1. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003

WEBSITES

1. www.pearsonhighered.com
2. www.fileguru.com
3. williamstallings.com

13EC005 RADAR AND NAVIGATIONAL AIDS 3 0 0 3

OBJECTIVES

- To study the Range equation and the nature of detection.
- To understand doppler principle to radars and hence detect moving targets, cluster, also tounderstand tracking radars.
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore.

OUTCOMES

At the end of the course the student should be able to

- Design Radar and Radar equations
- Analyze the concept noise detection in signals

UNIT I INTRODUCTION TO RADAR **9**

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies – Applications of Radar – The Origins of Radar.

The Radar Equation Introduction- Detection of Signals in Noise- Receiver Noise and the Signal-to-Noise Ratio-Probability Density Functions- Probabilities of Detection and False Alarm- Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters-System losses – Other Radar Equation Considerations

UNIT II MTI AND PULSE DOPPLER RADAR **9**

Introduction to Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics - Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

UNIT III DETECTION OF SIGNALS IN NOISE **9**

Introduction – Matched –Filter Receiver –Detection Criteria – Detectors –-Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction -Standard Propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters – Frequency Scan Arrays. Radar Transmitters- Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter.Radar Receivers - The Radar Receiver - Receiver noise Figure - Superheterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

UNIT IV METHODS OF NAVIGATION **9**

Introduction - Introduction - Four methods of Navigation.Radio Direction Finding - The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders. Radio Ranges - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving

Equipment - Range and Accuracy of VOR - Recent Developments.
Hyperbolic Systems of Navigation (Loran and Decca) - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System.

UNITV NAVIGATION SYSTEMS **9**

DME and TACAN - Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment.Aids to Approach and Landing - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System(MLS).Doppler Navigation - The Doppler Effect - Beam Configurations -Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems.Inertial Navigation - Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems.Satellite Navigation System - The Transit System - Navstar Global Positioning System (GPS).

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Flight Control, Radio Astronomy, Radars For Distance Measurement, Pulse Doppler Signal Processing, Radar Interferometry, Ocean Vector Winds Applications, Radar Ecology Applications, Scatterometry Applications, Cloud Radar Applications, Ground Penetrating Radar

TOTAL: 45

TEXT BOOKS

1. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2003.
2. Peyton Z. Peebles:, "Radar Principles", Johnwiley, 2007

REFERENCE

1. J.C Toomay, " Principles of Radar", 2nd Edition –PHI, 2004.

WEBSITES

1. www.tchb.gov.tw
2. www.navaidsltd.net/

13EC006 RF AND MEMS 3 0 0 3

OBJECTIVES

- To study the MEMS technology.
- To understand the micro machined RF filter and phase shifters
- To know about RF antennas.

OUTCOMES

At the end of the course the student should be able to

- Analyze the concept of active and passive RF devices
- Use and solve the semiconductor devices and RF measuring instruments
- Design the MEMS structure

UNIT I MEMS AND RADIO MEMS **9**

Introduction – RF mems configurations – micro fabrication for MEMS – electromechanical transducer – Microsensor for mems –metal and metal alloys for mems – polymer for MEMS- others materials for MEMEs

UNIT II Z RF MEMS SWITCHES AND RELAYS **9**

Mechanical switches-Electronics switches-Swictes for RF – Electrrostatic switching-Electromagnetic switching- Thermal switching- Magneticactuation in micro relays –Reply contact force and materials – MEMS switch – design consideration.

UNIT III MEMS INDUCTORS AND CAPACITORS **9**

Self inductance and mutual inductance- micro machined inductors – Effect of inductor layout – reduction of stray capacitance of planar inductor – improving Q factor – Variable inductor – MEMS gap – tining capacitors- MEME area tuning capacitors- dielectric tunable inductors

UNIT IV MICRO MACHINED RF FILTER AND PHASE SHIFTERS **9**

Modeling of reasonators- Mechanical coupling components – general considerations for mechanical filter – surface acoustic wave filers operation wave propagation in piezoelectric substrates-design of interdigital transducers-single phase unidirectional transducers –saw devices;capabilities, limitations and applicatiob. Ferrite phase shiters-semiconductor phase shifters –ferroelectric thin flim phase shifters-limitations of phase shifters- MEMS phase shifters-Ferroelectric pahse shifters

UNIT V MICROMACHINED TRANSMISSION LINES AND ANTENNA **9**

Introduction-micromachined transmission lines and components –deisgn , fabrication and measurements . overview of microstrip antenna-micromaching technioques to improve antenna performance – micromaching as a fabrication process for small antenna – micromachined reconfigurable antenna .

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Medical Uses Of Radio Frequency, Gyroscopes, Micromachined Ultrasound Transducer, Acoustic And Optical Applications Of MEMS ,NEMS Technology, Security And Remote Monitoring

TOTAL: 45

TEXT BOOKS

1. Vijay K.Varadhan , K.J.Vinoy , K.A.Jose, " RF MEMS and their application " John Wiley 2002.
2. Gabriel M Rebeiz , " RF MEMS Theory, Design and Technology " , john wiley & Sons Ltd , New Jersey , 2004.

REFERENCES

1. Mohamed Gad – El – Hak " MEMS Design and fabrication " CRC TAYLORS & FRANCIS ,2010
2. Tai- Ran Hsu , " MEMS and microsystems" , Mc Graw- hill , 2002
3. Gabriel M Rebeiz , " RF MEMS Theory, Design and Technology " , john wiley & Sons Ltd , New Jersey , 2004.
4. Hector J de Santos , " RF MEMS circuits Desin for wireless communications", Artech house,2002.

13EC007 MICROWAVE INTEGRATED CIRCUITS 3 0 0 3

OBJECTIVES

- To learn Recent Trends in Microwave Integrated Circuits
- To understand the familiarize analysis, design and fabrication techniques of Microwave Integrated Circuits

OUTCOMES

At the end of the course the student should be able to

- Can Be Able To Understand The Concept Of Hybrid Circuits
- Use the Microstrip Lines And Waveguides

UNIT I TECHNOLOGY OF HYBRID MICS **9**

Dielectric substrates-thick film technology and materials-thin film technology and materials-methods of testing-encapsulation of devices for MICs-mounting of active devices

UNIT II TECHNOLOGY OF MONOLITHIC MICS **9**

Processes involved in fabrication-epitaxial growth of semiconductor layer-growth of dielectric layer-diffusion-ion implantation- electron beam technology

UNIT III ANALYSIS OF MICROSTRIP LINE **9**

Methods of conformal transformation – numerical method for analysis- hybrid mode analysis-coupled mode analysis – method of images-losses in microstrips.

UNIT IV COUPLED MICROSTIRP SLOT LINE AND COPLANAR WAVEGUIDES **9**

Coupled microstrips – even and odd mode analysis – micro directional coupler – branch line coupler – periodic branch line coupler – synchronous branch line coupler

UNIT V LUMPED ELEMENTS AND NON –RECIPROCAL COMPONENTS **9**

Design and fabrication using microstrip – Flat resistors – fat inductors – inter digit capacitors – sandwich capacitors-ferromagnetic substrates for non reciprocal devices- microstrip circulators- latching circulators- isolators – phase shifter

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Geometrical Optics As A Limiting Case Of Wave Optics. Ray Matrices For Paraxial Ray Optics. Gaussian Beams. Generation Of Gaussian Beams At Microwave Frequencies. The Beam Waist. Propagation Of Gaussian Beams In Homogeneous Medium. Transformation Of Gaussian Beams With Lenses

TOTAL: 45

TEXT BOOK

1. Gupta K C and Amarjit singh " Microwave integrated circuits " John wiley and sons Wiley Eastern reprint 1978

REFERENCE

1. Hoffmann R K , " Handbook of microwave integrated circuits ", Artech house , 1987

13EC008 WIRELESS NETWORKS 3 0 0 3

OBJECTIVES

- To understand physical as wireless MAC layer alternatives techniques.
- To learn planning and operation of wireless networks.
- To study various wireless LAN and WAN concepts.
- To understand WPAN and geo-location systems

OUTCOMES

At the end of the course the student should be able to

- Analyze the basics of Routing and protocols in Ad hoc and Sensor Networks.
- Use the Wireless Broadband Networks Technology Overview, Platforms and Standards.
- Understanding management, testing and troubleshooting in Wireless Broadband Networks and working principles of wireless LAN, its standards and learn latest wireless networks

UNIT I PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES **9**

Wired transmission techniques: design of wireless modems, power efficiency, out of band radiation, applied wireless transmission techniques, short distance base band transmission, UWB pulse transmission, broad Modems for higher speeds, diversity and smart receiving techniques, random access for data oriented networks, integration of voice and data traffic.

UNIT II WIRELESS NETWORK PLANNING AND OPERATION **9**

Wireless networks topologies, cellular topology, cell fundamentals signal to interference ratio calculation, capacity expansion techniques, cell splitting, use of directional antennas for cell sectoring, micro cell method, overload cells, channels allocation techniques and capacity expansion FCA, channel borrowing techniques, DCA, mobility management, radio resources and power management ,securities in wireless networks.

UNIT III WIRELESS WAN **9**

Mechanism to support a mobile environment, communication in the infrastructure, IS-95 CDMA forward channel, IS – 95 CDMA reverse channel, packet and frame formats in IS – 95, IMT – 2000; forward channel in W-CDMA and CDMA 2000, reverse channels in W-CDMA and CDMA-2000, GPRS and higher data rates, short messaging service in GPRS ,mobile application protocols.

UNIT IV WIRELESS LAN **9**

Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11. The PHY Layer, MAC Layer, wireless ATM, HYPER LAN, HYPER LAN – 2.

UNIT V WPAN AND GEOLOCATION SYSTEMS **9**

IEEE 802.15 WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geolocation technologies for wireless geolocation, geolocation standards for E.911 service.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

OPNET, GloMoSim / QualNet, NS-2, OMNeT++. Create a simple network configuration and analyze it's performance based on various parameters using NS-2. Simulate the Multicast routing in NS-2. Study of various routing protocols by GloMoSim. Create a Vehicular networks and analyze it's performance using NS-2.

TOTAL: 45

TEXT BOOKS

1. Kaveh Pahlavan, Prashant Krishnamoorthy, Principles of Wireless Networks, - A united approach Pearson Education, 2002.
2. Jochen Schiller, Mobile Communications, Person Education – 2008, 2nd Edition.

REFERENCES

1. X.Wang and H.V.Poor, Wireless Communication Systems, Pearson education, 2004.
2. M.Mallick, Mobile and Wireless design essentials, Wiley Publishing Inc. 2003.
3. P.Nicopolitidis, M.S.Obaidat, G.I. papadimitria, A.S. Pomportsis, Wireless Networks, John Wiley & Sons, 2003.

WEBSITES

1. www.networktutorials.info
2. www.flukenetworks.com
3. www.ehow.com

13EC009 TELECOMMUNICATION SWITCHING AND NETWORKS 3 0 0 3

OBJECTIVES

- To understand the concepts of space switching, time switching and combination switching
- To understand the need for network synchronization, network control and management issues.
- To understand statistical modeling, blocking system characteristics and queuing system characteristics of telephone traffic.
- To characterize blocking probability holding service time distributions in speech and data networks.

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of switching Networks.
- Knowing digital switching and network synthesis

UNIT I MULTIPLEXING **9**

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital

Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings. SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats - SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

UNIT II DIGITAL SWITCHING **9**

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment- Elements of SSN07 signaling

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT **9**

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management

UNIT IV DIGITAL SUBSCRIBER ACCESS **9**

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

UNIT V TRAFFIC ANALYSIS **9**

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

The Evolution Of HIPERLAN – The Evolution Of IEEE 802.11 – Forthcoming IR Standards – Other RF Standards: Digital Enhanced Cordless Technology (DECT) – Bluetooth – Wireless ATM (WATM) – Home RF.

TOTAL: 45

TEXT BOOKS

1. Bellamy John, "Digital Telephony", John Wily & Sons, Inc. 3rd edn. 2009.
2. Viswanathan. T., "Telecommunication Switching System and Networks", Prentice Hall of India Ltd., 2006

WEBSITES

1. www.globalshiksha.com
2. professional-ebooks.blogspot.com

13EC010 REMOTE SENSING 3 0 0 3

OBJECTIVES

- To learn the basic concepts of remote sensing
- To study the effect of atmosphere and earth material in communication.
- To learn about optical and remote sensors.
- To learn and interpret the results of Geographic Information systems

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of Electro Magnetic Radiation
- Can be able to demonstrate satellite orbits and purpose
- Knowing various geographic information

UNIT I REMOTE SENSING **9**

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS **9**

Atmospheric characteristics – Scattering of EMR – Rayleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces-Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface:Imaging spectrometry and spectral characteristics

UNIT III OPTICAL AND MICROWAVE REMOTE SENSING **9**

Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM **9**

GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

UNIT V MISCELLANEOUS TOPICS **9**

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – An introduction

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Mobile satellite service: GSM. GPS, INMARSAT, navigation system, direct to home service (DTH), special services, e-mail, video conferencing and internet connectivity.

TOTAL: 45

TEXT BOOKS

1. M.G. Srinivas(Edited by), Remote Sensing Applications, Narosa Publishing House, 2001.
2. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001.

REFERENCES

1. Jensen, J.R., Remote sensing of the environment, Prentice Hall, 2007.
2. Kang-Tsung Chang,"Introduction to Geograhic Information Systems", TMH, 2013
3. Lillesand T.M. and Kiefer R.W., "Remote Sensing and Image Interpretation", John Wiley and Sons, Inc, New York, 2004
4. Burrough P A, "Principle of GIS for land resource assessment", Oxford.1994
5. Mischael Hord, "Remote Sensing Methods and Applications", John Wiley & Sons, New York, 1986.
6. Floyd F. Sabins, Remote sensing, "Principles and interpretation", W H Freeman and Company 1996.
7. IEEE Transactions on Geo-science and Remote sensing.2007.
8. Manual of Remote Sensing – American society of photogrammetry & remote sensing, 1993.

WEBSITES

1. www.ssmi.com
2. rst.gsfc.nasa.gov
3. http://www.research.umbc.edu/
4. http://rst.gsfc.nasa.gov/start.html

13EC011 CDMA SYSTEMS 3 0 0 3

OBJECTIVES

- To know about the basic concepts of CDMA
- To know the characteristic of IS-95 CDMA techniques
- To know about the optical CDMA concepts

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of spread spectrum techniques
- Can be able to demonstrate multicarrier CDMA systems

UNIT I BASIC CONCEPTS OF CDMA **9**

Spread spectrum communication techniques (DS-CDMA,FH-CDMA),Synchronization in CDMA system, Detection and Falsealarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

UNIT II IS-95 CDMA TECHNIQUES **9**

Spreading Codes , Power control, Handover techniques, Physical and logicalchannels and processing (forward and reverse links)

UNIT III WCDMA / CDMA 2000 **9**

Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation &demodulation process , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS **9**

Multicarrier CDMA, System design , Performance parameters – BER lower bound,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA **9**

Prime Codes and it's properties, Generalized and Extended Prime Codes, Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multiwavelength Optical CDMA networks.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Simulation and performance evolution of CDMA systems

TOTAL: 45

REFERENCES

1. John G.Proakis, "Digital Communications", McGraw Hill International Ltd, 4th ed., Singapore, 2008.
2. Andrew J. Viterbi, " CDMA: Principles of Spread Spectrum Communication",Addison- Wesley, 1st ed. , 1995.
3. Kaveth Pahlavan,. K. Prashanth Krishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, "IS –95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation", Pearson Education , 2nd ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, " OFDM for Wireless Multimedia Communication" , Artech House Boston ,London, 2000.

6. Andreas F. Molisch, "Wireless Communication", Wiley India, 2012.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, "GSM CDMA One and 3G Systems", Wiley India, 2004.
8. Guu-Chang Yang, "Prime Codes with Application to Optical and Wireless Networks", Artech House, Inc., 2002

ELECTRONICS ENGINEERING

13EC021 MEDICAL ELECTRONICS 3 0 0 3

OBJECTIVES

- To study the methods of recording various biopotentials.
- To study how to measure biochemical and various physiological information.
- To understand the working of units that helps to restore normal functioning.
- To understand the use of radiation for diagnostic and therapy.
- To understand the need and technique of electrical safety in Hospitals.

OUTCOMES

At the end of the course the student should be able to

- Analyze the function of heart, eye and brain
- Analyze the basics of radiology
- Analyze and demonstrate various measuring equipments

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, and Blood cell counters.

UNIT III ASSIST DEVICES AND BIO-TELEMETRY 9

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS 9

Ionizing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Information Gathering, Diagnosis, Evaluation, Monitoring, Control applications

TOTAL: 45

TEXT BOOKS

1. Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2002.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2008.

REFERENCE

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2008.

WEBSITES

1. www.hotcoursesabroad.com
2. www.medicalelectronicsdesign.com

13EC022 POWER ELECTRONICS 3 0 0 3

OBJECTIVES

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.

OUTCOMES

At the end of the course the student should be able to

- Analyze the functional concept of electronic devices
- Design the converters and inverters.
- Design and analyze about motor control, charges, SMPS and UPS.

UNIT I POWER ELECTRONICS DEVICES **9**

Characteristics of power devices – characteristics of SCR, Diac, Triac, SCS, GTO, PUJT – power transistors – power FETs – LASCR – two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.

UNIT II TRIGGERING TECHNIQUES **9**

Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering with microprocessor – forced commutation – different techniques – series and parallel operations of SCRs.

UNIT III CONTROLLED RECTIFIERS **9**

Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

UNIT IV INVERTERS **9**

Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.

UNIT V INDUSTRIAL APPLICATIONS **9**

DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Power electronics in- renewable energy, welding, aviation, aerospace, ups

TOTAL: 45

TEXT BOOKS

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3rd Edn. 2009 PHI.
2. Singh and Kanchandani : Power Electronics, TMH, 2008.

REFERENCES

1. Sen : Power Electronics, TMH, 2008
2. Dubey : Thyristorised power controllers, Wiley Eastern 1986.
3. Vithayathil : Power Electronics – Principles and applications McGraw-Hill, 2010.
4. Lander : Power Electronics, 3rd Edition, McGraw-Hill, 1994.

WEBSITES

1. powerelectronics.com
2. www.electronickits.com
3. www.woorank.com

13EC023 TELEVISION AND VIDEO ENGINEERING 3 0 0 3

OBJECTIVES

- To understand the synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver Systems.
- To understand the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering.

OUTCOMES

At the end of the course the student should be able to

- Analyze the fundamentals of digital TV broadcasting
- Design colour television architecture
- Use Satellite TV principles

UNIT I FUNDAMENTALS OF TELEVISION 8

Geometry form and Aspect Ratio - Image Continuity - Number of scanning lines - Interlaced scanning - Picture resolution - Camera tubes- Image orthicon – Vidicon –Plumbicon - silicon diode array vidicon - solid state image scanners - monochrome picture tubes - composite video signal - video signal dimension - horizontal sync. Composition - vertical sync. Details – functions of vertical pulse train – scanning sequence details. Picture signal transmission – positive and negative modulation – VSB transmission sound signal transmission – standard channel bandwidth.

UNIT II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER 9

TV transmitter – TV signal propagation – Interference – TV transmission Antennas – Monochrome TV receiver – RF tuner – UHF, VHF tuner - Digital tuning techniques – AFT - IF subsystems - AGC – Noise cancellation - Video and sound inter carrier detection - vision IF subsystem - video amplifiers requirements and configurations - DC re-insertion - Video amplifier circuits - Sync separation – typical sync processing circuits - Deflection current waveform – Deflection Oscillators – Frame deflection circuits – requirements - Line Deflection circuits – EHT generation – Receiver Antennas.

UNIT III ESSENTIALS OF COLOUR TELEVISION 8

Compatibility – colour perception - Three colour theory - luminance, hue and saturation -colour television cameras - values of luminance and colour difference signals - colour television display tubes - delta – gun-Precision – in-line and Trinitron colour picture tubes - purity and convergence - purity and static and dynamic convergence adjustments - pincushion correction techniques - automatic degaussing circuit- gray scale tracking – colour signal transmission – bandwidth - modulation of colour difference signals – weighting factors - Formation of chrominance signal.

UNIT IV COLOUR TELEVISION SYSTEMS 10

NTSC colour TV system - NTSC colour receiver - limitations of NTSC system – PAL colour TV system – cancellation of phase errors - PAL – D colour system - PAL coder – Pal Decoder receiver - chromo signal amplifier - separation of U and V signals - colour burst separation – Burst phase Discriminator – ACC amplifier - Reference Oscillator - Ident and colour killer circuits - U and V demodulators - Colour signal matrixing – merits and demerits of the PAL system – SECAM system – merits and demerits of SECAM system.

UNIT V ADVANCED TELEVISION SYSTEMS 10

Satellite TV technology- Cable TV – VCR - Video Disc recording and playback- Tele Text broadcast receiver – digital television – Transmission and reception- projection Television – Flat panel display TV

receiver – Stereo sound in TV – LED TV – LCD TV - 3D TV – EDTV – Digital equipments for TV studios

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Direct Broad Casting Systems, Video Conferencing, Audio Identification, Smart TV, Smart Class Applications By Using LCD Display

TOTAL: 45

TEXT BOOKS

1. R.R.Gulati, " Monochrome Television Practice, Principles, Technology and servicing, Second edition, New age International Publishes, 2007
2. R.R.Gulati "Monochrome and colour television ", New age International Publisher, 2007

REFERENCES

1. A.M Dhake, "Television and Video Engineering", Second edition, TMH, 2003.
2. S.P. Bali, " Colour Television, Theory and Practice", TMH, 2007

13EC024 ADVANCED ELECTRONIC SYSTEM DESIGN 3 0 0 3

OBJECTIVES

- To study RF component such as resonator, filter, transmission lines.
- To understand the design of RF amplifiers using transistors.
- To learn about fabrication of PCBs using CAD

OUTCOMES

At the end of the course the student should be able to

- Design the microwave techniques and its applications
- Analyze the concept of active and passive RF devices
- Use the semiconductor devices and RF measuring instruments
- Solve modern Power Supplies using SCR and SMPS technology

UNIT I INTRODUCTION TO RF DESIGN **9**

RF behaviour of passive components, Chip components and circuit board considerations, Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks, ABCD and scattering parameters, Analysis of amplifier using scattering parameter. RF filter – Basic resonator and filter configurations – Butterworth and Chebyshev filters. Implementation of microstrip filter design. Band pass filter and cascading of band pass filter elements.

UNIT II RF TRANSISTOR AMPLIFIER DESIGN **9**

Impedance matching using discrete components. Microstrip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design(S12 =0) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT III DESIGN OF POWER SUPPLIES **9**

DC power supply design using transistors and SCRs, Design of crowbar and foldback protection circuits, Switched mode power supplies, Forward, flyback, buck and boost converters, Design of transformers and control circuits for SMPS

UNIT IV DESIGN OF DATA ACQUISITION SYSTEMS **9**

Amplification of Low level signals, Grounding, Shielding and Guarding techniques, Dual slope, quad slope and high speed A/D converters, Microprocessors Compatible A/D converters, Multiplying A/D converters and Logarithmic A/D converters, Sample and Hold, Design of two and four wire transmitters

UNIT V DESIGN OF PRINTED CIRCUIT BOARDS **9**

Introduction to technology of printed circuit boards (PCB), General lay out and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Anomaly Mems Circuit Technology,X-Ray Inspection Using Loaded PCB

TOTAL: 45

TEXT BOOKS

1. Reinhold Luduig and Pavel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education, 2000.
2. Sydney Soclof, "Applications of Analog Integrated Circuits", Prentice Hall of India, 1990.
3. Walter C.Bosshart, "Printed circuit Boards – Design and Technology", TATA McGraw-Hill, 1983.

REFERENCES

1. Keith H.Billings, "Handbook of Switched Mode Supplies" McGraw-Hill Publishing Co., 1989.
2. Michael Jaacob, "Applications and Design with Analog Integrated Circuits" Prentice Hall of India, 1991.
3. Otmar Kigenstein, "Switched Mode Power supplies in Practice", John Wiley and Sons, 1989.
4. Muhammad H.Rashid, Power Electronics – Circuits, Devices and Applications, Prentice Hall of India, 2009

WEBSITES

1. electronicdesign.com
2. ezinearticles.com
3. www.mentor.com

13EC025 OPTO ELECTRONIC DEVICES 3 0 0 3

OBJECTIVES

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of light propagation
- Can be able to demonstrate source and detection devices

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS **9**

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II DISPLAY DEVICES AND LASERS **9**

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III OPTICAL DETECTION DEVICES **9**

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR **9**

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acousto -Optic devices, Optical, Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS **9**

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Optical networks, MOEMS, special purpose optical systems.

TOTAL: 45

TEXT BOOKS

1. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
2. Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi, 1997.

REFERENCES

1. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGrawHill International Edition, 1998.

13EC026 NANO ELECTRONICS 3 0 0 3

OBJECTIVES

- To learn the basic concepts of nano electronics and nano technologies
- To learn about silicon MOSFETS , quantum transport devices, carbon nano tubes and its applications
- To study about molecular electron devices and its applications.

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of nano electronics
- Can be able to demonstrate transport devices and nano tubes

UNIT I INTRODUCTION **9**

Background to nanotechnology: Types of nanotechnology and nanomachines – periodictable – atomic structure – molecules and phases – energy – molecular and atomic size –surface and dimensional space – top down and bottom up; Molecular Nanotechnology:Electron microscope – scanning electron microscope – atomic force microscope –scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation– nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation –plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials

UNIT II FUNDAMENTALS OF NANOELECTRONICS **9**

Fundamentals of logic devices - Requirements – dynamic properties – threshold gates;physical limits to computations; concepts of logic devices:- classifications – two terminaldevices – field effect devices – coulomb blockade devices – spintronics – quantumcellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. ultimatecomputation- power dissipation limit – dissipation in reversible computation – the ultimate computer.

UNIT III SILICON MOSFETS & QUANTUM TRANSPORT DEVICES **9**

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices-scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions,& contacts – advanced MOSFET concepts.Quantum transport devices based on resonant tunneling - Electron tunneling – resonanttunneling diodes – resonant tunneling devices; Single electron devices for logic applications.

UNIT IV CARBON NANOTUBES **9**

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes –assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs –Nanotube for memory applications – prospects of an all carbon nanotube

UNIT V MOLECULAR ELECTRONICS **9**

Electrodes & contacts – functions – molecular electronic devices – first test systems –simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Nanoscale heat, conduction, convection, radiation. Nanoscale Fluid Mechanics: Fluids at the nanoscale: major concepts, flow fluids flow at the nanoscale, applications of nanofludics

TOTAL: 45

TEXT BOOKS

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2008.
3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2012.

WEBSITES

1. www.nanotech-now.com
2. www.freewebs.com
3. www.nanonews.tv

13EC027 HARDWARE DESCRIPTION LANGUAGES 3 0 0 3

OBJECTIVES

- To learn the hardware level description for any digital circuits
- To study the compilation tool for the same

OUTCOMES

At the end of the course the student should be able to

- Design an FPGA based hardware platform of any circuits
- Able to write coding in both verilog and VHDL.

UNIT I BASIC CONCEPTS OF HARDWARE DESCRIPTION LANGUAGE **9**

Comparison between HDL and High Level Language Hierarchy, Concurrency, Logic and Delay Modelling, Structural, Data flow, Behavioral Styles of Hardware Description, Architecture of event driven simulation.

UNIT II VHDL **9**

Data Types, Operators, Classes of Objects, entities and architectures , Attributes – concurrent statements-sequential statements- signals and variables- Behavior, dataflow and structural modeling-Configurations, functions- procedures- packages - test benches- Design Examples

UNIT III VERILOG **9**

Signals, Identifier Names, Net and Variable Types, operators, Gate instantiations, Verilog module, concurrent and procedural statements, UDP, sub circuit parameters, function and task, -test benches-Design Examples

UNIT IV TIMING ISSUES **9**

Modeling delay, Timing Modeling, Timing Assertion, Setup and hold times for clocked devices.

UNIT V SYSTEM MODELLING **9**

Processor model, RAM model, UART Model, Interrupt Controller

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Basics of System Verilog , Simple programs using System Verilog.

TOTAL: 45

REFERENCES

1. Bhasker J, "A VHDL Primer", Prentice Hall, 1999.
2. Bhaskar J, "VHDL Synthesis Primer", Prentice Hall, 2nd Edition 1998.
3. Bhasker J, "A Verilog Primer", Prentice Hall, 1999.
4. Bhaskar J, "Verilog Synthesis Primer", Prentice Hall,1999.
5. Stefan Sjoholm and Lennart Lindh, "VHDL for Designers" 1997.
6. Michael D Ciletti, "Advanced Digital Design with Verilog HDL", Pearson education,2005.
7. Douglass Perry, "VHDL", Tata McGraw Hill, McGraw-Hill Professional, 4th Edition, May 2002.
8. Volnei A Pedroni, "Circuit Design with VHDL", Prentice Hall, 2004.
9. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Prentice Hall NJ, USA, 2003.
10. Neil Weste and Kamran Eshranghian "Principles of CMOS VLSI Design", Addison Wesley, 2000.

GENERAL ENGINEERING

13CS019 ARTIFICIAL INTELLIGENCE **3 0 0 3**

(Vide Mechanical Engineering)

13CS303/13CS033 OBJECT ORIENTED PROGRAMMING AND C++ **3 0 0 3**

OBJECTIVES

- To understand the concepts of objects and classes.
- To study the various types of constructors and destructors.
- To understand the types of inheritance.
- To learn the concept of file handling.
- To study the concept of generic programming.

OUTCOMES

At the end of the course the student should be able to

- Analyze and apply the object oriented principles.
- Solve the real time applications using object oriented programming.

UNIT I INTRODUCTION TO OOP **9**

Programming Paradigms-Basic concepts and benefits of OOP-Structure of C++ program -Tokens-Keywords-Identifiers-constants-Data types –Basic- User defined -Derived -Dynamic initialization -Reference variables-Scope resolution operator-Member dereferencing operators-memory management operators-Type casting-Function, Prototyping-call by reference- return by reference-Inline function-Default arguments –Function overloading.

UNIT II CONSTRUCTORS AND OPERATOR OVERLOADING **9**

Class specification-Access qualifiers-Static data members and member functions -Array of objects-Objects as function arguments-Friend functions-Returning objects-Pointers to members-Local classes -Constructors –copy-null –Parameterized- Constructors with default arguments—Constructor overloading -Dynamic constructors -Dynamic initialization using constructors-Destructors –Operator Overloading.

UNIT III TEMPLATES AND EXCEPTION HANDLING **9**

Function templates- overloaded function templates- user defined template arguments- class templates - Exception Handling: Exception handling mechanism- multiple catch- nested try- throwing the exception.

UNIT IV INHERITANCE, POLYMORPHISM AND VIRTUAL FUNCTION **9**

Defining Derived classes-Single Inheritance-Multiple Inheritance-Multi level inheritance-Hierarchical Inheritance-Hybrid Inheritance-Multipath inheritance-Virtual Base Class-Abstract class-Constructors in derived and base class-Virtual functions-Pure virtual functions

UNIT V CONSOLE INPUT/OUTPUT OPERATION AND FILE HANDLING **9**

Stream classes-Formatted I/O-I/O Manipulators-User defined manipulators-File handling-File pointer and manipulation-Sequential and random access-Error handling

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Aspect oriented programming - reusable components- macro-generator- Ada– Shareable Content Object Reference Model.

TOTAL: 45

TEXT BOOKS

1. B.Trivedi," Programming with ANSI C++", 2nd Edition, Oxford University Press, 2012.
2. B.Stroustrup, "The C++ Programming Language",4th Edition, Pearson Education, 2013.

REFERENCES

1. K.R.Venugopal, Rajkumar, T.Ravishankar, "Mastering C++ ",Tata McGraw Hill, 2007.
2. E.Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, 5th Edition, 2011.

13EC043 FUZZY AND NEURAL NETWORKS 3 0 0 3

OBJECTIVES

- To learn the basics of Neural network and algorithms
- To learning unsupervised networks and memories
- To learn the fuzzy logic.

OUTCOMES

At the end of the course the student should be able to

- Can be able to demonstrate fuzzy logic and fuzzy measures in real time
- Knowing decision making and classification using Neural networks

UNIT I INTRODUCTION TO NEURAL NETWORKS **9**

Biological neural - Neural processing - Supervised and unsupervised learning - Neural network learning rules. Single layer perception - discrete and continuous perception - multi layer feed forward network – Back propagation Networks - feedback networks - Training Algorithms.

UNIT II UNSUPERVISED NETWORKS **9**

Unsupervised Learning – Competitive Learning Networks – Kohonen self organising networks – Learning Vector Quantization – Hebbian Learning – Hopfield Network –Content Addressable Nature – Binary Hopfield Network – Continuous Hopfield Network.

UNIT III ASSOCIATIVE MEMEORIES AND SOM **9**

Bidirectional Associative Memory – Principle Component Analysis. Auto associative memories - Bidirectional Associative memory (BAM) - Self Organization Maps (SOM) and ART1.

UNIT IV FUZZY LOGIC **9**

Fuzzy sets - Fuzzy Rules: Extension Principle, fuzzy measures - fuzzy relations - fuzzy functions-Fuzzy Reasoning.

UNIT V FUZZY SYSTEMS AND APPLICATIONS **9**

Representation of fuzzy knowledge - fuzzy inference systems- Mamdani Model – Sugeno Model – Tsukamoto Model– Fuzzy decision making – Multi Objective Decision Making – Fuzzy Classification– Fuzzy Control Methods – Application.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Neural network structures for pattern recognition - self organizing networks

TOTAL: 45

REFERENCES

1. Jang J S R Sun C T and Mizutani E, "Neuro Fuzzy and Soft computing", Pearson Education, (Singapore), 2005.
2. S Rajasekaran and G A Vijayalakshmi Pai, "Neural networks Fuzzy logics and Genetic algorithms", Prentice Hall of India, 2011
3. Derong Liu , "Advances in Neural Networks--ISNN 2007 ", Springer, 2011.
4. Timothy J Ross, "Fuzzy Logic Engineering Applications", John Wiley and Sons, 2010.
5. James A. Anderson, "An Introduction to Neural Networks", Prentice Hall, 2002

13CS047 SOFT COMPUTING 3 0 0 3

OBJECTIVES

- To study Neural networks.
- To learn the genetic algorithm and fuzzy logic.
- To understand the neuro- fuzzy model of a system.

OUTCOMES

At the end of the course the student should be able to

- Analyze the fundamentals of neural networks applied for imaging
- Use and solve the various optimization techniques and its essentials
- Design the neural based fuzzy system

UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS **9**

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS **9**

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT III NEURAL NETWORKS **9**

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV FUZZY LOGIC **9**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT V NEURO-FUZZY MODELING **9**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Anomaly Detection, Applications In Signal Processing And Pattern Recognition Using MATLAB, Moving Window Based Neural Models, Modelling And Control Applications, Applications In Computer Grapics, Imaging And Vision

TOTAL: 45

TEXT BOOKS

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.

REFERENCES

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
4. S.N.Sivanandam, S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2007.
5. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992.

MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS

13EC051 ADVANCED MICROPROCESSORS 3 0 0 3

OBJECTIVES

- To study the concepts in internal programming model of Intel family of microprocessors.
- To learn the programming techniques using MASM, DOS and BIOS function calls.
- To understand the basic architecture of Pentium family of processors.
- To study the architecture programming and interfacing of 16 bit microcontrollers.
- To learn the concepts and architecture of RISC processor and ARM.

OUTCOMES

At the end of the course the student should be able to

- Analyze processors and its applications in real time.
- Analyze the design of interfacing units.
- Design Pentium and ARM processors

UNIT I ADVANCED MICROPROCESSOR ARCHITECTURE **9**

Internal Microprocessor Architecture-Real mode memory addressing – Protected Mode Memory addressing –Memory paging - Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions- Arithmetic and Logic Instructions.

UNIT II MODULAR PROGRAMMING AND ITS CONCEPTS **9**

Modular programming –Using keyboard and Video display –Data Conversions- Disk files- Interrupt hooks- use assembly languages with C/ C++.

UNIT III PENTIUM PROCESSORS **9**

Introduction to Pentium Microprocessor – Special Pentium registers- Pentium memory management – New Pentium Instructions –Pentium Processor –Special Pentium pro features – Pentium 4 processor.

UNIT IV 16-BIT MICRO CONTROLLER **9**

8096/8097 Architecture-CPU registers –RALU-Internal Program and Data memory Timers-High speed Input and Output –Serial Interface-I/O ports –Interrupts –A/D converter-Watch dog timer –Power down feature –Instruction set- External memory Interfacing –External I/O interfacing.

UNIT V RISC PROCESSORS AND ARM **9**

The RISC revolution – Characteristics of RISC Architecture – The Berkeley RISC – Register Windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control – Data movement and memory reference instructions.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Use of µc/os-ii- case study of coding for an automatic chocolate vending machine using mucos RTOS- case study for an adaptive cruise control systems in a car- case study for a smart card

TOTAL: 45

TEXT BOOKS

1. Barry B.Brey, The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing, Prentice Hall of India Private Limited, New Delhi, 2009.
2. John Peatman, Design with Microcontroller McGraw Hill Publishing Co Ltd, New Delhi,1988
3. Alan Clements, "The principles of computer Hardware", Oxford University Press, 3rd Edition, 2006.

REFERENCE

1. Rajkamal, The concepts and feature of micro controllers 68HC11, 8051 and 8096; S Chand Publishers, New Delhi, 2000.

WEBSITES

1. www.freebyte.com/electronics
2. www.topsite.com/best/microprocessor

13EC052 COMPUTER HARDWARE AND INTERFACING 3 0 0 3

OBJECTIVES

- To introduce issues related to CPU and memory.
- To study the concept of components on the motherboard.
- To understand different storage media.
- To learn the features of different I/O peripheral devices and their interfaces

OUTCOMES

At the end of the course the student should be able to

- Design the CPU and memory
- Analyze the storage devices and peripherals
- Solve the hardware problems in real time

UNIT I CPU AND MEMORY **9**

CPU essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel's CPU – CPU over clocking – over clocking requirements – over clocking the system – over clocking the Intel processors – Essential memory concepts – memory organizations – memory packages – modules – logical memory organizations – memory considerations – memory types – memory techniques – selecting and installing memory

UNIT II MOTHERBOARDS **9**

Active motherboards – sockets and slots – Intel D850GB – Pentium4 mother board – expansion slots – form factor – upgrading a mother board – chipsets – north bridge – south bridge – CMOS – CMOS optimization tactics – configuring the standard CMOS setup – motherboard BIOS – POST – BIOS features – BIOS and Boot sequences – BIOS shortcomings and compatibility issues – power supplies and power management – concepts of switching regulation – potential power problems – power management.

UNIT III STORAGE DEVICES **9**

The floppy drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector layout – IDE drive standard and features – Hard drive electronics – CD-ROM drive – construction – CDROM electronics – DVD-ROM – DVD media – DVD drive and decoder.

UNIT IV I/O PERIPHERALS **9**

Parallel port – signals and timing diagram – IEEE1284 modes – asynchronous communication - serial port signals – video adapters – graphic accelerators – 3D graphics accelerator issues – DirectX – mice – modems – keyboards – sound boards – audio bench marks

UNIT V BUS ARCHITECTURE **9**

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

The Specification Problem –WDL Overview – FM3TR Example – Refinement To An Implication- WDL Details – A Practical WDL Support Environment

TOTAL: 45

TEXT BOOKS

1. Stephen J.Bigelow, “Trouble Shooting, maintaining and Repairing PCs”, Tata McGraw-Hill, New Delhi, 2001.
2. Craig Zacker & John Rourke, “The complete reference: PC hardware”, Tata McGraw-Hill, New Delhi, 2007.

REFERENCES

1. Mike Meyers, “Introduction to PC Hardware and Troubleshooting”, Tata McGraw-Hill, New Delhi, 2003.
2. B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill, New Delhi, 2002.

13EC053 ROBOTICS 3 0 0 3

OBJECTIVES

- To learn the Robot organization and hardware.
- To study the Robotic vision systems and Principles of edge detection.
- To study the Robots in material handling, processing assembly and storage.

OUTCOMES

At the end of the course the student should be able to

- Learning the basics of robot sensors and its applications
- Can be able to demonstrate artificial intelligence applied to robots
- Understanding the fundamental concepts of kinematics.
- Gain the knowledge about various sensors used in robotics.

UNIT I ROBOT ORGANIZATION **9**

Coordinate transformation, kinematics and inverse kinematics – Trajectory planning and remote manipulation.

UNIT II ROBOT HARDWARE **9**

Robot sensors – Proximity sensors – Range sensors – Visual sensors – Auditory sensors – Robot manipulators – Manipulator dynamics – Manipulator control – Wrists – End efforts – Robot grippers.

UNIT III ROBOT AND ARTIFICIAL INTELLIGENCE **9**

Principles of AI – Basics of learning – Planning movement – Basics of knowledge representations – Robot programming languages.

UNIT IV ROBOTIC VISION SYSTEMS **9**

Principles of edge detection – Determining optical flow and shape – Image segmentation – Pattern recognition – Model directed scene analysis.

UNIT V ROBOT CONTROL AND APPLICATION **9**

Robot control using voice and infrared – Overview of robot applications – Prosthetic devices – Robots in material handling, processing assembly and storage.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Building of 4 axis or 6 axis robot - Vision system for pattern detection - sensors for obstacle detection – AI Algorithms for path finding and decision making

TOTAL: 45

REFERENCES

1. Koren, “Robotics for Engineers”, TMH International Company, 1995.
2. Vokopravotic, “Introduction to Robotics”, Springer, 1988.
3. Rathmill K., “Robot Technology and Application”, Springer, 1985.
4. Charniak and Mc Darmott, “Introduction to Artificial Intelligence”, TMH, 1986.
5. Fu K.S, Gonzally R.C, Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, TMH Book Company, 2008.
6. Barry Leatham and Jones, “Elements of Industrial Robotics”, Pittman Publishing, 1987.
7. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, “Industrial Robotic Technology Programming and Applications”, TMH Book Company, 2008
8. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloguing Publication, 1990.

13EC054 RECONFIGURABLE COMPUTING 3 0 0 3

OBJECTIVES

- To learn the various architectures of FPGA.
- To study the design of FPGA .
- To learn about the parallel processing

OUTCOMES

At the end of the course the student should be able to

- Can be able to perform the experiment in FPGA
- Understanding the fundamental concepts of parallel processing
- Gain the knowledge about various analysis

UNIT I INTRODUCTION **9**

Goals and motivations - History, state of the art, future trends - Basic concepts and related fields of study - Performance, power, and other metrics - Algorithm analysis and speedup projections - RC Architectures - Device characteristics - Fine-grained architectures – Coarse grained architectures

UNIT II FPGA DESIGN **9**

FPGA Physical Design Tools -Technology mapping - Placement & routing - Register transfer (RT)/ Logic Synthesis - Controller/Data path synthesis - Logic minimization

UNIT III PARALLEL PROCESSING **9**

RC Application Design - Parallelism - Systolic arrays -Pipelining - Optimizations -Bottlenecks - High-level Design - High-level synthesis - High-level languages - Design tools

UNIT IV ARCHITECTURES **9**

Hybrid architectures- Communication - HW/SW partitioning - Soft-core microprocessors-System Architectures -System design strategies - System services - Small-scale architectures -HPC architectures - HPEC architectures - System synthesis - Architectural design space explorations

UNIT V CASE STUDY **9**

Case Studies- Signal and image processing - Bioinformatics - Security - Special Topics - Partial Reconfiguration - Numerical Analysis -Performance Analysis/Prediction – Fault Tolerance

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Analysis of Xilinx Vertex FPGAs. (Virtex-4, Virtex-5). Difference between the homogeneous FPGA and Heterogeneous FPGAs.

TOTAL: 45

REFERENCES

1. C. Maxfield, “The Design Warrior's Guide to FPGAs: Devices, Tools and flows”, Newnes, 2004.
2. M. Gokhale and P. Graham, “Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays”, Springer, 2005.
3. C. Bobda, “Introduction to Reconfigurable Computing: Architectures, Algorithms and Applications”, Springer, 2007.
4. P. Lysaght and W. Rosenstiel, “New Algorithms, Architectures and Applications for Reconfigurable Computing”, Springer, 2005.
5. D. Pellerin and S. Thibault, “Practical FPGA Programming in C”, Prentice-Hall, 2005.
6. W. Wolf, “FPGA Based System Design”, Prentice-Hall, 2004.
7. R. Cofer and B. Harding, “Rapid System Prototyping with FPGAs: Accelerating the Design Process”, Newnes, 2005.

13EC055 HARDWARE-SOFTWARE CO-DESIGN 3 0 0 3

OBJECTIVES

- To learn the prototyping and emulation
- To study the compilation techniques and software tools for embedded systems

OUTCOMES

At the end of the course the student should be able to

- Design an embedded product
- Gain an knowledge in software tool required for embedded system design

UNIT I CO-DESIGN ISSUES **9**

Co-design Models, Architectures, Languages, A Generic Co-design Methodology Hardware software synthesis algorithms: hardware –software partitioning distributed system co-synthesis.

UNIT II PROTOTYPING AND EMULATION **9**

Prototyping and emulation techniques, prototyping and emulation Environ ments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure
Target Architectures:Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT III COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR ARCHITECTURES **9**

Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment.

UNIT IV DESIGN SPECIFICATION AND VERIFICATION **9**

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.

UNIT V LANGUAGES FOR SYSTEM –LEVEL SPECIFICATION AND DESIGN-I &II **9**

System level specification, design representation for system level synthesis, system level specification languages,Heterogeneous specifications and multi language co simulation the cosyma system and lycos system

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Coding in keil C software. Simple mini projects in embedded system

TOTAL: 45

TEXT BOOKS

1. Hardware / software co-design Principles and Practice Jorgen Staunstrup, Wayne Wolf 2009, Springer.
2. Hardware / software co-design Principles and Practice, 2002, Kluwer academic publishers

MANAGEMENT SCIENCES

13GE001 INTELLECTUAL PROPERTY RIGHTS **3 0 0 3**

(Vide Mechanical Engineering)

13GE003 INDIAN CONSTITUTION AND SOCIETY **3 0 0 3**

OBJECTIVES

- To know about the Indian constitution and its policies.
- To know about the state and central government structures and its functions.
- To know about the Indian Federal system.

OUTCOMES

At the end of the course the student should be able to

- Learning the Constituent Assembly of India
- Can be able to demonstrate functions of union government and state government

UNIT I INDIAN CONSTITUTION **9**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II UNION GOVERNMENT **9**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STATE GOVERNMENT **9**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV INDIAN FEDERAL SYSTEM **9**

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India

UNIT V SOCIETY **9**

Society : Nature, Meaning and definition; Indian Social Structure; Castle, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Case studies- political issues to people, message to the society

TOTAL: 45

TEXT BOOKS

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.2001.
2. R.C.Agarwal, "Indian Political System ", S.Chand and Company, New Delhi. 1997
3. Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.1962
4. K.L.Sharma, " Social Stratification in India: Issues and Themes ", Jawaharlal Nehru University, New Delhi.1997

REFERENCES

1. Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New delhi2005.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.2002
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.1998
4. Yogendra Singh, "(1997) Social Stratification and Charge in India ", Manohar, New Delhi.

WEBSITES

1. www.shvoong.com
2. www.globalshiksha.com
3. www.unesco.org

13MA006 OPERATIONS RESEARCH 3 0 0 3

OBJECTIVES

- To understand the concepts of Operations Research (OR) concerning with the efficient allocation of scarce resources.
- To learn the art that lies in the ability to reflect the concepts (efficient and scarce) in a well-defined mathematical model of a given situation.
- To understand the science consists in the derivation of computational methods for solving models.

OUTCOMES

At the end of the course the student should be able to

- Analyze the functional concept of operational research
- Use the basics of modelling
- Analyze and demonstrate critical paths and control

UNIT I INTRODUCTION **9**

Basic concepts and scope of OR – Phases of OR. Linear programming (LP) :Formulation of LP Problems – Limitations of LP – Solutions to LPP – Graphical Solution –Standard LP form and its Basic solutions – The simplex algorithm – Artificial Variable Technique – Big M method, Two phase method – Variants of the Simplex Method – Degeneracy, unbounded solution, infeasible solution – Application for business and Industrial problems.

UNIT II TRANSPORTATION MODEL **9**

Mathematical formulation of the problem – Methods for finding an initial solution – North West corner method, Least cost method, Vogel's approximation method (VAM) – Test for optimality – Variants of the Transportation Problem.

Assignment model:Mathematical Formulation of the problem – Solution of an Assignment Problem – Hungarian Algorithm –Variants of the Assignment problem – Traveling Salesman Problem.

UNIT III INTEGER LINEAR PROGRAMMING **9**

Types- Concept of a Cutting Plane – Gomary's cutting plane method – Branch and bound method. Dynamic programming:Concepts – Terminology – Bellman's Principle of optimality – Application in Network, Allocation and Inventory.

UNIT IV PROJECT MANAGEMENT: PERT AND CPM **9**

Concept of Network – PERT, CPM - Construction of Network – Critical path analysis – Probability in PERT analysis. project evaluation and review technique- resource analysis in network scheduling.

UNIT V INVENTORY CONTROL **9**

Deterministic model – Costs – Decision variables – EOQ – Instantaneous receipt of goods with and without shortages – Non-instantaneous receipt of goods without shortages - Price breaks – Probabilistic inventory model – Single period without setup cost – Inventory systems- Lead time – Safety stock – ROL,ROP determination.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Implementation of various searching algorithms, defining cost functions, heuristic approach for random search algorithm

TOTAL: 45

TEXT BOOKS

1. Sharma.J.K., "Operations Research : Theory and applications", Macmillan India Ltd., Reprint,2009.
2. Hamdy A.Taha, "Operations Research – An Introduction", Seventh Edition,, Prentice Hall of India Pvt Ltd., 2007.

REFERENCES

1. Don. T. Philips, Ravindran, A and James Solnerg, "Operations Research: Principles and Practice", John Wiley and Sons, 2007
2. Bobby Srinivasan and Sandblom. C.L, "Quantitative Analysis for Business Decisions", McGraw Hill Book Co, 2010
3. Chanrasekara Rao, K, Shanti Lata Misra, "Operations Research", Alpha Science International.,2005.

SIGNAL AND IMAGE PROCESSING

13EC071 ADVANCED DIGITAL SIGNAL PROCESSING 3 0 0 3

OBJECTIVES

- To study the parametric methods for power spectrum estimation.
- To study the concept of adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To learn the concept of multirate signal processing fundamentals.
- To study the concept of analysis of speech signals.
- To understand about the wavelet transforms.

OUTCOMES

At the end of the course the student should be able to

- Solve with Fourier Transforms and its applications
- Analyze and design the Various Filters
- Use the basics of correlation and power spectrum estimation
- Analyze and able to classify speech signals based on multi resolution techni

UNIT I PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION **9**

Relationship between the auto correlation and the model parameters – The Yule – Walker method for the AR Model Parameters – The Burg Method for the AR Model parameters – unconstrained least-squares method for the AR Model parameters – sequential estimation methods for the AR Model parameters – selection of AR Model order.

UNIT II ADAPTIVE SIGNAL PROCESSING **9**

FIR adaptive filters – steepest descent adaptive filter – LMS algorithm – convergence of LMS algorithms – Application: noise cancellation – channel equalization – adaptive recursive filters – recursive least squares.

UNIT III MULTIRATE SIGNAL PROCESSING **9**

Decimation by a factor D – Interpolation by a factor I – Filter Design and implementation for sampling rate conversion: Direct form FIR filter structures – Polyphase filter structure.

UNIT IV SPEECH SIGNAL PROCESSING **9**

Digital models for speech signal : Mechanism of speech production – model for vocal tract, radiation and excitation – complete model – time domain processing of speech signal:- Pitch period estimation – using autocorrelation function – Linear predictive Coding: Basic Principles – autocorrelation method – Durbin recursive solution.

UNIT V WAVELET TRANSFORMS **9**

Fourier Transform : Its power and Limitations – Short Time Fourier Transform – The Gabor Transform - Discrete Time Fourier Transform and filter banks – Continuous Wavelet Transform – Wavelet Transform Ideal Case – Perfect Reconstruction Filter Banks and wavelets – Recursive multi-resolution decomposition – Haar Wavelet – Daubechies Wavelet.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Audio signal processing, audio compression, digital image processing, video compression, speech processing, speech recognition, digital communications, radar, sonar, seismology and biomedicine

TOTAL: 45

TEXT BOOKS

1. John G.Proakis, Dimitris G.Manobakis, Digital Signal Processing, Principles, Algorithms and Applications, Third edition, (2009) PHI.
2. Monson H.Hayes – Statistical Digital Signal Processing and Modeling, Wiley, 2008.

REFERENCES

1. L.R.Rabiner and R.W.Schaber, Digital Processing of Speech Signals, Pearson Education (1979).
2. Roberto Crist, Modern Digital Signal Processing, Thomson Brooks/Cole (2004).
3. Raghuveer. M. Rao, Ajit S.Bopardikar, Wavelet Transforms, Introduction to Theory and applications, Pearson Education, Asia, 2000.

WEBSITES

1. www.springer.com/engineering/signals
2. www.wiley.com
3. www.onesmartclick.com
4. www.dspguide.com

13EC072 SPEECH PROCESSING 3 0 0 3

OBJECTIVES

- To introduce the models for speech production.
- To develop time and frequency domain techniques for estimating speech parameters.
- To introduce a predictive technique for speech compression.
- To understand speech recognition, synthesis and speaker identification.

OUTCOMES

At the end of the course the student should be able to

- Analyze the basics of speech signal, speech production mechanisms
- Design and use time domain and frequency domain analysis of speech signal
- Analyze the applications of speech signal processing

UNIT I NATURE OF SPEECH SIGNAL 9

Speech production mechanism, Classification of speech, sounds, nature of speech signal, models of speech production. Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

UNIT III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch extraction, Analysis - synthesis systems.

UNIT IV LINEAR PREDICTIVE CODING OF SPEECH 9

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains.

UNIT V HOMOMORPHIC SPEECH ANALYSIS 9

Central analysis of speech, format and pitch estimation, Applications of speech processing - Speech recognition, Speech synthesis and speaker verification.

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Algorithms: spectral estimation, dynamic time warping – hidden markov model – music analysis – pitch Detection – feature analysis for recognition – music synthesis – automatic speech recognition – feature Extraction for asr – deterministic sequence recognition – statistical sequence recognition – asr systems – speaker identification and verification – voice response system – speech synthesis: text to speech – voice Over ip.

TOTAL: 45

TEXT BOOKS

1. L.R.Rabiner and R.E Schafer:Digital processing of speech signals, Prentice Hall, 2009.
2. J.L Flanagan : Speech Analysis Synthesis and Perception - 2nd Edition - Sprenger Vertag, 1972.

REFERENCE

1. I.H.Witten : Principles of Computer Speech , Academic press, 1983.

WEBSITES

1. nist.gov/itl/iad/mig/
2. www.digitalspeech.com

13EC073 DIGITAL IMAGE PROCESSING 3 0 0 3

OBJECTIVES

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement and image restoration techniques.
- To study the image segmentation and representation techniques.
- To study the image compression procedures.

OUTCOMES

At the end of the course the student should be able to

- Analyze and calculate Image Transforms
- Use enhancement and restoration techniques into noisy images
- Analyze various compression techniques and understand how it is implemented in real time

UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS 9

Elements of visual perception –Image sensing and Acquisition- Image sampling and quantization- Basic relationship between pixels – Basic geometric transformations- 2D DFT – FFT –Walsh – Hadamard – DCT-DST-Haar-Slant – KL transforms-SVD-Introduction to wavelet transform

UNIT II IMAGE ENHANCEMENT TECHNIQUES 9

Spatial Domain methods: Basic intensity transformation – Histogram equalization and matching–Spatial filtering: Smoothing- Sharpening filters -Frequency domain filters: Smoothing – Sharpening filters – Homomorphic filtering- Color models:RGB,CMYK,HSI

UNIT III IMAGE RESTORATION 9

Model of Image Degradation/restoration process – Noise models – Estimating degradation function-Inverse filtering - Weiner filtering – Constrained least squares filtering –Geometric mean filter

UNIT IV IMAGE COMPRESSION 9

Lossless compression: Huffman coding- Arithmetic coding- LZW coding – Bit plane coding- Predictive coding.Lossy Compression: Transform coding– Basics of Image compression standards: JPEG, MPEG.

UNIT V APPLICATIONS & TOOLS IN IMAGE PROCESSING 9

Digital image watermarking , Image processing toolbox in MATLAB

UNIT VI STATE OF THE ART/ADVANCES (NOT FOR EXAMINATION)

Storage requirements for multimedia applications, Wavelets and Multi Resolution Processing

TOTAL: 45

TEXT BOOKS

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education 2009
2. S.Jayaraman, S.Esakkirajan,T.Veerakumar, Digital Image Processing, Tata McGraw Hill,2010

REFERENCES

1. William K Pratt, Digital Image Processing John Willey 2007.
2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learning ,2008
3. A.K. Jain, PHI, New Delhi 1995-Fundamentals of Digital Image Processing.