B.E. Electronics and Communication Engineering

THIRD TO EIGHTH SEMESTER SYLLABUS

(For the students admitted from 2009-2010 and subsequently)

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University and Accredited by NBA)

COIMBATORE – 641 014.

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B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

SUBJECTS OF STUDY

III Semester

Subject Code	Subject	L	T	P	C
09EC31	Mathematics III	3	1	0	4
09EC32	Electrical Engineering	3	1	0	4
09EC33	Electron Devices and Circuits	3	0	0	3
09EC34	Measurements and Instrumentation	3	0	0	3
09EC35	Digital Circuit Design	3	1	0	4
09EC36	Networks and Transmission Lines	3	1	0	4
	PRACTICALS				
09EC47	Electronic Circuits Design Laboratory	0	0	3	-
09EC48	Electrical Engineering and Measurements Laboratory	0	0	3	-
09EC49	Science of Creativity and Professional Ethics	2	-	-	-
	Total Credits				**22**

IV Semester

Subject Code	Subject	L	T	P	C
09EC41	Mathematics IV	3	1	0	4
09EC42	Analog Electronics	3	0	0	3
09EC43	Principles of Communication	3	1	0	4
09EC44	Signals and Systems	3	1	0	4
09EC45	Control Systems	3	1	0	4
09EC46	Principles of Environmental Science and Engineering	3	0	0	3
	PRACTICALS				
09EC47	Electronic Circuits Design Laboratory	0	0	3	4
09EC48	Electrical Engineering and Measurements Laboratory	0	0	3	4
09EC49	Science of Creativity and Professional Ethics	2	-	-	2
	Total Credits				**32**

V Semester

Subject Code	Subject	L	T	P	C
09EC51	Linear Integrated Circuits	3	0	0	3
09EC52	Digital Communication	3	1	0	4
09EC53	Microprocessors	3	1	0	4
09EC54	Digital Signal Processing	3	1	0	4
09EC55	Object Oriented Programming in C++ and Data Structures	3	1	0	4
09EC56	Electromagnetic Fields and Waveguides	3	1	0	4
	PRACTICALS				
09EC67	Linear and Digital Integrated Circuits Laboratory	0	0	3	-
09EC68	Microprocessors and Microcontrollers Laboratory	0	0	3	-
09EC69	Mini Project	0	0	3	**-**
	Total Credits				**23**

APPLICATIONS

MIME - Peer-to-peer computing - Shared application - Video conferencing - Centralized and distributed conference control - Distributed virtual reality - Light weight session philosophy. **(9)**

Total : 45

REFERENCE BOOKS

1. Jon Crowcroft, Mark Handley, Ian Wakeman, “Internetworking Multimedia”, Harcourt Asia Pvt.Ltd.Singapore, 1998.
2. Szuprowicz B.O., “Multimedia Networking”, McGraw Hill, NewYork, 1995.
3. Tay Vaughan,Multimedia Making it to Work, 4th Edition, Tata McGrawHill, New Delhi, 2000.
4. Ellen Kayata Wesel, Ellen Khayata, “Wireless Multimedia Communication: Networking Video, Voice and Data”, Addison Wesley Longman Publication, USA, 1998.

09ECE24 - INTERNET WORKING MULTIMEDIA

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the various aspects of fundamentals, subnetwork technology, multicast and transport protocol and applications in Multimedia.

EXPECTED OUTCOME

On completion of this course, the student will understand the fundamentals, subnetwork technology, multicast and transport protocol and applications in Multimedia.

INTRODUCTION

Digital sound - Video and Graphics - Basic Multimedia Networking - Multimedia Characteristics - Evolution of internet services model - Network requirements for audio/video transform - Multimedia coding and compression for text, image, audio and video - Multimedia communication in wireless network. **(9)**

SUBNETWORK TECHNOLOGY

Broadband services - ATM and IP - IPV6 - High speed switching - Resource reservation- Buffer management - Traffic shaping , Caching, Scheduling and policing, throughput, delay and jitter performance. **(9)**

MULTICAST AND TRANSPORT PROTOCOL

Multicast over shared media network - Multicast routing and addressing - Scaping multicast and NBMA networks - Reliable transport protocols - TCP adaptation algorithm- RTP - RTCP. **(9)**

MEDIA - ON – DEMAND

Storage and media servers - Voice and video over IP- MPEG-2 over ATM/ IP - Indexing synchronization of requests - Recording and remote control. **(9)**

VI Semester

Subject Code	Subject	L	T	P	C
09EC61	Data and Voice Communication Networks	3	0	0	3
09EC62	Embedded Systems	3	0	0	3
09EC63	VLSI Design	3	0	0	3
09EC64	Microwave Engineering	3	0	0	3
09EC65	Antennas and Wave Propagation	3	0	0	3
09EC66	Information Theory and Coding	3	1	0	4
	PRACTICALS				
09EC67	Linear and Digital Integrated Circuits Laboratory	0	0	3	4
09EC68	Microprocessors and Microcontrollers Laboratory	0	0	3	4
09EC69	Mini Project	0	0	3	2
	Total Credits				**29**

VII Semester

Subject Code	Subject	L	T	P	C
09EC71	RF Systems	3	0	0	3
09EC72	Wireless Communication	3	0	0	3
09EC73	Audio and Video Systems	3	0	0	3
09EC74	Elective I	3	0	0	3
09EC75	Elective II	3	0	0	3
	PRACTICALS				
09EC86	Communication and Digital Signal Processing Laboratory	0	0	3	-
09EC87	RF, Fiber Optics and Networking Laboratory	0	0	3	-
09EC88	Project	0	0	6	-
	Total Credits				**15**

VIII Semester

Subject Code	Subject	L	T	P	C
09EC81	Industrial Economics and Corporate Management	3	0	0	3
09EC82	Optical Communication and Networks	3	0	0	3
09EC83	Digital Image Processing	3	1	0	4
09EC84	Elective III	3	0	0	3
09EC85	Elective IV	3	0	0	3
	PRACTICALS				
09EC86	Communication and Digital Signal Processing Laboratory	0	0	3	4
09EC87	RF, Fiber Optics and Networking Laboratory	0	0	3	4
09EC88	Project	0	0	6	6
	Total Credits				**30**

PETRI NET MODELS

Finite State Automata - Petri nets - Stochastic Petri nets - Stochastic Reward nets - Coloured Petri nets.

Term Paper: Case study using the above modeling techniques. **(8)**

Total : 45

TEXT BOOKS

1. Geoffrey Gordon, "System Simulation", Prentice Hall of India, Second Edition, 2009.
2. Trivedi. K.S., "Probability and Statistics with Reliability Queueing and Computer Science Applications", Second Edition, John Wiley and Sons, NewYork, 2001.

REFERENCE BOOKS

1. Gotrifed B. S., "Elements of Stochastic Process Simulation", Prentice Hall of India, 1984.
2. J. S. Arson, J. C. Banks and B. L. Nelson, "Discrete Event System Simulation", Prentice Hall of India, 1996.
3. M. Ajmone Marsan, D.Kartson, G.Conte and S.Donatelli, "Modelling with Generalized Stochastic Petri nets", Wiley, New York, 1995.
4. Donald Gross, Shortle J.F., Thompson J.M., Harris C.M., "Fundamentals of Queueing Theory" John Wiley, Forth Edition, 2009.

09ECE23 MODELING AND SIMULATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamental modeling techniques, probability concepts and Petri-net modeling tool.

EXPECTED OUTCOME

On completion of the course, the student will have knowledge on the fundamental modeling techniques, probability concepts and Petri-net modeling tool.

SYSTEM AND SYSTEM ENVIRONMENT

Concept of system - Continuous and Discrete systems - Models of a system - Modeling approaches - Advantages and Disadvantages of simulation systems - System dynamics - Analysis of simulation output. **(6)**

PROBABILITY CONCEPTS IN SIMULATION

Random number generation - Mid square-mid product method - Constant multiplier method -Additive congruential method - Linear congruential method - Test for random numbers - Chi square test - the Kolmogrov - Srimov test - Runs test-Gaps test-Random variable generation-Distributions - exponential, Poisson, Uniform, Weibull - Empirical distribution - Normal distribution - building on empirical distribution - rejection method. **(12)**

STATE SPACE BASED MODELS

Markovian - Non Markovian models - Discrete and Continuous time Markov Chains - Markov reward models - Semi Markov models - Markov regenerative models. **(10)**

NON STATE SPACE METHODS

Performance models - Queueing models - Task precedence graphs - Dependability models-Reliability graphs - Fault trees. **(9)**

LIST OF ELECTIVES

Code No.	Subject	L	T	P	C
09ECE01	VLSI Signal Processing	3	0	0	3
09ECE02	Resource Management Techniques	3	0	0	3
09ECE03	Virtual Instrumentation	3	0	0	3
09ECE04	Speech Signal Processing	3	0	0	3
09ECE05	Advanced Embedded System Design	3	0	0	3
09ECE06	Nano Science and Technology	3	0	0	3
09ECE07	Advanced Digital Signal Processing	3	0	0	3
09ECE08	Multimedia Compression Techniques	3	0	0	3
09ECE09	Advanced Java Technology	3	0	0	3
09ECE10	Medical Electronics and Instrumentation	3	0	0	3
09ECE11	Advanced Medical Instrumentation	3	0	0	3
09ECE12	Wavelet Transforms and Applications	3	0	0	3
09ECE13	Advanced Microprocessors	3	0	0	3
09ECE14	DSP Based System Design	3	0	0	3
09ECE15	Soft Computing	3	0	0	3
09ECE16	Wireless Sensor Networks	3	0	0	3
09ECE17	Mobile Computing	3	0	0	3
09ECE18	Electromagnetic Compatibility	3	0	0	3
09ECE19	Robotics and Machine Vision	3	0	0	3
09ECE20	Computer Graphics	3	0	0	3
09ECE21	Satellite Communication	3	0	0	3
09ECE22	Radar and Navigational Aids	3	0	0	3
09ECE23	Modelling and Simulation	3	0	0	3
09ECE24	Internet working Multimedia	3	0	0	3

L - Lecture T - Tutorial

P - Practical C - Credit

3. Nathansan, “Radar Design Principles-Signal Processing and Environment”, PHI, Second Edition, 2007.

4. Hofmann-Wellenhof, Hlichlinegger and Collins J., “GPS Theory and Practice”, Fifth Edition, Springer International Edition, 2007

5. Roger J.Sullivan, “Radar Foundations for Imaging and Advanced Concepts”, PHI, 2004.

6. Paul D. Groves, “Principles of GNSS, Inertial, and Multisensor Integrated Navigation Systems”, GNSS Technology and Applications Series, Arctech House, First Edition, 2008.

SATELLITE RADIO NAVIGATION

General principles - Ranging equations - Orbital mechanics and clock characteristics - Principles of GPS - NAVSTAR GPS - GPS measurements and Navigation solution - Basic receiver block diagram - Concepts of differential. **(9)**

TERRESTRIAL RADIO NAVIGATION SYSTEMS

General principles - System Design considerations - Point Source systems - Direction Finders -Non-Direction Beacons - Marker Beacon - Distance Measurement equipment. **(8)**

INERTIAL NAVIGATION SYSTEMS

Introduction - Basic block diagram - Instruments - Accelerometer - Gyroscopes: Optical, and Mechanical.

Landing Systems: Mechanics of landing - Automatic Landing systems: Instrument, Microwave, Satellite and Carrier based landing systems.**(9)**

Total : 45

TEXT BOOKS

1. Skolnik M.I.,"Introduction to Radar Systems", Tata McGraw Hill, Third Edition, 2003.
2. Myron Kyton and W.R.Fried "Avionics Navigation Systems" John Wiley & Sons 1997.

REFERENCE BOOKS

1. Albert Helfrick. D, "Principles of Avionics", Avionics Communications Inc., 2004.
2. Nagaraja " Elements of Electronic Navigation", Tata McGraw Hill, Second Edition, 2000

09EC31 - MATHEMATICS- III

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

The objective is to incorporate the ideas of complex variables, partial differential equations and its applications and Fourier transforms that are imperative for effective understanding of Engineering subjects. The topics introduced will serve as basic tools for specialized studies in many Engineering fields.

EXPECTED OUTCOME

The students will have in depth knowledge about of complex variables, partial differential equations and its applications and Fourier transforms.

COMPLEX DIFFERENTIATION

Analytic functions – Definitions and properties – Cauchy Riemann equations in Cartesian and polar coordinates - Construction of analytic functions – Conformal mappings –Bilinear Transformation - The mappings of the form w= z+a, az, 1/z, z^2, e^z, sinz, cosz, -Simple problems. **(9)**

COMPLEX INTEGRATION

Cauchy's integral theorem - Integral formula - Taylor's and Laurent's series (without proof) - Types of singularities, Poles and residues - Cauchy's residue theorem –Applications - Contour integration using circular and semicircular contours. **(9)**

PARTIAL DIFFERENTIAL EQUATIONS

Formation by elimination of arbitrary constants and functions – Solution by direct method - Solution of first order non-linear PDE - Standard types - Lagrange linear equation -Linear higher order homogeneous PDE with constant coefficients. **(9)**

FOURIER TRANSFORMS

Fourier integral theorem (without proof) - Infinite Fourier transform - Infinite Fourier sine and cosine transforms - Properties and problems - Convolution theorem - Parseval's identity - Finite Fourier sine and cosine Transforms - Properties and Problems. **(9)**

BOUNDARY VALUE PROBLEMS

Vibration of strings - One dimensional wave equations, one dimensional heat flow - unsteady state and steady state - Two dimensional heat flow steady state in Cartesian coordinates - Separation of variables - Fourier series solution. **(9)**

Theory : 45
Tutorial : 15
Total : 60

TEXT BOOKS

1. Kandasamy, P.et al., "Engineering Mathematics", Volume – II & III S.Chand & Co., 2004.
2. Veerarajan .T, "Engineering Mathematics", (for Semester III), (Third Edition (Fifth Reprint) Tata .Mc Graw – Hill Publishing Company Ltd, 2008.
3. Venkataraman.M.K, "Engineering Mathematics III", (for B.E., Third Semester), (Revised and Enlarged Fourteenth Edition) The National Publishing Company, 2008.
4. Venkataraman.M.K, "Engineering Mathematics III-A", Eleventh Edition. The National Publishing Company, 2008.

REFERENCE BOOKS

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, John Wiley & Sons (Asia) Private Limited., 2008.
2. Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers, Fortith Edition, 2007.

09ECE22 RADAR AND NAVIGATIONAL AIDS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVES

To study the fundamental principles of radar, types of radar, and its operational principles and issues. This course will also introduce the student to various navigational systems including Satellite, Terrestrial and Inertial Navigation systems.

EXPECTED OUTCOME

On completion of this course, the student will be knowledgeable on the fundamentals of various radars and on various navigation techniques and equipments.

RADAR SYSTEMS

Basic Radar - Radar parameters - Block diagram - Radar frequencies - Derivation of simple range equation - Radar cross section - Effect of Pulse repetition frequency - Doppler effect - Pulsed radar - CW radar - MTI and Pulsed Doppler radar - Block diagrams and principles of working - Delay line cancellers and filters - Staggered prfs - Doppler filter banks -Digital MTI processing - Range gates and filters used in MTI - Comparison of radar systems. **(10)**

TRACKING RADARS

Basic principles of tracking in angle - sequential lobe switching - Conical scanning - Monopulse tracking methods: Amplitude comparison and phase comparison - Limitations to tracking accuracy - methods to reduce errors in accuracy -Low angle tracking - Tracking in range - Tracking in Doppler - Comparison of various types of tracking radars. **(9)**

- TDM standards for satellite systems - Error control for satellite link: Requirements, ARQ, Concatenated Codes, Interleaving, Turbo codes. **(10)**

MULTIPLE ACCESS FOR SATELLITE COMMUNICATIONS

FDM-FM-FDMA – TDMA - Structure and system design, Onboard Processing systems - DAMA and PAMA - CDMA system design and capacity. **(9)**

APPLICATIONS

Remote sensing - Navigation - Scientific and military application - VSAT: Network architecture, Access Control protocols and techniques, VSAT Earth stations - Satellite Mobile Telephony - Global star - DBS/DTH Television - GPS - Weather satellites - Maritime satellites. **(8)**

Total : 45

TEXT BOOKS

1. T.Pratt, C. Bostian and J.Allnutt; "Satellite Communications", John Wiley and Sons, Second Edition., 2003.
2. Dennis Roddy, "Satellite Communications", Mc Graw Hill, Fourth Edition, 2006**.**
3. Richharia M., "Satellite Communication Systems: Design Principles", McGraw-Hill Professional, Second Edition, 1999.

REFERENCE BOOKS

1. Pritchard W.L., H G Suyderhoud and R A Nelson, "Satellite Communication System Engineering", Second Edition, Prentice Hall, 1993.
2. Tri. T. Ha, "Digital Satellite Communications", McGraw Hill, Second Edition, 1990.
3. Agarwal B.N., "Design of Geosynchronous Space Craft", Prentice Hall, 1986.

09EC32 - ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To expose the students to the concepts of principle of operation and construction of DC and AC machines. To study the applications of electric drives. To acquire knowledge in power electronics.

EXPECTED OUTCOME

At the end of the course, the learner can understand the construction and operation of DC motor, DC generator, transformer, induction machines, synchronous machines and special motors. Also acquires knowledge about electric drives and their applications with preliminary concepts of Power Electronics.

DC MACHINES

DC Generator: Constructional details - Principles of operation - EMF equation - Types – Characteristics – Losses and efficiency – Applications.

DC Motor: Principles of operation - Torque equation – Characteristics – Speed Control – Applications. **(9)**

TRANSFORMERS

Construction - Principles of operation - EMF equation - Types – Single Phase Transformer under no-load and loaded condition – Equivalent circuit - OC and SC test – Regulation – Efficiency – Auto Transformer. **(9)**

INDUCTION MACHINES

Three phase induction motor - Construction – Types - Principle of operation - Torque slip characteristics – Speed control - Starting - Applications. Single phase induction motor- Capacitor start - Capacitor start and run – Universal motor. **(9)**

SYNCHRONOUS MACHINES AND SPECIAL MOTORS

Synchronous machines: Alternator – Construction - EMF equation - Regulation Synchronous motor - Principle of operation - Starting - Applications.

Special motors: DC and AC servomotors - Stepper motor - Permanent magnet motors - Printed circuit motors- Hysteresis motors. **(9)**

ELECTRIC DRIVES AND SPEED CONTROL

Concept of electric drives - Classification - Selection and rating of motors selection of motors for industrial, agricultural and marine applications Electronic methods of speed control - DC motors - Induction motors - Three phase and single phase. **(9)**

Theory : 45
Tutorial : 15
Total : 60

TEXT BOOKS

1. Edward Hughes, “Electrical Technology” ELBS Edition, 2002.
2. Pillai.S. K “A First Sourse in Electric Drives” Willey Eastern Ltd, Second Edition, 2002.

REFERENCE BOOKS

1. Kothari D. P., “Basic Electrical Engineering”, Tata McGraw Hill, 2004.
2. Ashfaq Husain “Electrical Machines”, Dhanpat Rai & Co, New Delhi, 2004.
3. Mehta V. K., “Principles of Electrical Engineering and Electronics”, S. Chand&Co Ltd, New Delhi, 2005.

09ECE21 - SATELLITE COMMUNICATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamental concepts of Satellite, its orbits, satellite launch methods, operating principles of various electrical and electronic systems in satellite & Earth stations including the Tracking and Control systems, Satellite link parameters, concepts of link design, access techniques, and applications of satellites.

EXPECTED OUTCOME

On completion of this course, the student will have a thorough knowledge on the fundamental concepts of Satellite, its orbits, satellite launch methods, operating principles of various electrical and electronic systems in satellite & Earth stations including the Tracking and Control systems, Satellite link parameters, concepts of link design, access techniques, and applications of satellites.

SATELLITE ORBITS AND TRAJECTORIES

Orbital Mechanics : Orbit Equations, Kepler’s Laws, Orbital Period, Orbit types - Look angle determination - Orbital effects on communication system performance - Satellite Launch. **(8)**

SATELLITE AND EARTH STATION SUBSYSTEMS

Satellite Subsystems: Power, Transponders, Antennas - AOCS, TTC&M - Control - Effects of earth - Perturbation, sun transit, moon transit - Satellite power design, Reliability - MTBF Basic Equations - System Noise and G/T ratio - Earth Station subsystems Uplink, Downlink and Design for a specified C/N ratio with GEO and LEO examples - Atmospheric and Rain effects on link performance. **(10)**

LINK DESIGN, MODULATION AND ERROR CONTROL

Single link design - Double link design aspects - PAM, Baseband processing - Digital Modulation for satellite links: BPSK,QPSK and QAM

2. William Newman & Robert Sproull, “Principles of Interactive Computer Graphics”, McGraw Hill, 1986.

3. Amarendra.N.Sinha and Arun .D.Udai, “ Computer Graphics”, Tata McGraw Hill, 2008.

09EC33 - ELECTRON DEVICES AND CIRCUITS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To equip the students with the knowledge about construction, principles, operation, and applications of various electronic devices.

EXPECTED OUTCOME :

On completion of this course the student will have in depth knowledge about the operation and switching characteristics and other applications of various electronic devices.

SEMICONDUCTOR DIODE THEORY

Semiconductor Diode - Ideal Diode - Semiconductor materials - Energy levels - Extrinsic and Intrinsic materials - n-type and p-type - Semiconductor diodes - Resistance Levels - Equivalent Circuits - Terminal characteristics and parameters of junction diodes - Load line analysis - Diode Approximations - Diode testing - Diode specifications - Transition and Diffusion Capacitances - Switching times of diode - Breakdown mechanism of Diodes - Zener Diodes - Operation in the Reverse breakdown region - Specifications of Zener Diode - Equivalent Circuits. **(9)**

BJT THEORY AND BIASING

Simplified Structure and Modes of Operation - Operation of NPN Transistor in the Active mode - Ebers-moll Model - PNP transistor - Current Voltage characteristics -Early effect - DC load line and Biasing point - Operating Point - Fixed Bias - Emitter Bias - Voltage Divider Bias Circuits - Comparison of Basic Bias circuits - Bias circuit Design - Bias Stabilization. **(9)**

FET THEORY AND BIASING

Device Structure - Operation with Zero gate Voltage - P-Channel MOSFET - N-Channel MOSFET - CMOS - VMOS - Operating the MOS Transistor

in the Sub threshold region - Current Voltage characteristics - FET DC load line and Biasing point - Gate Bias, Self Bias, Voltage Divider Bias Configurations - Comparison of Basic Bias circuits - Bias Circuit Design - Depletion Type MOSFET - Enhancement Type MOSFET - Universal JFET Bias Curve. **(9)**

OTHER ELECTRONIC DEVICES

Schottky, Varactor, Power, Tunnel and Photo Diodes - Photoconductive Cells - Solar Cells - Photo Transistors - Opto-Isolators - Light Emitting Diodes - OLED - IR Emitters - Liquid Crystal Displays - Thermistors - SCR: Operation, Characteristics and Applications - DIAC - TRIAC - UJT - Shockley Diode - Variable Voltage Capacitor. **(9)**

APPLICATIONS OF SEMICONDUCTOR DEVICES

Applications of Diode: Rectifier Circuits Half Wave, Full wave and Bridge Rectifier with Capacitor, Inductor Filter - L and Pi Section Filter - Clippers - Clampers - Limiting Circuits - Voltage Multipliers - Zener diode Voltage regulator.

Applications of Special Semiconductor Devices: SCR, VVC, UJT - Transistor switching circuits. **(9)**

Total : 45

TEXT BOOKS

1. Sedra and Smith, “Microelectronic Circuits”, Oxford University Press, Fifth Edition, 2004.
2. David A. Bell, “Electronic Devices and Circuits”, Prentice Hall of India, Forth Edition, 2007.

REFERENCE BOOKS

1. Robert L. Boylestead and Louis Nasheresky, “Electron Devices and Circuits: Theory and Practice”, Prentice Hall of India, Eighth Edition, 2002.

THREE DIMENSIONAL DISPLAY METHODS AND TRANSFORMATION

Three dimensional display methods - Three dimensional object representations: Polygon surfaces, Curved lines and surfaces, Spline representation, Bezier curves and surfaces - Three dimensional transformation: Translation, rotation, scaling, other transformation, Composite transformation. **(8)**

VISIBLE SURFACE DETECTION METHODS AND SURFACE RENDERING METHODS

Visible surface detection algorithm: Classification of visible surface detection algorithms, Back-face detection, Depth-Buffer method, A-Buffer method, Scan-line method - Illumination model and Surface-Rendering methods: Basic illumination model, Polygon-Rendering methods. **(9)**

COLOR MODELS AND COMPUTER ANIMATION

Color Model: Standard primaries and chromaticity diagram - Intuitive color concepts: RGB, YIQ, CMY, HSV, HLS Color models.

Computer Animation: Design of animation sequences - Key-Frame systems morphing - Motion specification. **(9)**

Total : 45

TEXT BOOK

Donald Heam and Pauline Baker, “Computer Graphics”, Prentice Hall of India, Second Edition, 2008.

REFERENCE BOOKS

1. Foley, Vandam, Ferner, Huges, “Computer Graphics: Principles and Practice”, Pearson Education,2003.

09ECE20 - COMPUTER GRAPHICS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the basic principles for the design, use and understanding of computer graphics system.

EXPECTED OUTCOME

On completion of this course, the students will understand the basic principles and techniques of computer graphics which enable them to design graphics system and application programs.

INTRODUCTION

A survey of computer graphics - Video display devices: Refresh cathode ray tubes, Raster scan and random scan display, Direct view storage tubes, Flat panel displays, Three dimensional viewing devices - Graphical input devices: Keyboards, Mouse, Trackball, Joysticks, Data glove, Graphical tablets, Touch panel, Light pen, Voice systems. **(8)**

LINE DRAWING ALGORITHMS & TWO DIMENSIONAL VIEWING

Line drawing algorithms: DDA, Bresenham's line algorithm, Circle, Ellipse generating algorithm - Two dimensional geometrical transformation: Translation, Rotation, Scaling, Matrix representation, Composite Transformation - Other transformations: Reflection, Shear - Two dimensional viewing : Viewing pipeline, Viewing co-ordinate reference frame - Window-to-view port coordinate transformation, Clipping operations - Point clipping - Line clipping: Cohen and Sutherland line clipping - Polygon clipping: Sutherland-Hodgemen polygon clipping, Weiler-Atherton polygon clipping. **(10)**

2. Jimmie J Cathey., "Schaum's Outlines - Electronic Devices and Circuits", McGraw Hill, Second Edition, 2005.
3. Schilling D.L., and Belove C., "Electronics Circuits: Discrete and Integrated", Tata McGraw Hill, Third Edition, 2002.
4. Millman and Halkias.C., "Integrated Electronics", Tata McGraw Hill, First Edition, 2008.
5. Millman J.and Taub H., "Pulse Digital and Switching Waveform", Tata McGraw Hill, Second Edition, 2007.

09EC34 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To equip the students with relevant knowledge about Electronic Instruments and Measurement techniques.

EXPECTED OUTCOME

On completion of this subject, students would have acquired adequate knowledge about the principles of measurements, and operation of important Electronic Instruments.

INTRODUCTION TO MEASUREMENTS AND INSTRUMENTS

Measurement - Instrumentation - Methods of measurements - Modes of Measurements -Functional elements of instruments - Static and Dynamic characteristics of instruments -Errors in Measurements - Statistical analysis of data.

DC and AC Measurements: DC Ammeter - DC Voltmeter - Series and Shunt type Ohm meters - AC Indicating Instruments - Digital Voltmeters - Successive Approximation - Ramp type - Voltage to Frequency converter - Potentiometeric integrating type - Dual Slope integrating type - Digital Multimeter. **(10)**

SENSORS AND TRANSDUCERS

Classification of Transducers - Resistance transducers - Inductance transducers -Capacitance transducers - Piezo electric transducer - Strain gauge - Pneumatic sensors -Light sensors - LVDT - Thermistors - Thermocouples - Pressure sensors - Electronic weighing machines - Ultrasonic detectors - Photo sensitive devices. **(9)**

BRIDGE MEASUREMENTS

Measurement of Low, Medium and High resistances- Wheatstone Bridge, Kelvin Bridge - AC bridges: Hay Bridge, Maxwell Bridge, Desauty bridge,

IMAGE PROCESSING

Human Vision - Digital image **-** Image geometry, sampling and quantization - Gray scale transformations, Look-up tables - Linear gray scale **-** Scaling - Contrast enhancement - Histogram equalization - Local contrast Enhancement - Thresholding - Linear filters - Smoothing filter - Gaussian filter - Edge filters - Sobel - Median filter. **(8)**

APPLICATIONS

Dimensional Checking **-** Simple gauging **-** Angle gauging - Shape checking - Presence verification - Sorting and counting of objects - Application Analysis - Planning - Specification development - Project management. **(9)**

Total : **45**

TEXT BOOKS

1. Deb,"Robotics Technology and Flexible Automation", Tata McGraw-Hill, New Delhi, 2003.
2. Demant. C, Streicher-Abel. B, and Waszkewitz. P, "Industrial Image Processing- Visual QualityControl in Manufacturing", Springer, 1999.

REFERENCE BOOKS

1. Mikell P.Groover, "Automation Production System and Computer Integrated Manufacturing", Prentice Hall of India, New Delhi, 2004.
2. Nello Zuech, "Understanding and Applying Machine Vision", Marcell Dekker Inc, Second Edition, 2000.
3. Bhabatosh Chanda and Dutta Mazumder, "Digital Image Processing and Analysis", Prentice Hall of India, 2002.
4. Ramesh Jain, Rangachar Kasturi, and Brian G. Schunk, "Machine Vision", McGraw Hill International Edition, 1995.

09ECE19 - ROBOTICS AND MACHINE VISION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamentals of Robotics and Machine Vision and their industrial applications.

EXPECTED OUTCOME

On completion of this course, students will be able to understand the fundamentals of Robotics and Machine Vision and their industrial applications.

FUNDAMENTALS OF ROBOTICS

Definition - Anatomy - Specification - Configuration - Drive Systems: Electric, Hydraulic and Pneumatic drives - End effectors - Classifications and gripper force analysis. **(7)**

ROBOT KINEMATICS AND PROGRAMMING

Forward and inverse kinematics of three degrees freedom robots - General and compound mapping - Robot programming: Programming methods, Robot programming using VAL off-line language. **(9)**

IMAGE OPTICES AND ACQUISITION

Image optics: Thin lens imaging equation - Image resolution - Depth of field - Aperture - Exposure - F-number - Aberrations - Lens types and selection - Lighting techniques and sources - System and hardware - Transmission to the computer **-** Basic operation of a frame grabber - Direct digital transmission.

Image Acquisition: Solid-state sensors **-** CCD, CMOS sensor operation - Image degradation - Video standard - Image quality - Camera types: Progressive scan cameras, Asynchronous cameras, Digital cameras, Line-scan cameras. **(11)**

Schering Bridge, Wien Bridge - Q meters - Automatic Bridges. **(8)**

SIGNAL GENERATORS AND ANALYZERS

Sine wave generator - Frequency synthesized signal generator - Pulse and square wave generator - Wave analyzers: Frequency Selective Wave Analyzer, Heterodyne wave analyzer, Harmonic Distortion Analyzers - Spectrum Analyzer - Frequency counter and time interval measurement - CRO: Block diagram of General Purpose Oscilloscope, Basic controls of CRO - Digital Storage Oscilloscope - Sampling Oscilloscope - Digital Frequency Meter - X-Y Recorders. **(12)**

VIRTUAL INSTRUMENTATION

Introduction to Virtual Instrumentation - Basics of LabVIEW - FOR and WHILE loops - Structures - Arrays and Clusters - Graphs and Charts - Data Acquisition with LabVIEW. **(6)**

Total : 45

TEXT BOOKS

1. Albert D Helfrick, Cooper. W.D, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, New Delhi, 2006.
2. Sanjay Gupta and Joseph John, “Virtual Instrumentation Using LabVIEW”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.

REFERENCE BOOKS

1. Barry Paron, “Sensor, Transducer and Lab VIEW”, Prentice Hall, New Delhi, 2000.
2. Nakra B C and Choudhury K K, “Instrumentation Measurement and Analysis”, Tata McGraw Hill, New Delhi, Second Edition, 2004.

3. Sawhney A K, “A course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Rai and Sons, New Delhi, 2000.
4. Albert D Helfrich, Cooper. W.D, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, Fifth Edition, 2002.
5. Garry M Johnson, “LabVIEW Graphical Programming”, Tata McGraw Hill, New Delhi, Forth Edition, 2007.
6. Lab VIEW Basics-I Manual, National Instruments, 2009.

2. Keiser B., “Principles of Electromagnetic Compatibility”, Artech House, Third Edition, 2002.

REFERENCE BOOKS

1. White R.J., “HandBook Series of Electromagnetic Interference and Compatibility”, Don White Consultants, 1980.
2. Violette N., White D.R.J., “Electromagnetic Compatibility HandBook”, Van Nostrand Reinhold, 1987.

CONDUCTED EMISSION AND SUSCEPTIBILITY

Line impedance Stabilization network (LISN) - Common and Differential mode current gain - Power Supply filters - Properties - Topology - Effect of filter components on common and differential mode currents - Noise emission characteristics of linear power supply and SMPS - Power supply and filter placement. **(9)**

CROSSTALK AND SHIELDING

Transmission line theory - Three conductor line - Frequency domain crosstalk - Time domain crosstalk - Lumped circuit model - Shielded wires - Effects of pigtails - Twisted wires - Effects of twists - Balancing - Audio rectification - Ground loops - Shielding effectiveness - Farfield - Electric sources - Magnetic sources - Low frequency magnetic field shielding effect of aperture reflection and cross talk in digital circuits. **(9)**

ESD AND SYSTEM DESIGN FOR EMC

Origin - Effect - Design techniques - Preventing the ESD event - Hardware Immunity - Software Immunity - System design : Ground loops - Common impedance coupling - System configuration - System enclosures - Power line filter placement - Placement and number of PCBs - Internal cable routing and connector placement - PCB design - Component selection - Power distribution - Component placement - PCB ground grid - DED coupling capacitors. **(9)**

Total : 45

TEXT BOOKS

1. Ott H.W., “Noise Reduction Techniques in Electronic Systems”, Wiley Interscience, Second Edition, 2006.

09EC35 - DIGITAL CIRCUIT DESIGN

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To gain in-depth knowledge about the internal operations and design aspects of digital circuits.

EXPECTED OUTCOME

Students can gain in-depth knowledge on the fundamentals, concepts, design implementation and applications of digital circuits.

INTRODUCTION

Review of Binary Number Systems - Boolean Algebra and Logic Gates - Digital Logic Families - Karnaugh Map Method: Two-and Three-Variable Maps , Four-Variable Map, Product of Sums Simplification, Sum of Products Simplification, Don’t Care Conditions - NAND and NOR implementation - Quine-McClusky methods. **(9)**

COMBINATIONAL LOGIC DESIGN

Adder - Subtractor - Carry Look ahead Adder - BCD adder - Magnitude Comparator - Decoders - Encoders - Multiplexers - Demultiplexer - Design of Combinational Logic Circuits: using Decoders, Multiplexers and Demultiplexers. **(7)**

SEQUENTIAL LOGIC DESIGN

Flip-Flops - Types - Master Slave configuration - Characteristic table and equation - Flip Flop excitation tables - Shift registers - Binary Counter - Ring Counter - Johnson’s Counter - Timing Signal Generation - Mealy/ Moore models - Analysis of clocked sequential circuits - Concepts of state equations: State diagrams, State table, State reduction, State Assignment - Design of synchronous sequential circuits - Up/Down Counters, Modulo-N counters.

(11)

ALGORITHMIC STATE MACHINES AND PROGRAMMABLE LOGIC DEVICES

RTL - ASM - Data paths and micro operations - Design Example - Binary multiplier. Introduction to Programmable Logic Devices - Read Only Memory - Programmable Array Logic - Programmable Logic Array - Field Programmable Logic Switch - Architecture of PLDs. **(9)**

VHDL

Introduction to VHDL - Design flow - Entity, architecture, process, configuration and package declarations - Signals and data types - Operations and expressions - Concurrent and sequential statements - Behavioral modeling - VHDL code for Combinational circuits, Flip Flops, Registers and Counters. **(9)**

Theory : 45
Tutorial : 15
Total : 60

TEXT BOOKS

1. Morris Mano, "Digital Design", Prentice Hall of India, New Delhi, Fourth Edition, 2008.
2. Donald P. Leach, Albert Paul Malvino, "Digital Principles and Applications", McGraw Hill, Fifth Edition, 2001.

REFERENCE BOOKS

1. Tocci R J and Widmer N S, "Digital systems principles and applications", Pearson education Pvt limited, Eighth Edition, 2001.
2. Roger L. Tokheim, "Schaum's Outlines - Digital Principles", McGraw Hill, Third Edition, 1994.
3. James Palmer and David Perlman, "Schaum's Outlines - Introduction to Digital Systems", McGraw Hill, 1993.

09ECE18 - ELECTROMAGNETIC COMPATIBILITY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study about EMI Sources, EMI problems, their solution and design methods in PCB / Subsystem level, emission & immunity level measurement methods and the EMC standards.

EXPECTED OUTCOME

On completion of this syllabus the students will be able to understand the principles of EMI Sources, EMI problems, their solution and design methods in PCB / Subsystem level, emission & immunity level measurement methods and the EMC standards.

BASICS OF ELECTROMAGNETIC COMPATIBILITY, REVIEW OF COMPONENTS AND SIGNAL ANALYSIS

Electrical dimensions - EMC units - Electronic system and component requirements- Measurement of emission - Additional product requirements - Radiated Susceptibility - Conducted Susceptibility - Electro Static Discharge (ESD) - EMC design constraints - Wires - PCB lands - Effect of lead inductance and capacitance - Lumped circuit model for various active and passive components - Signal and Spectrum - Spectral bounds of trapezoidal waveforms. **(9)**

RADIATED EMISSION AND SUSCEPTIBILITY

Maxwell's equation - Radiation - Dipole - Loop Antenna - Half Wave Antenna - Arrays - Characteristics of antennas - Friis transmission equation - Effect of reflection - Broad Band Antenna measurement - Differential vs. Common mode currents - Emission circuit models - Current probes - Susceptibility models for wires and PCB lands. **(9)**

and Mobile Systems", Thomson Asia Pvt Ltd, Singapore, 2005.

5. William C.Y. Lee, "Wireless & Cellular Telecommunications", Third Edition, McGraw-Hill Education(Asia), 2006.
6. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Second Edition, Springer International Edition, 2009.

4. J.Basker, "A VHDL Primer", Addison Welsey, New Delhi, Third Edition, 2006.
5. Charles H Roth, "Fundamentals of Logic Design", Thomas Publication Company, Fourth Edition, 2003.
6. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw Hill International Edition, New Delhi, 2002.

09EC36 - NETWORKS AND TRANSMISSION LINES

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study about Two-port networks, filters, transmission lines, attenuators and equalizers.

EXPECTED OUTCOME

On completion of this syllabus the students will be able to understand about of Two-port Networks, Filters, Transmission lines, Attenuators and Equalizers.

NETWORKS AND NETWORK FUNCTIONS

Functional classification of Networks - Two Port Networks - Two Port Network parameters - Impedance - Admittance - ABCD & Hybrid parameters - Interconnection of Two Port Networks: Series, Parallel, Cascade - Equivalent Networks : T, Pi and Ladder - Symmetrical and Asymmetrical Networks - Symmetrical Networks: Characteristic impedance, Propagation constant - Asymmetrical Networks: Iterative impedance, Image impedance, Image transfer constant and Insertion loss -Half section (L-section), symmetrical T and Pi section into half section. **(9)**

FILTERS

Introduction - Low pass, High pass, Band pass and Band stop Filters - Butterworth filter - Constant filters: m-derived, k filters - Proto-type filter section - Reactance vs Attenuation constant characteristics of low pass filter - Attenuation vs frequency characteristics - Phase shift vs Frequency characteristics - Impedance vs Frequency curve of T, Pi and m-derived filter section - Need for m-derived filters - Cut off frequency for low pass and high pass filter. **(9)**

PROTOCOLS & IEEE STANDARDS

Introduction to mobile Ad-hoc Network - Applications - Wireless LAN (WiFi) Architecture and protocol layers - WAP 1.1 and WAP 2.0 - XHTML-MP - Bluetooth-enabled Devices network - Layers in Bluetooth protocol - Security in Bluetooth protocol.

IrDA - ZigBee - IEEE 802.11 - 802.11 b/a/g comparisons - MAC LAYER - 802.16 - WiMAX. **(9)**

OVERVIEW OF MOBILE APPLICATION LANGUAGES & OPERATING SYSTEMS

Introduction - XML - JAVA - Java 2 Micro Edition (J2ME) - Java Card - Operating system – Palm OS - Windows CE - Symbian OS - Linux for Mobile Devices. **(9)**

Total : 45

TEXT BOOKS

1. Raj Kamal, “Mobile Computing”, Oxford University Press, New Delhi, 2007.
2. Jochen H. Schiller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.

REFERENCE BOOKS

1. Charles E. Perkins, “Mobile IP: Design Principles and Practices”, Addison Wesley, 1998.
2. James D. Solomon, “Mobile IP, The Internet Unplugged”, Prentice Hall, 1998.
3. Jon W. Mark, Weihua Zhuang, “Wireless Communications and Networking”, Prentice Hall, New Delhi, 2007.
4. Dharma Prakash Agarval, Qing , An Zeng, “Introduction to Wireless

09ECE17 - MOBILE COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamental concepts of mobile communication systems, wireless computer networks and mobile application languages.

EXPECTED OUTCOME

On completion of this course the students can understand the concepts of mobile communication systems, wireless computer networks and mobile application languages.

INTRODUCTION

Mobile Communication - Mobile Computing - Mobile Computing Architecture - Mobile Devices - Mobile System Networks - Mobile phones - Digital music players - Hand held pocket computers - Hand held devices: Operating systems, Smart systems, Limitations of mobile devices, Automotive systems. **(9)**

WIRELESS STANDARDS

GSM - Services and system architecture - Radio Interfaces : Space Division Multiple Access, Time Division Multiple Access, Frequency Division Multiple Access - Protocols - Localization - Security - New Data Services - General Packet Radio Service - High-Speed Circuit Switched Data - DECT - Medium Access Control - Introduction to CDMA-based systems - IMT-2000 - i-mode - OFDM. **(9)**

TRANSPORT LAYER IN MOBILE NETWORKS

Mobile IP - IPv6 - Dynamic Host Configuration Protocol - Mobile ad-hoc networks. **Mobile transport layer :** Traditional TCP - Classical TCP improvements - TCP over 2.5 / 3G wireless networks. **(9)**

TRANSMISSION LINE THEORY

Transmission line as a cascade of T-Sections - General Solution of the transmission line - Voltage and Current of a line - Infinite line - Input impedance - Reflection coefficient - Wavelength and Velocity of propagation, Waveform distortion - Distortion less transmission line - Telephone cable - Inductance loading of telephone cables, Input impedance of lossless lines - Reflection on a line not terminated by Z_o - Transfer impedance - Reflection factor and reflection loss - T and Pi Section equivalent to lines. **(9)**

THE LINE AT RADIO FREQUENCIES

Standing waves and standing wave ratio on a line - One eighth wave line - Quarter wave line and impedance matching - Half wave line - Circle diagram for the dissipation less line - Smith Chart - Application of Smith Chart - Conversion from impedance to reflection coefficient - Impedance to Admittance conversion - Input impedance of a lossless line terminated by impedance - Single stub matching and double stub matching. **(9)**

ATTENUATORS AND EQUALIZERS

Attenuators - T-type - Pi Type Attenuator - Lattice - Bridged T - L-Type - Equalizers - Inverse Networks - Series Equalizer - Full Series Equalizer - Shunt Equalizer - Full Shunt Equalizer - Constant Resistant Equalizer - Bridged T -Attenuation Equalizer - Bridged T- Phase - Lattice Attenuation - Lattice Phase Equalizer. **(9)**

Theory : 45
Tutorial : 15
Total : 60

TEXT BOOK

Ryder J.D., “Networks, Lines and Fields”, PHI, New Delhi, 2003.

REFERENCE BOOKS

1. Umesh Sinha, “Networks and Transmission Lines”, Tech India, Eighth Edition, 2003.
2. Robert A. Chipman, “Schaum’s Outline Series – Theory and Problems in Transmission Lines”, McGraw Hill, 1968.
3. Samarajit Ghosh, “Network Theory: Analysis and Synthesis”, Prentice Hall, 2005.
4. Raju G.S.N., “Electromagnetic Field Theory and Transmission Lines”, Pearson Education, First Edition, 2005.

NETWORK LAYER

Gossiping and Agent-based Unicast forwarding - Energy-efficient Unicast - Broadcast and Multicast - Geographic routing - Mobile nodes – Data-centric and Content-based networking -Data-centric Routing - Data aggregation - Data-centric storage - Higher layer design issues. **(8)**

APPLICATIONS

WINS - µAMPS Underwater Acoustic and Deep space networks.

Case Studies: Target detection tracking - Habitat monitoring - Environmental disaster monitoring - Practical implementation issues - IEEE 802.15.4 low rate WPAN - Sensor Network Platforms and tools - Sensor node hardware - Node-level software platforms - Node level simulators. **(7)**

Total : 45

TEXT BOOKS

1. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Elsevier Publication, 2004.
2. Raghavendra C.S., Krishna, Sivalingam M., and Tarib Znati, “Wireless Sensor Networks”, Springer Publication, 2006.

REFERENCE BOOKS

1. Edgar H .Callaway, “Wireless Sensor Networks: Architecture and Protocol”, CRC press, First Edition, 2004.
2. Holger Karl , Andreas Willig, “Protocol and Architecture for Wireless Sensor Networks”, John Wiley Publication, 2007.

09ECE16 - WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study about the different layers of Wireless Sensor Networks and their applications.

EXPECTED OUTCOME

On completion of this course, the students will have in-depth knowledge about the different layers of Wireless Sensor Networks and their applications.

INTRODUCTION

Single node architecture - Hardware components - Energy consumption of sensor nodes - Network architecture - Sensor network scenarios - Types of sources and sinks - Single-hop versus Multi-hop networks - Multiple Sinks and Sources - Design principles - Development of Wireless Sensor Networks. **(9)**

PHYSICAL LAYER

Wireless channel and communication fundamentals - Frequency allocation - Modulation and Demodulation - Wave propagation effects and noise - Channel models - Spread Spectrum Communication - Packet transmission and Synchronization - Quality of Wireless channels and Measures for improvement - Physical layer and Transceiver design consideration in Wireless Sensor Networks - Energy usage profile - Choice of Modulation - Power Management. **(9)**

DATA LINK LAYER

MAC protocols - Fundamentals of wireless MAC protocols - Low Duty cycle protocols and Wakeup concepts - Contention-Based protocols - Schedule-based protocols - Link Layer protocols - Fundamentals task and requirements - Error control - Framing - Link management. **(9)**

09EC41 - MATHEMATICS IV

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

The objective is to incorporate the basic Numerical methods required for solving Engineering problems and also to study the basic statistical ideas, Special functions and Random process that are imperative for effective understanding of Engineering subjects. The topics introduced will serve as basic tools for specialized studies in many Engineering fields.

EXPECTED OUTCOME

The students will have in depth knowledge in basic Numerical methods, basic statistical ideas, Special functions and Random process.

TWO DIMENSIONAL RANDOM VARIABLES

Probability mass function - Probability distribution function - Cumulative distribution function - Marginal probability functions - Conditional distribution - Expectation of two dimensional random variables - Covariance - Correlation - Regression - Curve fitting - Least square technique - Only curve of the form or reducible to the form $y = ax + b$, $y = ax^2 + bx + c$. **(9)**

RANDOM PROCESSES

Classification of random processes – Special classes of Random processes – Average values of Random processes – Stationary – Analytical representation of random processes – Auto correlation function and its properties – Cross Correlation function and its properties – Ergodicity – Mean Ergodic theorem – Correlation Ergodic process – Distribution Ergodic process – Power spectral Ergodic density function and its properties.

(9)

NUMERICAL METHODS – I

Linear simultaneous equations : Gauss elimination method – Gauss Jordan method – Crout's method - Gauss Seidal method – Relaxation method.

Ordinary differential equations : Taylor series – Modified Eulers – Runge Kutta fourth order methods – Milne's predictor – Corrector method. **(9)**

NUMERICAL METHODS – II

Finite difference approximations - Solution of PDE – Laplace equation - Liebmanns iteration process - Poisson equation – Parabolic equation – Bender Schmidt and Crank - Nicholson methods - Hyperbolic equation. **(9)**

SPECIAL FUNCTIONS

Bessel functions – Differential equations – Generating function – Orthogonality–Recurrence relations – Legender Polynomials – Differential equations – Rodrigue's formula – Generating function – Orthogonality – Recurrence relations. **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Kandasamy. P., etal., "Numerical methods" S.Chand and Co, 2008.
2. Veerarajan T , "Probability statistics and Random Process", Tata Mc Graw Hill Publishing Company Ltd.,2002.
3. Venkataraman M .K , "Higher mathematics for Engineering and Science" National Publishing Company , 2000.

NEURO-FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems - Architecture - Hybrid Learning Algorithm - Learning Methods that Cross-fertilize ANFIS and RBFN - Coactive Neuro-Fuzzy Modeling - Framework - Neuron Functions for Adaptive Networks - Neuro-Fuzzy Spectrum. **(9)**

ARTIFICIAL INTELLIGENCE

Search Techniques: Hill climbing , Best first search , Breadth first search , Depth first search -Knowledge representation using predictive logic - Representing knowledge using rules -Semantic network - Frames. **(8)**

Total : 45

TEXT BOOK

Jang J.S.R., Sun C.T., and Mizutani E., "Neuro-Fuzzy and Soft Computing", PHI, 2004.

REFERENCE BOOKS

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 2004.
2. Elaine Rich, Kevin knight, Shivashankar B. Nair, "Artificial Intelligence", McGraw Hill, Third Edition, 2009.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 2002.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2004.
5. Sivanandam S.N., & Deepa S.N., "Principles of Soft Computing", Sunny Offset Process, First Indian Edition, 2008.

09ECE15 - SOFT COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the concepts of fuzzy set theory, genetic algorithms, neural networks, neuro fuzzy modeling and Artificial Intelligence.

EXPECTED OUTCOME

On completion of this course the students will have in-depth knowledge about the concepts of fuzzy set theory, genetic algorithms, neural networks, neuro fuzzy modeling and artificial intelligence.

FUZZY SET THEORY

Fuzzy Sets - Fuzzy Set theoretic Operations - Member Function Formulation and Parameterization - Fuzzy Rules and Fuzzy Reasoning - Extension Principle and Fuzzy Relations - Fuzzy if-then Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Mamdani Fuzzy Models -Sugeno Fuzzy Models - Tsukamoto Fuzzy Models - Input Space Partitioning and Fuzzy Modeling.

(10)

GENETIC ALGORITHMS

Fitness computations - Cross over - Mutation - Reproduction - Schema theorem - K-armed Bandit problem - Building block - Hypothesis minimal deceptive problem - Mapping objective to fitness form - Fitness scaling - Ranking. **(8)**

NEURAL NETWORKS

Supervised Learning Neural Networks - Perceptrons - Adaline - Backpropagation - Mutilayer Perceptrons - Radial Basis Function Networks - Unsupervised Learning Neural Networks -Competitive Learning Networks - Kohonen Self-organizing Networks - Learning Vector Quantization - Hebbian Learning. **(10)**

REFERENCE BOOKS

1. Kapoor .J.N and Saxena. H.C., " Mathematical Statistics", S.Chand and Co, Twevelth Edition, 2003.

2. Grewal. B.S. "Higher Engineering Mathematics", Khanna Publishers, Fortith Edition, 2007.

09EC42 - ANALOG ELECTRONICS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To equip the students with the knowledge on Amplifiers, Voltage regulators & Oscillator circuits.

EXPECTED OUTCOME

On completion of this course, the student will have in-depth knowledge on amplifier circuits, multivibrators and oscillator circuits.

BJT & FET SMALL SIGNAL ANALYSIS

AC Analysis of BJT Circuits: Coupling and bypass capacitors - AC load lines - Transistor models and parameters - Analysis of CB,CE,CC circuits - Comparison of CB, CE, CC circuits.

AC Analysis of FET Circuits: Coupling and bypass capacitors – AC load lines – FET models and parameters – Analysis of Common Drain, Common Gate, Common Source circuit – Comparison of FET and BJT circuits. **(9)**

BJT & FET FREQUENCY RESPONSE AND COMPOUND CONFIGURATION

BJT Internal capacitances and High Frequency Model - Frequency response of CE amplifier - MOSFET Internal capacitances and High Frequency Model - Frequency response of CS amplifier - Single stage Common Emitter amplifier - Capacitor coupled two stage Common Source Amplifier - Direct coupled two stage circuits - Two stage circuits with Emitter follower output - DC feedback pair - BIFET Circuits - Differential Amplifier - Small Signal High Frequency Amplifier - Amplifier testing using Square wave input. **(9)**

- Butterfly Computation - Overview and Scaling - Bit Reversed Index Generation - An 8 point FFT Implementation on TMS320C54XX Computation of the signal Spectrum. **(11)**

PROGRAMMING CASE STUDIES

ALP for Addition, Subtraction & Multiplication - ALP for Convolution Operation: Linear Convolution, Circular Convolution - ALP for Correlation Operation - ALP for FFT computation - FIR & IIR filter designs using TMS320C54XX Kit. **(9)**

Total : 45

TEXT BOOK

Avtar Singh, Srinivasan.S, “Digital Signal Processing”, Brooks/Cole, 2003.

REFERENCE BOOKS

1. Venkataramani B., Bhaskar M., “Digital Signal Processors, Architecture, Programming & Applications”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
2. Texas Instruments Manuals for TMS320C54X Volumes 1 to 5.

09ECE14 - DSP BASED SYSTEM DESIGN

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamentals of DSP hardware & software and the methods of integrating and programming them.

EXPECTED OUTCOME

On completion of this syllabus the students will be able to understand the fundamentals of DSP hardware & software and the methods of integrating and programming them.

COMPUTATIONAL ACCURACY

Number Formats for signals and coefficients in DSP systems - Dynamic Range and Precision - Sources of Errors in a DSP Implementation - A/D Conversion Errors -DSP Computational Errors - D/A Conversion Errors. **(9)**

PROGRAMMABLE DSP

Commercial DSP Devices - Embodiments - Architecture of TMS320C54XX DSP Processors - Bus Structure - CPU - Internal Memory and Memory Mapped Registers - Instruction Set - Addressing Modes in TMS320C54XX Processors: Immediate Addressing, Absolute Addressing, Accumulator Addressing, Direct Addressing, Indirect Addressing, Memory Mapped Register Addressing, Stack Addressing. **(9)**

ON CHIP PHERIPHERALS

Hardware Timer - Host Port Interface - Clock Generator - Interrupt structures. **(6)**

IMPLEMENTATION OF BASIC ALGORITHMS

The Q notation - Convolution - FIR filters - IIR Filters - Decimation Filters - Adaptive Filters - 2D signal Processing - Matrix Multiplication - FFT Algorithm for DFT Computation - 2,4,8 & N=2^M Point DFT Computation

POWER AMPLIFIERS

Series-fed Class A Common Emitter Power Amplifier -Transformer Coupled Amplifier - Class B Amplifier operation - Class B Amplifier circuits – Non Linear Distortion - Power transistor Heat sinking - Amplifiers using Complementary Symmetry configuration - Class C Amplifier - Class D Amplifier - Class S Amplifier - Feedback Voltage Regulators - Series and Shunt Voltage Regulators - Overload and Short Circuit Protection. **(9)**

FEEDBACK AMPLIFIERS AND OSCILLATORS

Feedback Concept - Effect of negative feedback - Analysis of feedback amplifiers: Voltage Series, Current Series, Current Shunt, Voltage Shunt - Conditions for Oscillation - Classification of Oscillators - RC Phase Shift Oscillator - Wien Bridge Oscillator - Twin-T Oscillator - Hartley Oscillator - Colpitts Oscillator - Clapp Oscillator - Armstrong Oscillator - Frequency Stability of Oscillator - Tuned Collector Oscillator - Negative Resistance Oscillator – Crystal Oscillators. (**9)**

MUTIVIBRATORS AND TIME BASE GENERATORS

Astable multivibrator - Collector coupled and Emitter coupled multivibrator - Waveforms - Timing - Synchronization and Frequency division - Bistable mulitivibrator : Fixed biased, Self biased - Modulo-N counter - Shift registers - Schmitt trigger circuits -Monostable multivibrator : Collector coupled, Emitter coupled - Triggering methods - General features of time base signal - Exponential sweep - Negative-Resistance Switches - Sweep circuit using a Transistor Switch - Transistor constant current sweep - Miller and bootstrap time base generator - Current Time- Base Generators.**(9)**

Total : 45

TEXT BOOKS

1. Sedra and Smith, “Microelectronic Circuits”, Oxford University Press, Fifth Edition, 2004.

2. Millman. J and Taub H., “Pulse Digital and Switching Waveforms”, Tata McGraw Hill, Second Edition, 2007.

REFERENCE BOOKS

1. David A.Bell, “Electronic Devices and Circuits”, PHI, Forth Edition, 2007.
2. Edwin C. Lowenberg, “ Schaum’s Outline of Theory and Problem of Electronic Circuits”, McGraw Hill, 1989.
3. Robert L. Boylestead and Louis Nasheresky, “Electron Devices and Circuits: Theory and Practice”, Prentice Hall of India, Eighth Edition, 2008.
4. D.L.Schilling and C. Belove, “Electronics Circuits: Discrete and Integrated”, Third Edition, 2002.
5. Millman and Halkias.C., “Integrated Electronics”, Tata McGraw Hill, 2008.

RISC PROCESSORS II(Superscalar Processors) AND ARM

Intel i960 - Intel IA32 - MIPS R8000 - MIPS R10000 - Motorola 88110 - SPARC version 8 - SPARC version 9 - ARM Processors - ARM registers - ARM instructions - ARM built-in shift mechanism - ARM branch instructions - sequence control - Data movement and Memory reference instruction. (**9)**

PC HARDWARE OVERVIEW

Functional Units & Interconnection - New Generation Mother Board logic- - Advanced Mother Board-286 to Pentium 4 Bus Interface - ISA - EISA - VESA - PCI - PCIX - Peripheral Interfaces and Controllers, Memory and I/O Port Addresses. (**9)**

Total : 45

TEXT BOOKS

1. Brey B.B., “The Intel Microprocessor 8086/8088, 80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Architecture, Programming & Interfacing”, Prentice-Hall of India, Seventh Edition, 2006.
2. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata McGraw Hill, 2006.

REFERENCE BOOKS

1. Govindarajulu B., “IBM PC and clones Hardware, Trouble Shooting and Maintenance”, Tata McGraw Hill, New Delhi, Second Edition, 2008.
2. Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, Second Edition 2006.
3. Mohamed Rafiquzzaman, “Microprocessors and Microcomputer Based System Design”, CRC Press, Second Edition, 2007.
4. Steve Furbe, “ARM System-on-Chip Architecture”, Addison-Wesley Professional, Second Edition, 2000.

09ECE13 - ADVANCED MICROPROCESSORS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the architecture and principles of operation of Intel, Pentium, RISC & ARM processors and their interfacing techniques.

EXPECTED OUTCOME

On completion of this syllabus, the student can understand the architecture and principles of operation of Intel, Pentium, RISC & ARM processors and their interfacing techniques.

INTEL 80386, 80486 PROCESSORS

Review of 8086 processor - 80386 Processor architecture - Addressing modes. Memory management - Real, Protected and Virtual 8086 mode - Memory paging - 80486 processor architecture and signal - Memory management - 80486 Cache mechanism - Salient features - Comparison of Microprocessors (8086 - 80186 - 80286 - 80386 - 80486) **(9)**

PENTIUM MICROPROCESSORS

Pentium Microprocessor Architecture - Special Pentium Registers - Pentium Memory Management - New Pentium Instructions - Pentium Pro Microprocessor Architecture - Special features - Pentium IV Architecture - Comparison of Pentium Microprocessors. **(9)**

RISC PRINCIPLES AND PROCESSORS

RISC properties - RISC versus CISC - RISC evaluation - Power PC620 - Instruction fetching - Branch Prediction - Fetching - Speculation - Instruction dispatching - dispatch stalls - Instruction Execution - Issue stalls - Execution Parallelism - Instruction completion - Basics of P6 micro architecture - Pipelining - Out-of-order core pipeline - Memory subsystem. **(9)**

09EC43 - PRINCIPLES OF COMMUNICATION

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study the principles of analog modulation & demodulation schemes, Transmitters & Receivers and the effect of noise in communication systems.

EXPECTED OUTCOME

Upon completion of this syllabus, students will be able to understand the principles of analog communication systems and the effect of noise in communication systems.

AMPLITUDE MODULATION

Concept of base band and bandwidth - Electromagnetic spectrum - Communication system model - Need for modulation.

Amplitude Modulation: DSB-SC - Conventional AM - SSB - VSB - AM modulators: Power law modulator - Switching Modulator - Balanced modulator - Ring modulator.

Demodulation of AM: Envelope detector - Demodulation of DSB-SC - Demodulation of SSB - Demodulation of VSB - Multiplexing: Frequency division multiplexing, Quadrature carrier multiplexing.

(10)

ANGLE MODULATION

Representation of FM and PM signals - Spectral characteristics of Angle modulated signals: Angle modulation by a sinusoidal signal and arbitrary message signal - Direct FM generation: Varactor diode modulator - Reactance modulator - Narrowband FM generation - Indirect FM generation - Demodulation of FM: Slope detector, Balanced slope detector, Foster Seeley discriminator, Ratio detector, PLL demodulator, Quadrature FM demodulator. **(8)**

TRANSMITTERS AND RECEIVERS

AM transmitters: Low level transmitter - High level transmitter - SSB transmitters: Filter method, Phase shift method - ISB transmitter - Receiver parameters - AM receivers: Tuned radio frequency receivers, Super heterodyne receivers - SSB receivers: Non coherent BFO, Coherent BFO - Multi channel pilot carrier - FM transmitters: Direct FM transmitter, Indirect FM transmitter - Stereo FM transmitter - Stereo FM receiver. **(10)**

PULSE ANALOG MODULATION

Sampling theorem: Low pass signals, Band pass signals - PAM generation: Natural sampling, Flat top sampling - Signal recovery through holding - Time Division Multiplexing of PAM signals - Channel bandwidth - Pulse Width Modulation: Generation and Detection - Pulse Position Modulation: Generation and Detection - Bandwidth Noise trade-off. **(8)**

NOISE IN COMMUNICATION SYSTEMS

Classification of Noise - Shot noise - Thermal noise - Noise calculations: Single noise source, Multiple noise sources - Equivalent noise bandwidth - Noise figure of an amplifier - Experimental determination of noise figure - Power Spectral Density - Effective Noise Temperature - Equivalent Noise Resistance - Noise figure in terms of available gain - Cascaded stages - Cascode amplifier - Noise in Amplitude modulated systems: AM with carrier, DSB-SC, SSB-SC - Noise in Frequency modulated and Phase modulated systems - Noise in PAM, PWM, PPM systems. **(9)**

Theory : 45
Tutorial : 15
Total : 60

TEXT BOOKS

1. Simon Haykin, “Communication Systems”, John Wiley & Sons, Fifth Edition, 2008.
2. Wayne Tomasi, “Electronic Communication Systems: Fundamentals Through Advanced”, Pearson Education, Fifth Edition, 2004.

Example of bi-orthogonal scaling functions and wavelets - Construction of simple wavelets like Haar and db2, db4 - Non separable multidimensional wavelets - Wavelet packets - Two dimensional wavelet decomposition - Regularity - Vanishing moments. **(9)**

APPLICATIONS

Applications - Image compression - EZW algorithm - Audio compression - Audio masking - Wavelet based audio coding signal denoising - Edge detection - Object isolation - Object detection by wavelet transforms of projections - Image fusion. **(9)**

Total : 45

TEXT BOOKS

1. Rao R.M., Bopardikar A.S., “Wavelet Transforms-Introduction to Theory and Applications”, Pearson Education, 2009
2. Jaideva C. Goswami, Andrew K.Chan, “Fundamentals of Wavelets - Theory, Algorithms and Applications”, John Wiley & Sons, Inc., Singapore, 2006.

REFERENCE BOOKS

1. Soman K.P. and Ramachandran K.I., “Insight into Wavelets from Theory Practice”, Prentice Hall of India Private Limited, 2008.
2. C.Sidney Burrus, Ramesh ,A. Gopinath, Haitao Guo , “Introduction to Wavelets and Wavelet Transforms” ,Prentice Hall, New Delhi, First Edition, 1998.
3. Stephane G.Mallat, “A Wavelet Tour of Signal Processing”, Academic Press, Second Edition, 1999

09ECE12 WAVELET TRANSFORMS AND APPLICATIONS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the basic concepts of wavelets & their transforms and their applications.

EXPECTED OUTCOME

On completion of this syllabus, the student will understand the basic concepts of wavelets & their transforms and their applications.

SIGNAL DECOMPOSITION

Fundamentals - Overview of Fourier transform and Short Time Fourier transform - Introduction to wavelets - Continuous Wavelet Transform - Time frequency resolution - Inverse CWT. **(9)**

DISCRETE WAVELET TRANSFORM AND WAVELET DECOMPOSITION

Introduction - Approximation of vectors in nested linear vector spaces - Example of MRA - Haar wavelet - Digital Filter implementation of Haar Wavelet Decomposition. **(9)**

MRA, ORTHOGONAL WAVELETS, AND THEIR RELATIONSHIP TO THEIR FILTER BANK

Formal Definition of an MRA - Construction of a general orthonormal MRA - Wavelet Basis for MRA - Digital Filtering Interpretation - Examples of Orthogonal basis -Generating wavelets - Interpreting orthonormal MRAs for Discrete Time signals - Bi-orthogonal Wavelet Bases - Filtering Relationship for bi-orthogonal filters. **(9)**

TYPES OF WAVELETS

Examples of wavelets: Examples of orthogonal basis generating wavelets - Daubechies D4 scaling function and wavelet - Band limited wavelets -

REFERENCE BOOKS

1. Lathi. B. P. “Communication Systems”, BS Publications, 4th Edition, 2004.
2. Hwei P. Hsu, “Schaum’s Outlines of Analog and Digital Communication”, McGraw Hill, Second Edition, 2006.
3. Lloyd Temes and Mitchel E. Schultz, “Schaum’s Outlines - Electronic Communication”, McGraw Hill, Second Edition, 1998.
4. Herbert Taub and Donald L. Schilling, “Principles of Communication”, McGraw Hill International Student Edition, Third Edition, 2008.
5. Kennedy G, “Electronic Communication Systems”, Tata McGraw Hill, Forth Edition, 2008.
6. John G. Proakis and Masoud Salehi, “Fundamentals of Communication Systems”, Pearson Education, LPE, 2008.

09EC44 SIGNALS AND SYSTEMS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVES

To study about continuous time signals & systems, discrete time signals & systems, Fourier series, Fourier transform, Sampling, Laplace transform and Z transform.

EXPECTED OUTCOME

Upon completion of this syllabus, learners will be able to understand the basics of continuous time Signals & Systems, discrete time Signals & Systems and system analysis using Fourier transform, Laplace transform and Z-transform.

INTRODUCTION TO SIGNALS AND SYSTEMS

Basic continuous time signals - Basic discrete time signals - Representation of signals in terms of impulses - Continuous time systems - Discrete time signals - Properties of systems - Linear Time Invariant systems : Discrete and Continuous - Continuous time system representation by differential equations - Discrete time system representation by difference equation - Block diagram representation. **(9)**

FOURIER ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS

Fourier series representation of periodic signals - Approximation of periodic signals using Fourier series and convergence of Fourier series - Representation of aperiodic signals - Continuous Time Fourier Transform - Properties of Fourier Transform - Response of Continuous time systems to complex exponentials - Frequency response of systems characterized by differential equations. **(9)**

considerations, Intelligent prosthetic knee, Hierarchically controlled prosthetic hand, Self-aligning orthotic knee joint - Sensory augmentation and substitution - Visual system: Visual Augmentation, Tactual vision substitution, Auditory vision substitution - Auditory system: Auditory Augmentation, Visual Auditory Substitution, Tactual Auditory Substitution - Tactual System: Tactual Augmentation, Tactual Substitution. (**10)**

PRINCIPLES OF LASER APPLICATIONS IN MEDICINE AND BIOLOGY

Fundamentals of photo medicine and photo biology - Photo Dermatology - Photo Dynamic Therapy - Laser Therapy of lesions, ulcers and tumors - Laser systems for biomedical applications - General laser surgery : laser surgery of eye and other organs - Lasers in diagnostic applications - Laser hazards and precautions. **(8)**

Total : 45

TEXT BOOKS

1. Bronzino J.D. “Biomedical Engineering HandBook”, CRC Press LLC, 2000.
2. Webster J.G. “BioInstrumentation”, Wiley Publications, 2007.

REFERENCE BOOKS

1. Thomas Surry, Jumer E.Dowdey, Robert C Murry, “Physics of Diagnostic Radiology”, Williams and Wilkins, Forth Edition, 1990.
2. John G.Webster, “Encyclopedia of Medical Devices and Insturumentation”, Wiley Publications, 1988.
3. Khandpur R.S, “Hand Book of Biomedical Instrumentation”, TataMcGraw Hill Publication, New Delhi, Second Edition, 2005.
4. Wolbasrsht. M. L, “Laser Application in Medicine and Biology”, Plenum Press NewYork, 1989.

09ECE11 - ADVANCED MEDICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE:

To equip the students with knowledge of various advanced medical equipments and treatment methods.

EXPECTED OUTCOME :

On completion of this course, the students will have knowledge of various advanced medical equipments and treatment methods.

MAGNETIC RESONANCE IMAGING

Magnetic resonance physics: Larmor precession, RF excitation and detection, Physics of transmitted signal, Signal detection and detectors - Pulse sequences: Gradient echo, spin echo.

Imaging: Image quality - Equipment - CT: Artifacts, Application & limitation of projection CT image formation - Spiral or Helical CT: Slip Ring Technology, CT Angiography. (**10)**

FIBRE OPTICS IN MEDICINE

Gastroscope - Bronchoscope - Cystoscope - Colonoscope - Enteroscope - Lithotripsy. (**8)**

NEONATAL INSTRUMENTATION & ANESTHESIA MACHINE

Incubator - Physiological heat balance - Heat loss methods - Apnea detection - Photo therapy devices - Gas supply and delivery - Vapor delivery - Patient breathing circuit - Complete schematic of anesthesia machine. **(9)**

PROSTHETICS AND ORTHOTICS

Artificial heart and circulatory assist devices - Engineering design - Haemocompatibility - Orthopedic Prosthesis: Fundamentals, Design

FOURIER ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS

Representation of periodic signals by discrete time Fourier series - Representation of periodic and aperiodic signals by Discrete Time Fourier Transform - Properties of Discrete Time Fourier transform - Parseval's relation - Convolution property - Response of discrete time systems to complex exponentials - Frequency response of systems characterized by difference equations - Short Time Fourier Transform - Wavelet Transform. **(9)**

SAMPLING

Representation of continuous time signals by samples - Sampling theorem - Reconstruction from samples using interpolation - Effect of under sampling - Aliasing error - Discrete time processing of continuous signals - Sampling of discrete time systems. **(9)**

LAPLACE TRANSFORM AND Z TRANSFORM

Laplace and Inverse Laplace transform - Analysis and characterization of LTI system using Laplace transform - Z transform and Inverse Z transform - Properties of Z transform - Analysis and characterization of LTI system using Z transform. **(9)**

Total : 45
Tutorial : 15
Total : 60

TEXTBOOK

Allan V.Oppenheim, S.Willsky and S.H. Nawab, "Signals and Systems", Pearson Education, 2007.

REFERENCE BOOKS

1. Simon Haykins and Barry Van Veen, “Signals and Systems”, John Wiley & Sons, Third Edition, 2002.
2. Hsu H. P., Rakesh Ranjan “Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint, 2007.
3. Rodger E. Ziemer, William H. Tranter and Ronald. D. Fannin, “Signals & Systems “, Pearson Education, Forth Edition, 2002.
4. Edward .W.Kamen and Bonnie .S. Heck “Fundamentals of Signals and Systems Using the Web and Matlab”, Prentice Hall, Inc., 2000.
5. Lathi. B. P, “Linear Systems and Signals”, Oxford University Press, 2004.
6. Sidney Burrus C., Ramesh, A. Gopinath, Haitao Guo, “Introduction to Wavelets and Wavelet Transforms”, Prentice Hall, 1998.

ADVANCES IN BIOMEDICAL INSTRUMENTATION

Computers in Medicine - LASER in Medicine - Endoscopes - Cryogenic Surgery - Nuclear Imaging Techniques - Computer Aided Tomography (CAT) - Thermography - Magnetic Resonance Imaging (MRI) - Positron Emission Tomography (PET) - Biomaterials. **(10)**

Total : 45

TEXT BOOKS

1. Dr.M.Arumugam, “Biomedical Instrumentation”, Anuradha Agencies, Kumbakonam, Second Edition, 2006
2. Leslie Cromwell, “Biomedical Instrumentation and Measurements”, Pearson Education, New Delhi, Second Edition, 2007.

REFERENCE BOOKS

1. John G.Webster, “Medical Instrumentation Application and Design”, John Wiley, Forth Edition, 2009.
2. Venkataraman, “Biomedical Electronics and Instrumentation”, Galgotia Publications, Second Edition, 2003.
3. Joseph J Carr and John M Brown “Introduction to Biomedical Equipment Technology”,Pearson Education, New Delhi, Forth Edition 2001.
4. Geddes LA and Baker L.E, “Principles of Applied Biomedical Instrumentation”, John Wiley and Sons, NewYork, Third Edition, 1989.
5. Khandpur R.S, “Hand Book of Biomedical Instrumentation”, TataMcGraw Hill Publication, New Delhi, Second Edition, 2003.

09ECE10 MEDICAL ELECTRONICS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To equip the students with knowledge of various medical equipments and their applications.

EXPECTED OUTCOME

On completion of this course, the students will have knowledge of various medical equipments and their applications.

BIO ELECTRIC POTENTIALS AND BIO POTENTIAL ELECTRODES

Resting and Action Potentials - Half Cell Potential - Electrode Paste - Electrode Material - Types of Electrodes: Micro-Electrodes, Depth and Needle, Surface and Chemical Electrodes. **(10)**

BIOPOTENTIAL RECORDERS

Electrocardiography (ECG) - Electroencephalography (EEG) - Electromyography (EMG) - Electroretinogrphy (ERG) - Electro-oculorography (EOG). **(8)**

PHYSIOLOGICAL ASSIST DEVICES & OPERATION THEATRE EQUIPMENT

Pacemakers - Pacemaker batteries - Artificial Heart Valves - Defibrillators - Nerve and Muscle Stimulators - Heart-Lung Machine - Kidney Machine - Ventilators - Anesthesia Machine - Blood flow meters - Cardiac Output Measurements - Pulmonary Function Analyzer - Gas Analyzer - Oxymeters. **(10)**

SAFETY INSTRUMENTATION

Introduction - Radiation safety Instrumentation - Physiological Effect due to 50 Hz current - Micro and Macroshock - Electrical Accidents in Hospitals - Devices to protect against Electrical Hazards - Hospital Architecture. **(7)**

09EC45 - CONTROL SYSTEMS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study the concepts of modeling and stabilization of control system, its characteristics, time and frequency analysis under transient as well as steady state conditions, stability and state-space modeling.

EXPECTED OUTCOME

Upon completion of this course, students will be able to model physical systems, analyze their transient and steady state behavior, design controllers in both time and frequency domain to meet the required specifications using both classical and state-space model.

SYSTEMS WITH FEEDBACK

Open loop and closed loop systems - Linear systems - Effect of feedback on parameter variation and sensitivity - Mathematical models of physical systems - Mechanical and Electrical systems - Analogous systems - DC and AC servomotors - Potentiometers - Synchros - Tachogenerators - Stepper motors - Gear trains - Transfer function - Block diagram reduction method - Signal flow graphs - Mason's gain formula. **(9)**

TIME RESPONSE ANALYSIS

Standard test signals - Time domain study of first and second order feedback control systems - Time domain specifications - Steady state errors - Error constants - Root locus. **(9)**

FREQUENCY RESPONSE ANALYSIS

Frequency response specifications - Correlation between time domain and frequency domain specifications - Polar plot - Bode plot - All pass and minimum phase systems. **(9)**

STABILITY ANALYSIS

Location of roots of characteristic equation and response - Necessary conditions for stability - Routh Hurwitz criterion - Gain margin and Phase margin - Gain adjustments - Nyquist Criterion - Closed loop stability. **(9)**

STATE VARIABLE ANALYSIS

State, State variables and State model - Representation using physical, phase and canonical variables - Diagonalization - Transfer function from state model - State transition matrix - Solution of state equations.(lapalce transform approach) **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOK

Nagrath,I.J., and Gopal M., "Control System Engineering", New age International Edition, Third Edition, 2002.

REFERENCE BOOKS

1. Joseph J. Distefano, Allen R. Stubberud, Ivan J. Williams, "Schaum's Outlines - Feedback and Control Systems", Tata McGraw Hill, Second Edition, 1995.
2. Benjamin.C.Kuo, "Automatic Control Systems", Prentice Hall of India, Seventh Edition, 2002.
3. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Private Limited, Fifth Edition, 2009.
4. Nagoor Kani A., "Control Systems", RBA Publications, 2006.

Framework - Enterprise Applications. **(9)**

MOBILE APPLICATION DEVELOPMENT

Mobile Information Device Profile - Deployment Of Mobile Objects - Foundation Profile - RMI Profile For Mobile Devices - Development Of Midlets - Mobile Networking Applications. **(9)**

Total : 45

REFERENCES

1. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2000.
2. Cay S.Horstmann, Gary Cornell, "Core Java, Volume 1 And 2", Fifth Edition, Pearson Education Publishers, 2003.
3. Topley, "J2ME In A Nutshell", O'Reilly Publishers, 2002.
4. Hunt, "Guide to J2EE Enterprise Java", Springer Publications, 2004.
5. Ed Roman, "Enterprise Java Beans", Wiley Publishers, 1998.
6. Avstin, "Advance Programming For The Java2 Platform" 'Pearson Education, 2001.

09ECE09 - ADVANCED JAVA TECHNOLOGY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the various aspects of fundamentals, network programming, distributed computing and multi-tier and mobile applications in JAVA.

EXPECTED OUTCOME

On completion of this course, the student will understand the fundamentals, network programming, distributed computing and multi-tier and mobile applications in JAVA.

JAVA FUNDAMENTALS

Java Virtual Machine - Reflection - I/O Streaming - Filter and Pipe Streams - Byte Codes - Byte Code Interpretation - Dynamic Reflexive Classes - Threading - Java Native Interfaces - GUI Applications. **(9)**

NETWORK PROGRAMMING IN JAVA

Stream Customization - Sockets - Secure Sockets - Custom Sockets - UDP Datagrams - Multicast Sockets - URL Classes - Reading Data From The Server - Writing Data - Configuring The Connection - Reading The Header - Content Handlers - Telnet Application - Java Messaging Services. **(9)**

DISTRIBUTED COMPUTING IN JAVA

Remote Method Invocation - Activation Models - RMI Custom Sockets - Object Serialization - Call Back Model - RMI - IIOP Implementation - CORBA - IDL Technology - Naming Services - CORBA Programming Models - JAR File Creation. **(9)**

MULTI - TIER APPLICATION DEVELOPMENT

Server Side Programming - Servlets - Session Management - Cookies - HTTP Communication - JDBC - Multimedia Data Handling - Java Media

09EC46 PRINCIPLES OF ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

The aim of this course is to provide an instrument of learning useful to students so that they will be more informed and able to make judgments concerning the environment based upon sound scientific knowledge.

EXPECTED OUTCOME

The students will have an idea about our environment based upon sound scientific knowledge.

ENVIRONMENTAL CHEMISTRY

Chemistry and the Environment – Environmental segments – Composition and Characteristics of Atmosphere, Hydrosphere, Lithosphere, and Biosphere: Chemical species and particulates present in the environment - Reactions in the atmosphere. Photochemical smog. Impact of man on the environment. Impact of Environment upon humans. **(9)**

ECOSYSTEMS AND BIODIVERSITY

Concepts of an ecosystem: types, structure and functions of the ecosystem. Food chains, food webs and ecological pyramids.

Biodiversity : Definition – Genetic, species, ecosystem and landscape diversities – India as a mega diversity nation – Hot spots of biodiversity. Importance of biodiversity – Loss of biodiversity – Causes of reduction in biodiversity. Conservation of biodiversity – Restoration of biodiversity. **(9)**

ENVIRONMENTAL POLLUTION

Sources, causes, effects and management of Air, Water, Soil, Marine, Noise and Radioactive pollution. Sources of Solid, Hazardous, Biomedical and Chemical wastes. Solid Waste Disposal and treatment methods. **(9)**

ENERGY AND ENVIRONMENT

Energy resources – Growing energy needs - renewable and non-renewable energy sources - use of alternate energy sources – Solar, Wind, Tidal Geothermal and OTEC – (Principles only) merits and limitations. **(3)**

SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development – Urban Population - problems related to energy – Water Conservation. Rainwater harvesting – Environment Ethics – Green house effect, Global warming, climate change, Nuclear hazards and accidents. Issues involved in enforcement of environment legislation – precautionary principle – polluter pays principle – the Beneficiary pays principle – role of an Individual in Environment protection – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act and Forest (Conservation) Act. **(9)**

BIOTECHNOLOGY AND GREEN CHEMISTRY

Biotechnology and its applications in environmental protection – Bioinformatics – Bioremediation. Biological purification of contaminated air.

Green chemistry for clean technology: Significance of green chemistry – Basic components of Green chemistry. Industrial applications of green chemistry. Green fuels – e – green propellants and Bio catalysts. **(6)**

Total : 45

TEXT BOOKS

1. Dara, S.S. “A Text Book of Environmental Chemistry and Pollution Control” , Eighth Edition, S. Chand & Company Ltd, 2008.
2. Kaushik, A. and Kaushik, C.P. “Environmental Science and Engineering”, Second Edition, New Age International (P) Limited Publishers, 2006.
3. Dr. Raghavan Nambiar, K. “Text book of Environmental Studies”, Scitech Publications (India) Pvt. Ltd, Chennai, 2007.

predictive coding - Quad trees - DCT coding - Wavelet methods - Filter banks - EZW coding - SPIHT coding - JPEG 2000 standards. **(9)**

VIDEO COMPRESSION

Video signal representation - Video compression techniques - MPEG1,2,4 - Motion estimation - H.248, H.261, H.323, H.324 - Overview of wavelet based compression and DVI technology - PLV performance Real time compression. **(9)**

Total : 45

TEXT BOOKS

1. Sayood Khaleed, “Introduction to Data Compression”, Morgan Kauffman, 3rd Edition, 2006.
2. Gibson.J.D. Berger.T, Lookbaugh.T, Linbergh.D, R.L.Baker, “Digital compression for multimedia : Principle & Standards”, Morgan Kaufmann,1998.

REFERENCE BOOKS

1. Jerry D. Gibson, “Multimedia Communications: Directions and Innovations”, Morgan Kaufmann, Second Edition,2001.
2. Fred Halsall, “Multimedia communication-Applications, Networks, Protocols and Standards”, Pearson Education, 2001.
3. David Solomon, “Data Compression the Complete Reference”, Springer, 4th Edition, 2007.

09ECE08 - MULTIMEDIA COMPRESSION TECHNIQUES

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the basic coding techniques in digital communication and multimedia compression techniques.

EXPECTED OUTCOME

On completion of this course, the students will understand basic coding techniques in digital communication and multimedia compression techniques.

INTRODUCTION

Overview of information theory - Redundancy - Overview of human codes, Visual System -Taxonomy of compression techniques - Overview of source coding - Source models - Scalar quantization - Rate distortion - Vector quantization - Structure quantizer - Error analysis and methodologies.**(9)**

TEXT COMPRESSION

Compaction techniques - Huffman coding - Adaptive Huffman coding - Arithmetic coding -Shannon Fano Coding and dictionary techniques - LZW family algorithms - Entropy measures - Quality measures. (**9)**

AUDIO COMPRESSION

Audio compression techniques - Frequency domain and filtering - Basic sub band coding-Application to speech coding - G.722 - Application of audio coding: MPEG audio, MP3 progressive encoding - Silence compression - Speech compression techniques - Vocoders - Linear predictive coder. **(9)**

IMAGE COMPRESSION

Approaches to image compression - Predictive techniques - PCM, DPCM, DM - Vector Quantization - Adaptive Vector Quantization - Binary tree

REFERENCE BOOKS

1. Benny Joseph, “Environmental Studies” Tata McGraw Hill Publishing Company Ltd, 2008.
2. Surinder Deswal and Anupama Deswal, “A Basic Course in Environmental Studies”, Dhanpat Rai & Co. (P) Ltd, 2006.

09EC47 - ELECTRONIC CIRCUITS DESIGN LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

OBJECTIVE

To provide the students with a practical exposure to the design and test of electronic circuits.

EXPECTED OUTCOME

After the completion of this course, the students get exposure to the design aspects, operational characteristics and applications of electronic circuits.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diodes
2. Characteristics of CE, CB & CC Transistor circuits
3. FET & UJT characteristics
4. SCR characteristics
5. DIAC and TRIAC Characteristics
6. Transistor Biasing Circuits
7. Wave shaping circuits
8. Rectifiers and filters
9. CB, CE Amplifier Configuration.
10. Emitter follower and Bootstrap circuits
11. Feedback Amplifiers
13. RC coupled Amplifier
14. Hartley & Colpitt's Oscillators
15. RC Phase shift & Wien Bridge oscillators
16. UJT Relaxation Oscillator
17. Class A single tuned Amplifiers

REFERENCE BOOKS

1. Fliege N.J., "Multirate Digital Signal Processing", John Wiley, 2000.
2. John G.Proakis et.al, "Algorithms for Statistical Signal Processing", Pearson Education, 2002.
3. Dimitris G.Manolakis et.al, "Statistical and Adaptive Signal Processing", McGraw Hill, Newyork, 2000.
4. John G.Proakis, Dimitris G.Manolakis, "Digital Signal Processing", Pearson Education, 2002.

LINEAR ESTIMATION AND PREDICTION

Linear prediction - Forward and backward predictions - Solutions of the Normal equations - Levinson - Durbin algorithms - Least Mean Squared error criterion - Wiener filter for filtering and prediction - FIR Wiener filter and Wiener IIR filters - Discrete Kalman filter. **(9)**

ADAPTIVE FILTERS

FIR adaptive filters - adaptive filter based on steepest descent method - Widrow Hoff LMS adaptive algorithm, Normalized LMS - Adaptive channel equalization - Adaptive echo cancellation - Adaptive noise cancellation - Adaptive recursive filters (IIR) - RLS adaptive filters-Exponentially weighted RLS - sliding window RLS. **(9)**

WAVELET TRANSFORMS

Fourier Transform: Power and Limitations - Short time Fourier transform - Gabor Transform - Discrete Time Transform and filter banks - Continuous Wavelet Transform - Wavelet Transform Ideal Case - Perfect Reconstuction Filter Banks and wavelets -Recursive multi-resolution decomposition - Haar wavelet - Daubechies wavelet. **(9)**

Total : 45

TEXT BOOKS

1. Monson H.Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons, Inc., Singapore, 2002.
2. Raghuveer .M Rao, “Introduction to Wavelet Transform”, New Age International, 2000.

18. Class-B Push-Pull Amplifier
19. Differential Amplifier
20. Multivibrators & Schmitt trigger
21. Series voltage Regulator
22. Shunt voltage Regulator

SIMULATION OF THE ABOVE CIRCUITS USING PSPICE / TINAPRO.

Total : 60

09EC48 - ELECTRICAL ENGINEERING AND MEASUREMENTS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

ELECTRICAL ENGINEERING LABORATORY

OBJECTIVE

To gain knowledge about the practical aspects of basic electrical engineering.

EXPECTED OUTCOME

On completion of this laboratory, students would have acquired adequate knowledge about the practical aspects of basic electrical engineering.

LIST OF EXPERIMENTS

1. Load test on DC shunt motor.
2. Load test on Three phase induction motor.
3. Load test on Single phase induction motor
4. Load test on Single phase transformer.
5. Load test on DC Compound motor.
6. No load Speed control of DC shunt motor – Armature Control & Field Control
7. Swinburne's test.
8. Load test on DC shunt generator.
9. Critical speed of DC shunt generator.
10. OCC of DC shunt generator.
11. OC and SC test on single phase transformer.
12. Transfer function of armature and field controlled DC motor.

09ECE07 - ADVANCED DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the parametric methods for power spectrum estimation, adaptive filtering techniques using LMS algorithm and its applications, multi-rate signal processing fundamentals and Wavelet Transform methods.

EXPECTED OUTCOME

On completion of this course, students can understand the parametric methods for power spectrum estimation, adaptive filtering techniques using LMS algorithm and its applications, multi-rate signal processing fundamentals and Wavelet Transform methods.

DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes - Ensemble averages, Stationary processes, Autocorrelation and Autocovariance matrices - Parseval's Theorem - Wiener-Khintchine Theorem - Power Spectrum, Spectral Factorization, Filtering random processes - Low Pass Filtering of White Noise - Parameter estimation: Bias and consistency. **(9)**

SPECTRUM ESTIMATION

Estimation of spectra from finite duration signals, Non-Parametric Methods - Correlation Method - Periodogram Estimator, Performance Analysis of Estimators - Unbiased, Consistent Estimators - Modified Periodogram, Bartlett and Welch methods, Blackman-Tukey method - Parametric Methods - AR, MA, and ARMA model based spectral estimation - Frequency Estimation - Yule-Walker equations, solutions using Durbin's algorithm. **(9)**

2. Gregory Timp, “Nanotechnology”, Springer-Verlag, 1999.

REFERENCE BOOKS

1. Charles P Poole, Frank J Owens, “Introduction to Nanotechnology”, John Wiley and Sons, 2003.
2. Bharat Bhushan, “Springer HandBook of Nanotechnology”, 2004.
3. Michael Kohler, Wolfgang, Fritzsche, “Nanotechnology: Introduction to Nanostructuring Techniques”, 2004.
4. Mark Ratner, Danial Ratner, “Nanotechnology: A Gentle Introduction to the Next Big Idea”,Pearson, 2003.
5. William Goddard, Donald W Brenner, “Handbook of Nano Science Engineering and Technology”, CRC Press, 2004.

MEASUREMENTS LABORATORY

OBJECTIVE

To gain knowledge about practical aspects of various Electronic instruments and Measurement techniques.

EXPECTED OUTCOME

On completion of this laboratory, students would have acquired adequate knowledge about the practical aspects of using electronic instruments for measuring various physical and electrical quantities.

LIST OF EXPERIMENTS

1. Measurement of displacement using LVDT.
2. Measurement of distance using LDR
3. Measurement of temperature using RTD.
4. Measurement of temperature using Thermocouple.
5. Measurement of force using Strain Gauge.
6. Measurement of pressure using Piezo-Electric Pick up.
7. Measurement of distance using Capacitive Pick up.
8. Measurement of distance using Inductive Pick up.
9. Measurement of Linearity of Potentiometer.
10. Measurement of resistance using Wheatstone bridge.
11. Measurement of capacitance using Desauty bridge.
12. Measurement of Inductance using Maxwell bridge.
13. Measurement of frequency and phase using CRO.
14. Calibration of Voltmeter & Ammeter using Standard meters.
15. Measurement of Instrumentation Amplifier characteristics.

MEASUREMENT USING LabVIEW

16. Transition Measurement using LabVIEW
17. Linear Algebra Calculator
18. Heat flow measurement
19. Vibration Analysis
20. Data Acquisition & Data logging

Total : 60

09CE49 - SCIENCE OF CREATIVITY AND PROFESSIONAL ETHICS

ASSESSMENT : THEORY

OBJECTIVE

To inculcate among the students the importance of spirituality, yoga and procedures to manage stress and strain and to impart the knowledge of professional and management skills.

EXPECTED OUTCOME

The students will be able to manage stress and strain in their profession in future. They will have knowledge of introspection procedures, practical considerations and guidelines for their living.

INTRODUCTION

Science of Creativity and Personality Development – Objectives - Evolution of the universe - **C**reation Theory – Evolution Theory – Theory of Permanence – Theory of Mithya – Big-Bang Theory – Static and Dynamic States – Etherial Particles - Panchabhudas – Evolution of life **-** Science and Spiritualism – Physical Transformation of Biomagnetism - Harmony in life – Self, Family,Society and nature - Cause and Effect System. **(9)**

LIFE FORCE, MIND AND CONCIOUSNESS

Life force – Origin – Potentiality of the life force – Pathway to realize universal force- Premordial state - Almighty – Mind – Existence and purpose of mind – Greatness and Mystery - Role of mind in shaping one's personality - Ten Stages – Totality – Wisdom – Consciousness – Sixth Sense – Action, Word and Deed– Six Temperaments. **(9)**

TECHNIQUES FOR SELF EVALUTION

Blockades for personality development – Six Impurities - Introspection – Analysis of thought – Moralization of desire – Eradication of worries – Neutralization of anger – Realization of self or actualization of the Universe – Understanding of Morality, Duty and Charity – Yoga - Different types - Kundalini Yoga – Nine centers – Removal of six imprints – Meditation

techniques - Raman spectroscopy - Surface analysis and depth profiling - Mechanical properties, electron transport properties, magnetic and thermal properties. **(8)**

INORGANIC SEMICONDUCTOR NANOSTRUCTURES

Quantum confinement in semiconductor nanostructures - Quantum wells, quantum wires, quantum dots, super lattices, band offsets and electronic density of states - Fabrication techniques: Requirements, epitaxial growth, lithography and etching, cleared edge overgrowth - Growth on vicinal substrates, Strain-induced dots and wires, Electrostatically induced dots and wires, Quantum well width fluctuations, Thermally annealed quantum wells - Self-assembly techniques. **(8)**

NANOSTRUCTURED MOLECULAR MATERIALS, DEVICES AND APPLICATIONS

Introduction - Building blocks - Principles of self-assembly, non-covalent interactions, intermolecular packing, nanomotors - Self assembly methods to prepare and pattern nanoparticles - Nanoparticles from micellar and vesicular polymerization - Functionalized nano particles, Colloidal nanoparticles crystals, Self-organizing inorganic nano particles, Bio-nanoparticles - Nanoobjects**,** Nanomagnetic materials - Particulate nanomagnets and geometrical nanomagnets - Magneto resistance - Probing nanomagnetic materials - Nanomagnetism in technology - Carbon nanotubes - Fabrication - Applications - Organic FET, organic LED's - Organic photovoltaics - Injection lasers, quantum cascade lasers, optical memories, electronic applications, colulomb blockade devices. **(11)**

Total : 45

TEXT BOOKS

1. Kelsall Robert. W, Ian Hamley, Mark Geoghegan, "Nanoscale Science and Technology", Wiley Eastern, 2004

09ECE06 - NANO SCIENCE AND TECHNOLOGY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To equip the student with relevant knowledge about nano science and technology and their applications.

EXPECTED OUTCOME

On completion of this course, the student will have relevant knowledge about nano science and technology and their applications.

INTRODUCTION AND CLASSIFICATION

Classification of nanostructures, nanoscale architecture - Effects of nanometre length scale: Changes to system total energy, changes to system structures, vacancies in nanocrystals, dislocations in nanocrystals - Effect of nanoscale dimensions on various properties: Structural, thermal, chemical, mechanical, magnetic, optical and electronic properties - Effect of nanoscale dimensions on biological systems. **(9)**

NANOMATERIALS AND CHARACTERIZATION

Fabrication methods - Top down processes: Milling, Lithographics and Machining - Bottom-up process: Vapour phase deposition methods, Plasma assisted deposition process, MBE and MOVPE, Liquid phase methods, Colloidal and Solgel methods - Methods of templating the growth of nanomaterials - Ordering of nanosystems, Self-assembly and Self-organization -Preparation, safety and storage issues. **(9)**

GENERIC METHODOLOGIES FOR NANOTECHNOLOGY

Characterization: General classification of characterization methods - Analytical and imaging techniques - Microscopy techniques: Electron microscopy, Scanning electron microscopy, Transmission electron microscopy, STM, Field ion microscopy, Scanning tunnelling microscopy, Atomic force microscopy - Diffraction techniques - Spectroscopy

and its benefits. **(9)**

HUMAN BODY

Body structure – Endocrine glands and Six Chakras – Seven Thadus – Health and Nature – Medicines - Understanding the Need, Habit, Environmental Conditions, Society and Evolutionary process of life – Physical Exercise and its Importance – Regulating food, work, rest, sex and thought. **(9)**

PROFESSIONAL ETHICS

Engineering Ethics – Variety of moral issues – Moral autonomy – Profession and Professionalism - Professional Ideals and Virtues – Engineers as responsible experimenters – Safety and Risk – Reducing risk – Collegiability and Loyalty – Professional Rights – Intellectual Property Rights – Multinational Corporations – environmental ethics – engineering as managers. **(9)**

Total : 45

TEXT BOOKS

1. Yogiraj Vethathri Maharishi, “Karma Yoga – The Holistic Unity”, Vethathri Publications, Forth Edition, 2004.
2. Mike Martin and Roland Schinzinger,”Ethics in Engineering”, McGraw Hill, NewYork 1996.

REFERENCE BOOKS

1. Charles D. Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
2. Laura Schlesinger, “How Could You Do That: The Abdication of Character, Courage, and Conscience”, Harper Collins, NewYork, 1996.

3. Stephen Carter, “Integrity”, Basic Books, NewYork, 1996.

4. Tom Rusk, “The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life”, Viking, NewYork, 1993.

5. Naagarazan R.S., “A Textbook on Professional Ethics and Human Values”, New Age International Publishers, NewDelhi, 2009.

- Memory Management - Time Management - Clock Ticks - Advantages and disadvantages of real time kernel **(10)**

INPUT-OUTPUT DEVICES

Keyboard basics - Keyboard scanning algorithm - Multiplexed LED displays - Character LCD modules - LCD module display - Configuration - Time-of-day clock - Timer manager - Interrupts - Interrupt service routines - IRQ - ISR - Interrupt vector or dispatch table multiple-point - Interrupt-driven Pulse Width Modulation.

(8)

APPLICATIONS

Wireless communication Protocols: Zigbee Protocols, Blue tooth Protocols, IrDA. **Case Study of Programming with RTOS: C**oding for Elevator Controller, Data Compressor, Software Modem, Alarm Clock, Telephone PBX, Inkjet printer, Personal Digital Assistants, Set-Top-Box, System-on-Silicon. **(9)**

Total : 45

TEXT BOOKS

1. Arnold Berger, “Embedded System Design: An Introduction to Processes, Tools, and Techniques”, CMP Books, First Edition, 2002.

2. Jean J. Labrosse, “Embedded Systems Building Blocks: Complete and Ready- To-Use Modules in C”, CMP Books, Second Edition, 2000.

REFERENCE BOOKS

1. Wayne Wolf, “Computers as Components” Morgan Kaufmann Publishers, Second Edition, 2005.

2. David E Simon, “An Embedded Software Primer”, Pearson Education Asia, Seventh Edition, 2009.

3. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, Second Edition, Tata McGraw-Hill, 2005.

09ECE05 ADVANCED EMBEDDED SYSTEM DESIGN

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study about embedded system design cycle, protocols, software tools, real time kernels, I/O devices and RTOS.

EXPECTED OUTCOME

On completion of this course, the student can understand the concepts of embedded system design cycle, protocols, software tools, real time kernels, I/O devices and RTOS.

PRINCIPLES OF EMBEDDED SYSTEM

Overview of Embedded system Architecture - Categories of Embedded Systems - Applications of Embedded System - Embedded Design Life Cycle: Product Specification, Hardware/Software Partitioning, Iteration and Implementation, Detailed Hardware and Software Design, Hardware Software Integration, Product Testing and Release, Maintenance and Upgrading Existing products. **(9)**

SPECIAL SOFTWARE DEVELOPMENT TOOLS

Manipulating the Hardware - Interrupts and Interrupt Service Routine - Watch dog timer - Flash memory - Host-based debugging - ROM Emulators, In-Circuit Emulators - Debug Kernels - Logic analyzer - BDM, JTAG and Nexus. **(9)**

REAL TIME SYSTEM CONCEPTS

Foreground / Background systems - Critical section of code - Resource - Shared Resource - Multitasking-task - Context switch - Kernal - Scheduler - Non-preemptive Kernels - Preemptive Kernels - Reentrancy - Reentrant Functions - Round Robin Scheduling - Task Priorities - Static Priorities - Mutual Exclusion - Deadlock - Intertask Communication - Message Mailboxes - Message Queues - Interrupts - Task Management

09EC51 - LINEAR INTEGRATED CIRCUITS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study about the building blocks and applications of various Linear Integrated Circuits.

EXPECTED OUTCOME

On completion of this course, the students will have thorough knowledge about the Operational Amplifier and the applications of various Linear Integrated Circuits.

DIRECT COUPLED AND DIFFERENTIAL AMPLIFIER

Direct coupled amplifier - Problems associated with DC amplifiers - Differential Amplifier (DA) - Differential Amplifier circuits analysis - DA using constant Current Source - Current mirror - Types of Current mirrors - Basic building blocks of 741 Operational amplifier - I/O stages and Gain stage of 741 Op-Amp - DC analysis and Small signal analysis of Op-Amp - Frequency Response of Op-Amp. **(9)**

OPERATIONAL AMPLIFIERS PARAMETERS AND APPLICATIONS

Op-Amp parameters: Slew rate - Power-bandwidth - Input offset voltage - Input Bias current - CMRR - Open loop Voltage gain - Output resistance - Differential input resistance.

Op-Amp applications: Inverting, Non Inverting amplifier - Summer - Voltage follower - Differentiator - Integrator - Differential Amplifier - Instrumentation Amplifier - Voltage to Current converter - Current to Voltage converter - Comparator - Schmitt Trigger - Window comparator - Precision rectifier - Logarithmic Amplifier - Antilog Amplifier. **(9)**

OSCILLATORS, MULTIVIBRATORS AND PLL APPLICATIONS

Analysis and Design of RC Phase shift Oscillator - Wien Bridge Oscillator - High frequency LC Oscillators - 555 Timer - Functional Diagram - Analysis and design of Astable Multivibrator - Monostable Multivibrator using 741 and 555 timer - Square and Triangular wave oscillators - 565 PLL operating principles - Building Blocks of PLL - PLL Applications - Frequency multiplier - FM detector - AM detector - FSK demodulator - Frequency Synthesizer - Phase detector. **(9)**

ACTIVE FILTERS AND SWITCHED CAPACITOR FILTERS

Butterworth filters - Active filters - Sallen-Key filter structures - Chebyshev filters -Comparison of Butterworth and Chebyshev Filters - Infinite Gain and Multiple Feedback filters (IGMF) - Design of filters - Switched capacitor Filters. **(9)**

SPECIAL PURPOSE INTEGRATED CIRCUITS

Voltage Regulators - Fixed, Adjustable Regulators - Switching voltage regulators - Dual Tracking Regulators - Voltage regulators using 723 - Audio power amplifier using LM 380 - Function generator ICL 8038 - D to A converter - Binary weighted Network - R-2R ladder network - 8-bit DAC 0808 - A to D converter - Successive Approximation -Counter Type - Dual slope - Flash ADC converter - ADC 0801. **(9)**

Total : 45

TEXT BOOKS

1. Somanathan Nair B., “Linear Integrated Circuits, Analysis, Design and Applications”, Wiley India Publishers, First Edition, 2009.
2. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, Prentice Hall of India, Forth Edition, 2000.

LINEAR PREDICTIVE CODING OF SPEECH

Principles of Linear Predictive analysis - Solution of LPC equations - Cholesky decomposition method - Durbin’s method - Lattice formulation and Solutions - Predictive Error signal - Frequency domain interpretation of Linear Predictive analysis - Synthesis of Speech - Applications of LPC parameters. **(9)**

HOMOMORPHIC SPEECH PROCESSING

Homomorphic Systems for Convolution - Complex Ceptrum of speech - Pitch detection - Formant Estimation - Homomorphic Vocoder - Speaker Recognition systems - Speech Recognition systems. **(9)**

Total : 45

TEXT BOOK

Rabiner L.R., Schafer R.W., “Digital Processing of Speech Signals”, Pearson Education-India, New Delhi, 2004.

REFERENCE BOOKS

1. Thomas F.Quuatied, “Discrete-Time Signal Processing”, Pearson Education-India, New Delhi, 2004.
2. Owens F.J, “Signal Processing of Speech”, Macmillan, New York, 1993.
3. Rabiner L.R. K JUang B.H, “Fundamentals of Speech Recognition”, Pearson Education India, New Delhi, 2003.
4. John.R.Deller, Jr.John Hansen, John G.Proakis, “Discrete Time Processing of Speech Signal”, IEEE Press, 2000.

09ECE04 - SPEECH SIGNAL PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the basic concepts of speech signal modeling and time domain & frequency domain methods of speech processing.

EXPECTED OUTCOME

On completion of this course, students will be able to understand basic concepts of speech signal modeling and time domain & frequency domain methods of speech processing.

SPEECH SIGNAL MODELLING

Digital Speech processing - Process of speech Production: Mechanism of Speech production, Acoustic phonetics - Acoustic theory of speech production: Sound propagation, Effect of losses in vocal tract, Effect of radiation at lips, Effect of nasal coupling - Lossless tube models - Digital models for speech signals. **(9)**

TIME DOMAIN METHODS FOR SPEECH PROCESSING

Time dependent processing of speech - Short Time Energy and Average Magnitude - Short Time Average zero crossing rate - Speech versus Silence discrimination using energy and zero crossings - Pitch period estimation using Parallel processing approach - Short time Autocorrelation function - Short time average magnitude difference function - Pitch period estimation using autocorrelation function - Median Smoothing and Speech processing. **(9)**

FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING

Short Time Fourier Analysis: Definitions, Properties - Design of Digital Filter banks - Implementation of Filter bank Summation method - Spectrographic Displays - Pitch Detection - Analysis by Synthesis - Analysis-Synthesis systems. **(9)**

REFERENCE BOOKS

1. David A.Johns, “Analog Integrated Circuit Design”, Wiley India Publishers, First Edition, 2009.
2. Botkar K.R., “Integrated Circuits”, Khanna Publishers, Second Edition, 2003.
3. Sonde B.S., “Introduction to System Design Using Integrated Circuits”, New Age International Publishers Ltd., 2003.
4. Roy Choudhury, Shail Jain, “Linear Integrated Circuits”, Wiley India Publishers, 2004.

09EC52 - DIGITAL COMMUNICATION

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVES

To study the principles of digital communication, baseband shaping for data transmission and digital modulation & demodulation and Spread Spectrum techniques.

EXPECTED OUTCOME

Upon completion of this course, students will be able to understand the principles of digital communication and Spread spectrum techniques.

PULSE DIGITAL MODULATION

Pulse Code Modulation (PCM) - Channel Noise and Error Probability - Quantization noise and Signal-to-Noise ratio - Robust Quantization - Differential Pulse Code Modulation (DPCM) - Delta Modulation - Delta Sigma Modulation - Limitation - Adaptive Delta Modulation - Coding Speech at low Bit Rates - Applications - Comparison of PCM and Delta Modulation. **(9)**

BASEBAND SHAPING FOR DATA TRANSMISSION

Signaling Formats - RZ, NRZ, Duo Binary, Split Phase (Manchester) and High Density Bipolar Coding - Scrambling and Unscrambling - Intersymbol Interference - Nyquist criterion for distortionless baseband binary transmission - Correlative Coding - Eye Pattern - Baseband M-ary PAM Systems - Adaptive Equalization for Data Transmission. **(9)**

BASEBAND DEMODULATION/DETECTION

Signals and Noise - Error performance degradation - Demodulation and Detection - Vectorial view of signals and noise - Basic SNR parameter - Detection of Binary Signals in Gaussian Noise - Maximum likelihood receiver structure - Matched Filter - Correlation realization of the Matched filter - Optimizing error performance - Error probability performance of binary signaling. **(9)**

DATA ACQUISITION

DAQ and Other Data Acquisition Acronyms - Connecting computer to real world - Signals 101 - Selecting and Configuring DAQ measurement Hardware - Understanding Analog and Digital I/O - NI-DAQmx Tasks - Advanced Data Acquisition. **(9)**

INSTRUMENT CONTROL IN LabVIEW

Instrumentation Acronyms - Connecting computer to Instruments - SCPI - VISA - Instrument control in LabVIEW - Advanced LabVIEW Structures and Functions. **(9)**

Total : 45

TEXT BOOK

Jeffrey Travis, Jim Kring, “LabVIEW for Everyone- Graphical Programming Made Easy and Fun”, Pearson Education, Third Edition, 2009.

REFERENCE BOOKS

1. Gary W. Johnson, Richard Jennings, “LabVIEW Graphical Programming”, Tata McGraw Hill, Forth Edition, 2006.
2. Barry Paton., “Sensor, Transducers and LabVIEW”, Prentice Hall, 2000.
3. Sanjay Gupta, Joseph John, “Virtual Instrumentation Using LabVIEW”, Tata McGraw Hill, First Edition, 2006.
4. LabVIEW Basics I & II Manual, National Instruments.

09ECE03 - VIRTUAL INSTRUMENTATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the LabVIEW basics & programming, execution, visual displays, File I/O, Data Acquisition and instrument control of Virtual Instrumentation.

EXPECTED OUTCOME

On completion of this course, students will be able to understand the LabVIEW basics & programming, execution, visual displays, File I/O, Data Acquisition and instrument control of Virtual Instrumentation.

LabVIEW BASICS

Front Panels - Block diagrams - LabVIEW- Projects - Sub VIs - Icon - Connector - Pull-down menus - Floating Palettes - Tollbar - Pop-up menus - Crating VIs - Basic Controls, Indicators and Fun Stuff They Do - Wiring Up - Running VI. **(9)**

LabVIEW PROGRAMMING AND EXECUTION

Loading and Saving VIs - Debugging Techniques - Creating Sub VIs - Documenting Work - Two Loops - Shift Registers - Case Structure - Dialogs - Sequence Structure-Flat or Stacked - Timing - Timed Structures - Formula Node - Expression Node - While Loop and Case Structure Combination - Arrays and Clusters. **(9)**

VISUAL DISPLAYS AND FILE I/O

Waveform Charts - Graphs - XY Graphs - Chart and Graph Components - Intensity Charts and Graphs - Time Stamps, Waveforms and Dynamic data - Mixed Signal Graphs - Exporting Images of Charts and Graphs - Strings and String Functions - Parsing Functions - File Input/Output. **(9)**

BANDPASS MODULATION AND DEMODULATION/DETECTION

Digital Bandpass Modulation Techniques - Phase Shift Keying - Frequency Shift Keying - Amplitude Shift Keying - Amplitude Phase Keying - Detection of Signals in Gaussian Noise - Decision regions - Correlation regions - Coherent Detection of PSK and FSK - Noncoherent Detection of DPSK and FSK - Probability of bit error for BPSK, BFSK and DPSK - Comparison of bit error performance for various modulation types - M-ary Signaling and Performance - Symbol Error Performance for M-ary Systems - Probability of symbol error for MPSK and MFSK - Symbol error probability. **(9)**

SPREAD SPECTRUM TECHNIQUES

Spread Spectrum - Advantages - Pseudonoise Sequences - Properties - Direct Sequence Spread Spectrum Systems - Processing gain and performance - Frequency Hopping Systems - Fast Hopping versus Slow Hopping - FFH/MFSK demodulator - Processing gain - Synchronization - Acquisition - Tracking - Jamming Considerations - Jamming game - Broadband noise Jamming - Partial band noise Jamming - Multiple tone Jamming - Pulse Jamming - Repeat back Jamming - Code Division Multiple Access. **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Bernard Sklar, “Digital Communications: Fundamentals and Applications”, Pearson Education, Second Edition, 2001.
2. Taub and L.Schilling, “Principles of Communication”, McGraw Hill International Student Edition, Third Edition, 2008.

REFERENCE BOOKS

1. Simon Haykin, “Digital Communications”, John Wiley, Student Edition, 2004.
2. H.P.Hsu, “Schaum’s Outlines - Analog and Digital Communication”, Tata McGraw Hill, Second Edition, 2006.
3. Lathi B.P, “Modern Digital and Analog Communication Systems”, Oxford University Press, New Delhi, Third Edition, 2005.
4. Roy Blake, “Electronic Communication Systems”, Thomson Delmar, Second Edition, 2002.
5. Sam K Shanmugam, “Digital and Analog Communication Systems”, Forth Edition, John Wiley, New York, 2002.

INVENTORY CONTROL

Need for the inventory - Costs involved in inventory - Concepts of average inventory, economic order quantity - Deterministic model: Fixed ordering quantity models - EOQ model with uniform demand, finite / infinite replacement with / without shortages - Dynamic ordering quantity model, EOQ with one price break - Inventory control - Buffer stock - Determination of optimum buffer stock - EOQ system of ordering - Multi item order model - ABC analysis. **(10)**

REPLACEMENT THEORY

Replacement theory - Equipment replacement policies in deterministic cases - Replacement in anticipation of failure - Group Replacement Policy. **(7)**

NETWORK SCHEDULING

Scheduling techniques - Network diagrams - Network calculations - Critical path method - PERT calculations - Optimistic, Pessimistic and most likely time - Cost analysis - Least Cost Schedule. **(8)**

QUEUING THEORY AND SIMULATION

Queuing Theory (waiting line model) - Introduction to Queuing system - Characteristics of queuing systems - Single server model - Performance evaluation - **Simulation** - Monte-carlo method - Application to queuing problems. **(7)**

Total : 55

TEXT BOOKS

1. Hamdy A.Taha, “Operations Research - An Introduction”, Pearson Publications, 7th Edition, Third Indian Reprint, 2004.
2. S.D.Sharma “Operations Research”, Kedar Nath Ram Nath & Co., Publishers, 1996.
3. Verma A.P., “Operation Research”, Kataria S.K. & Sons, Third Edition, 2006.

09ECE02 - RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the concepts of mathematical modeling of decision problems, the design of optimization techniques for solving mathematical models and decision making based on obtained solutions.

EXPECTED OUTCOME

The knowledge of resource management technique will help the decision makers to analyze any decision situation and offer solutions for the best utilization of limited resources and to improve the efficiency and productivity of organizations.

LINEAR PROGRAMMING

Development of operations research - Modelling - Structure of mathematical models - Definition and properties of linear programming problems - Canonical and standard forms - Graphical solution of two variable linear programming problems - Simplex method - Optimality and feasibility conditions - Computational procedure. **(7)**

DUALITY THEORY AND APPLICATIONS

Definition of dual problem - Primal and dual properties - Assignment models - Hungarian Technique - Transportation problem **-** Initial solution - Least Cost Method - Vogels approximation method - Balanced and unbalanced problems - Degenerate solutions. **(8)**

DYNAMIC PROGRAMMING

Characteristics of dynamic programming model - Bellman's principle of optimality - Formulation of dynamic programming model - Forward and backward computations. Applications - Stage coach problem - Resource allocation problem - Cargo loading problem - Inventory - Replacement problem. **(8)**

09EC53 - MICROPROCESSORS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVES

To study the features of microprocessors and assembly language programming.

EXPECTED OUTCOME

Upon completion of this course, students will be able to understand the architecture of microprocessors and assembly language programming.

ARCHITECTURE OF 8085 MICROPROCESSOR

Functional Block Diagram - Registers, ALU, Bus systems - Timing and control signals - Machine cycles and timing diagrams - Interrupts - Programming of 8085 - Instruction formats - Addressing modes - Instruction set - Need for Assembly language - Assembly language programs. **(9)**

PERIPHERAL INTERFACING

Interfacing requirements - Memory mapped I/O, I/O mapped I/O, Interfacing memory chips - Bus contention - 8255 PPI, 8279 keyboard and display controller, 8257 DMA controller, 8251 USART - Interrupt controller 8259 - Serial I/O standards RS232C, RS422A and IEEE 488. (**9)**

ARCHITECTURE OF 8086 MICROPROCESSOR

Intel 8086 Internal Architecture - 8086 addressing modes- Instruction set - 8086 assembly language Programming - Interrupts. **(9)**

ARM ARCHITECTURE

Acorn RISC Machine - Architecture Inheritance - ARM Programming Model - ARM Development Tools - Three and Five Stage Pipeline ARM Organization - ARM Instruction Execution and Implementation - ARM Co-Processor Interface. **(9)**

ARM ASSEMBLY LANGUAGE PROGRAMMING

ARM Instruction Types - Data Transfer, Data Processing and Control Flow Instructions - ARM Instruction Set - Co-Processor Instructions. **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publishing (India), Mumbai, 2007.
2. Douglas V Hall, "Microprocessors and Interfacing" Tata McGraw Hill Book Company, Second Edition, 2005.

REFERENCE BOOKS

1. Mathur A.P., "Introduction to Microprocessors", Tata McGraw Hill Book Company, Third Edition, 1998.
2. Barey B Brey, "The Intel Microprocessor Architecture Programming and Interfacing", Pearson Education, Seventh Edition, 2006.
3. Steve Furber, "ARM System on Chip Architecture" Addison Wesley Professional, Second Edition, 2000.
4. Andrew N.Sloss, Dominic Symes and Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Morgan Kaufmann Publishers, First Edition, 2004.
5. John Uffenbeck, "The 80x86 Family, Design, Programming and Interfacing", Pearson Education, Third Edition, 2002.

SYSTOLIC ARCHITECTURE DESIGN

Introduction - Systolic array design methodology - FIR systolic arrays - Selection of scheduling vector - Matrix Multiplication and 2D systolic array Design - Systolic design for space representations containing Delays. **(9)**

FAST CONVOLUTION

Introduction - CookToom algorithm - Winograd algorithm - Iterated convolution - Cyclic convolution - Design of fast convolution Algorithm by Inspection. **(9)**

Total : 45

TEXT BOOK

Keshab K.Parhi, "VLSI Digital Signal Processing Systems: Design and Implementation", Wiley, 2007.

REFERENCE BOOKS

1. Geiger, Randall L, and Allen, Phillip E., Strader, Noel K., "VLSI Design Techniques for Analog and Digital Circuits", McGraw-Hill, New York, 1990.
2. Haskard, Malcom R., May, Lan C., "Analog VLSI Design - NMOS and CMOS", Prentice Hall of Australia, 1998.
3. Yeap, Gary, "Practical Low Power Digital VLSI Design", Kluwer Academic Publishers, Boston, 1998.

09ECE01 - VLSI SIGNAL PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the Mixed signal design concepts of CMOS circuits, Analog VLSI systems, pipelined and parallel processing and their industrial applications.

EXPECTED OUTCOME

On completion of this course, the students will understand Mixed signal design concepts of CMOS circuits, Analog VLSI systems, pipelined and parallel processing and their industrial applications.

ANALOG VLSI SIGNAL PROCESSING

Continuous Time Signal Processing: Mixed-Signal VLSI Chips - Basic CMOS Circuits - Basic Gain Stage - Gain Boosting Techniques - Super MOS Transistor - Introduction to Primitive analog cells - Linear voltage - Current converters - MOS multipliers - MOS Resistors - Amplifier based signal processing. **(9)**

CURRENT MODE SIGNAL PROCESSING

Introduction - Sampled data signal processing - Switched current Data Converters - Practical consideration in VLSI circuits - Design example. **(9)**

DIGITAL VLSI SIGNAL PROCESSING

Pipelining and parallel processing: Introduction - Pipelining of FIR Digital filters - Parallel processing - Pipelining and parallel processing for Low Power - Low Power Design - Needs for low power VLSI chips, charging and discharging capacitance, short circuit current of an inverter, CMOS leakage current, basic principles of low power design. **(9)**

09EC54 - DIGITAL SIGNAL PROCESSING

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study in detail about Discrete Fourier Transform, design of Digital filters, Effect of finite register length in Digital filters, multirate signal processing and about Digital signal processors.

EXPECTED OUTCOME

On completion of the course, the students will be able to know the basic concepts of Discrete Fourier Transform, design of digital filters and about multirate signal processing and its applications.

DISCRETE FOURIER TRANSFORM

Discrete Fourier Transform (DFT) - Properties of DFT - Digital filtering method using DFT - Linear and Circular Convolution, Overlap add and Overlap save method - Fast Fourier Transform - Radix-2 FFT - Properties - Decimation in Time - Decimation in Frequency - Data shuffling and bit reversal - Computation of IDFT using DIT and DIF. **(9)**

DIGITAL FILTERS

Approximation of analog filters - Design of Butterworth and Chebyshev filters- Frequency transformation - Properties of IIR filters - IIR filter design - Bilinear transformation and Impulse invariant transformation - Characteristics of FIR filters - Frequency response of Linear phase FIR filters - Design of FIR filters - Fourier series method - Window functions - Recursive, Non recursive filters - Digital filter realization - Direct, canonic, cascade, parallel and ladder realizations. **(10)**

EFFECTS OF FINITE REGISTER LENGTH

Number representation - Effect of Quantization - Product Quantization - Coefficient Quantization - Limit cycle Oscillations - Signal scaling - Finite Register length effects in FIR, IIR filters and DFT computations. **(8)**

MULTIRATE DIGITAL SIGNAL PROCESSING

Decimation - Interpolation - Sampling rate Conversion by a Rational factor - Filter design and implementation of Sampling rate Converters - Multistage implementation of sampling rate converters - Application to sub band coding - Quadrature Mirror filter banks. **(9)**

DIGITAL SIGNAL PROCESSORS

Introduction to DSP architecture - Harvard architecture - Fixed point and Floating point processors – Basics of TMS320C67X processors and Analog Devices. **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Ludeman L C, “Fundamentals of Digital Signal Processing”, John Wiley, Singapore, 1992.
2. Sanjit. K. Mitra, “Digital Signal Processing - a Computer Based approach”, Tata McGraw Hill, Second Edition, 2005.

REFERENCE BOOKS

1. Ifeacher E.C. & Jervis B.W., “Digital Signal Processing: A Practical Approach”, Pearson Education, Second Edition, 2002.
2. Monson H Kayes, “Schaum’s Outlines - Digital Signal Processing”, McGraw Hill, 1998.

3. Study of Fiber Optic Analog link’s characteristics.
4. Study of Fiber Optic Digital link’s characteristics and Pulse broadening.
5. Electromagnetic/ RF interference in OFC and copper media.
6. Measurement of speed of light.

NETWORKS LAB

1. PC to PC communication.

   Parallel communication using 8-pin Parallel cable – Serial communication using RS-232.
2. Ethernet LAN protocol – To simulate and study the performance of CSMA/CD protocol.
3. To simulate and study the performance of Token Bus and Token Ring protocol.
4. Wireless LAN protocol – To simulate and study the performance of network with CSMA/CA protocol and compare with CSMA/CD protocol.
5. Implementation and study of Stop and Wait protocol.
6. Implementation and study of Go back-N and Selective Repeat protocol.
7. Implementation of Distance Vector Routing Algorithm.
8. Implementation of Shortest Path Algorithm.
9. Implementation of Least Cost Routing Algorithm.
10. Implementation of Link state Routing Algorithm.
11. Implementation of Data Encryption and Decryption.
12. Transfer of files from PC to PC using Windows/Unix Socket programming.

Total : 60

09EC87 - RF, FIBER OPTICS AND NETWORKING LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

OBJECTIVE

To study the characteristics and test the performance of various microwave devices, components, microwave communication systems, fiber optic communication systems & its components and various protocols used in computer networks.

EXPECTED OUTCOME

On completion of this lab course the students will be able to understand the characteristics and performance of various microwave devices, components, microwave communication systems, fiber optic communication systems & it's components and various protocols used in computer networks.

LIST OF EXPERIMENTS

RF LAB

1. Characteristics of Isolator, Circulator, Magic Tee and Directional coupler.
2. Mode characteristics of Reflex Klystron.
3. Measurements of VSWR and unknown impedance.
4. Measurement of Dielectric constant of solid dielectric.
5. Radiation pattern of antennas.
6. Study of Microstripline and antenna.
7. Study of Satellite Communication system through trainer kit.
8. Study of Mobile Phone system through trainer kit.

FIBER OPTICS LAB

1. Measurement of Numerical Aperture.
2. Losses in optic fiber.

3. Fliege N.J., "Multirate Digital Signal Processing", John Wiley, 2000.
4. Oppenheim A.V., Schafer R.W. & Buck J.R., "Discrete - Time Signal Processing", Prentice Hall Signal Processing Series, Second Edition, 1999.
5. Proakis J.G., Manolakis D.G, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, Third Edition, 1996.
6. Vinay K Ingle & John Proakis, "Digital Signal Processing Using Matlab", Brooks / Cole, Second Edition, 2006.

09EC55 - OBJECT ORIENTED PROGRAMMING IN C++ AND DATA STRUCTURES

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study the principles of Object Oriented Programming and concepts of C++, design algorithms to solve practical problems.

EXPECTED OUTCOME

Upon completion of this course, students will have knowledge about Object Oriented Programming, data structures and C++. They will be able to design different algorithms to solve practical problems.

INTRODUCTION AND PRINCIPLES OF OBJECT ORIENTED PROGRAMMING

Principles: Conventional programming versus object oriented programming - Data abstraction - Encapsulation - Inheritance - Polymorphism - Benefits of Object Oriented systems.

Introduction: Tokens - Expressions - Control Structures - Functions in C++ - Classes and Objects - Constructors and Destructors - Operator Overloading and type conversions. Inheritance - Extending classes - Manipulating strings. **(9)**

POLYMORPHISM, I/O STREAMS AND FILE HANDLING TECHNIQUES

Pointers - Virtual functions and polymorphism - File Handling Templates - Exception handling. **(9)**

LINEAR DATA STRUCTURES & ALGORITHMS

Algorithm analysis - Lists, Stacks and queues - Priority queues: Models - Simple implementations - Binary Heap - Hashing. **(9)**

NONLINEAR DATA STRUCTURES & ALGOTRITHMS

Trees - implementation of trees - Tree Traversals - Binary trees - Search tree ADT - AVL trees - Splay Trees - Graph Algorithms - Definition -

DIGITAL SIGNAL PROCESSING

- Generation of waveforms
- Convolution and correlation
- DFT, IDFT and FFT
- FIR filter design
- IIR filter design
- Multirate Signal Processing
- Convolutional encoding and decoding
- Experiments using DSP Kit
  - – Convolution and Correlation using DSP Starter kits
  - – DFT and FFT Calculation using DSP Starter kits
  - – FIR and IIR filter design using DSP Starter kits
- Image Processing.
  - – Histogram
  - – Watermarking
  - – Edge Detection
  - – Transforms
  - – Convolution

09EC86 - COMMUNICATION & DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

OBJECTIVE

To provide the students with a practical exposure to design and testing of analog and digital communication circuits & systems, digital signal processing and it's applications.

EXPECTED OUTCOME

After completion of the experiments, the students will get exposure to design and testing of analog and digital communication circuits & systems, digital signal processing and it's applications.

LIST OF EXPERIMENTS

ANALOG COMMUNICATION

- AM Generation
- AM Detector and AGC
- Radio receiver characteristics
- Balanced Modulator
- FM Detector
- Simulation of Analog Communication System

PULSE MODULATION

- PAM and Verification of sampling theorem
- PWM and PPM generation and detection

DIGITAL COMMUNICATION

- Delta modulator
- FSK Generation
- PCM encoder and decoder
- Simulation of Digital Communication System

Topological sort - Shortest path algorithm - Network flow problems - Minimum spanning tree. **(9)**

SORTING AND SEARCHING

Searching: Binary search - Linear search - Fibonacci search - Sorting: Insertion sort - Shell sort - Heap sort - Merge sort - Quick sort - Indirect sorting - Bucket sort. **(9)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education Asia, Third Edition, 2007.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Ltd., Forth Edition, 2008.

REFERENCE BOOKS

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley Student Edition, 2007.
2. John R.Hubbard, "Schaum's Outlines Programming with C++", Tata McGraw Hill, Second Edition, 2000.
3. Jean - Paul Tremblay & Paul G.Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill Edition, Second Edition, 2007.
4. John R.Hubbard, "Schaum's Outline of Theory and Problem of Data Structure with C++", McGraw-Hill, New Delhi, 2000.
5. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publication, Third Edition, 2006.

09EC56 - ELECTROMAGNETIC FIELDS AND WAVEGUIDES

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study the basic concepts of electrostatic & magnetostatic fields, time varying fields, wave propagation through various media.

EXPECTED OUTCOME

On completion of this course, the student will have a thorough knowledge about the various concepts and fundamentals of electrostatic fields, magnetostatic fields and propagation of electromagnetic waves in bounded and unbounded media.

ELECTROSTATIC FIELDS

Fundamentals of vector calculus - Introduction to electrostatic fields - Coloumb's law and field intensity - Electric fields due to continuous charge distributions - Electric flux density - Gauss's law - Maxwell's equation - Applications of Gauss's law - Electric Potential - Relationship Between E and V - Flux Lines - Energy Density - Conductors - Boundary Conditions in Electrostatic Fields - Laplace and Poisson's Equations - Application Note: Capacitance of Micro-strip lines. (**10)**

MAGNETOSTATIC FIELDS

Biot-Savart's law - Ampere's Circuital law - Applications - Magnetic Flux Density and Equations - Magnetic Scalar and Vector Potentials - Derivations - Magnetic Torque and Moment - Boundary Conditions - Magnetic Energy - Application Note: Mag Levitation. **(9)**

TIME VARYING EM FIELDS AND WAVE PROPAGATION

Faraday's law - Motional Electromotive Forces - Displacement Current - Maxwell's Equations in Final Form - Time Varying Potentials - Time Harmonic Fields - Wave Propagation in Lossy Dielectrics - Plane Waves in Lossless Dielectric, Free Space and Good Conductors - Power and

TEXT BOOK

Rafael C.Gonzalez & Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.

REFERENCE BOOKS

1. Anil.K.Jain, "Fundamentals of Digital image Processing", Prentice Hall of India, 1995.
2. Kenneth. R. Castleman, "Digital Image Processing", Pearson Education, Second Edition, 2008.
3. Sid Ahmed M.A., "Image Processing - Theory, Algorithm and Architecture", McGraw Hill, 2009.
4. William K.Pratt, "Digital Image Processing", John Wiley, Fourth Edition, 2006.
5. Jayaraman S, Esakkirajan S & Veerakumar T, "Digital Image Processing", Tata McGraw Hill, 2009.

IMAGE COMPRESSION

Coding redundancy - Spatial and temporal redundancy - irrelevant information - Measuring image information - Fidelity criteria - Image compression models - Image formats, compression standards - Lossless compression: Huffman coding, Golomb coding, Arithmetic coding, Variable length coding, LZW coding, Bit plane coding and Lossless predictive coding - Lossy compression : Lossy predictive coding, Block transform coding, Scalar and Vector Quantization/Wavelet Coding. **(9)**

IMAGE SEGMENTATION AND REPRESENTATION

Image segmentation: Point detection- line detection - Edge detection - Edge linking and boundary detection - Thresholding: Global, Optimal, Multiple and Variable - Region based segmentation: Region growing by pixel aggregation - Region splitting and merging.

Image representation: Chain code - Polygonal approximation - Signatures - Boundary segments - Skeletons. **(9)**

DESCRIPTION AND RECOGNITION

Boundary descriptors: Simple descriptors, Shape numbers, Fourier descriptors, Statistical moments - Regional Descriptors: Simple descriptors, Topological descriptors, Texture -Relational descriptors.

Object Recognition: Pattern and pattern classes - Recognition based on Decision - Theoretical methods: Matching, Optimum statistical classifiers, Neural Networks - Structural methods: Matching shape numbers, String numbers. **(8)**

Theory : 45

Tutorial : 15

Total : 60

Poynting Vector - Reflection of a Plane Wave at Normal Incidence and Oblique Incidence - Application Note: Microwaves. **(10)**

PARALLEL PLATE AND RECTANGULAR WAVEGUIDES

Transverse Electromagnetic Waves ,Transverse Magnetic Waves, Transverse Electric Waves - TM Waves between Parallel Plates - TE Waves between Parallel Plates - Energy-Transport Velocity - Attenuation - TM waves in Rectangular Waveguides - TE waves in Rectangular Waveguides - Attenuation - Discontinuities in Rectangular Waveguides. **(8)**

CIRCULAR WAVEGUIDES AND CAVITY RESONATORS

Bessel's Differential Equation and Bessel Functions - TM Waves in Circular Waveguides - TE Waves in Circular Waveguides - TM Waves along a Dielectric Slab - TE Waves along a Dielectric Slab - Rectangular Cavity Resonators - Quality Factor of Cavity Resonator - Circular Cavity Resonator. **(8)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOKS

1. Mathew.N.O.Sadiku, "Elements of Electromagnetics", Oxford University Press, Fourth Edition, 2009.
2. David .K.Cheng, "Field and Wave Electromagnetics", Pearson Education, Second Edition, 2007.

REFERENCE BOOKS

1. Jordan E.C., and Balmain K.G., "Electromagnetic Waves and Radiating Systems", Prentice Hall of India Pvt Ltd, Second Edition, 2005.

2. Joseph A.Edminister,"Schaum's Outlines - Electromagnetics", Tata McGraw Hill, Second Edition, 1995.

3. Karl E.Longman and Sava V.Savov, "Fundamentals of Electro-Magnetics", Prentice Hall of India, 2006

4. Kraus, Fleisch, "Electromagnetics with Applications", McGraw-Hill, 2005.

5. Nannapaneni Narayana Rao, "Engineering Electro Magnetics", Prentice Hall of India, Sixth Edition, 1999.

09EC83 - DIGITAL IMAGE PROCESSING

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamentals of digital images and different techniques in Digital Image Processing such as Image Enhancement, Transformations, Segmentation, Compression & Restoration, Representation, Description and Recognition.

EXPECTED OUTCOME

On completion of this course, the students will have in-depth knowledge on the fundamentals of digital images and different techniques in Digital Image Processing such as Image Enhancement, Transformations, Segmentation, Compression & Restoration, Representation, Description and Recognition.

DIGITAL IMAGE FUNDAMENTALS & TRANSFORMS

Fundamental steps in image processing - Components of an image processing system - Elements of visual perception - Image sampling and Quantization - Basic relationship between pixels. **Image Transforms**: 2D DFT - Discrete Cosine Transform, Hadamard Transform, Walsh transform, Haar, Slant and Karhunen Loeve Transform. **(9)**

IMAGE ENHANCEMENT & RESTORATION

Image Enhancement: Basic intensity transformation functions - Histogram processing: Equalization, Specification - Smoothing spatial filters - Sharpening spatial filters - Frequency domain filters: Smoothing and sharpening.

Image Restoration: Model of image degradation - Noise Models - Spatial Filtering: Mean, Order statistics, Adaptive Filters - Frequency Domain Filtering: Band pass, Band reject, Notch/ filters, Optimum notch filtering - Linear position invariant degradations - Inverse filtering - Wiener filtering - Constrained least square filtering - Geometric mean filter. **(9)**

REFERENCE BOOKS

1. Siva Ram Moorthy C., and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, Prentice Hall of India, First Edition, 2002.
2. Rajiv Ramaswami and Kumar N. Sivarajan, Galen Sasaki “Optical Networks : A Practical Perspective”, Elsevier Science Ltd, 2009, Third Edition, 2009
3. Biswanath Mukherjee, “Optical WDM Networks”, Springer Series, 2006.
4. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.

09EC61 - DATA AND VOICE COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the concepts of various contemporary data and voice communication networks including the computer based data networks and circuit switched voice networks.

EXPECTED OUTCOME

On completion of this course, the student will become thoroughly knowledgeable on the various concepts, principles and standards relevant to contemporary digital networks for data and voice communication.

INTRODUCTION TO NETWORKS

Definition of layers, services, interface and protocols - OSI model - Layers and Duties - TCP/IP reference model - Layers and Duties - Physical layer: characteristics, general description - Data and Signals - Transmission Media Types. **(7)**

DATA LINK LAYER AND NETWORK INTERCONNECTION

Logical link control functions - Framing, Flow Control, Error Control, CRC - Protocols: ARQ, HDLC, Point-to-point - Medium Access layer - Random access - Controlled access - Channelization - LAN Protocols: IEEE Standards-802.3, 802.4, 802.5 - Internetworking, Interconnection issues - Connecting devices: Repeaters, Hubs, Routers, Switches and Gateways - Virtual LANs. **(8)**

NETWORK PROTOCOLS & UPPER OSI LAYERS

Internet Protocols, Internet ProtocolV4, Internet ProtocolV6 - Address Resolution Protocol (ARP) - Reverse Address Resolution Protocol (RARP) - Internet Control Message Protocol (ICMP) - Internet Group Management Protocol (IGMP) - Process-to-process delivery - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - Stream Control

Transmission Protocol (SCTP) - Teletype Network (TELNET) - Simple Mail Transfer Protocol (SMTP) - File Transfer Protocol (FTP) - Hyper Text Transfer Protocol (HTTP) - Simple Network Management Protocol (SNMP). **(11)**

TRAFFIC ENGINEERING, ROUTING TECHNIQUES & CONGESTION CONTROL

Traffic Engineering fundamentals - Parameters - Busy Hour, BHCA, CCR, BHCR, GOS & Blocking probability - Forwarding and Routing techniques - Optimization - Distance Vector Routing - Link State Routing - Least Cost Routing - Virtual Private Network - Multi Protocol Label Switching - OSPF - Congestion control - QOS. **(10)**

DIGITAL SWITCHING FOR VOICE & VoIP

Space Division switching - Time Division switching - Two Stage and Multi stage switches - STS and TST switches - Digital Cross connect systems - Signalling techniques - DTMF Signalling - Channel Associated Signaling - Common Channel Signaling - Introduction to SS7 standard - VoIP - SIP - H.323 Standard. **(9)**

Total : 45

TEXT BOOKS

1. Behrouz.A. Forouzan, “Data Communication and Networking”, Tata McGraw Hill, Fourth Edition, 2007.
2. John C. Bellamy, “Digital Telephony”, John Wiley, Third Edition, 2006.

REFERENCE BOOKS

1. Stallings.W, “Data and Computer Communication”, Prentice Hall of India, Eighth Edition, 2007.
2. Ed Tittle,”Schaum’s Outlines - Computer Networking”, Tata McGraw Hill, Second Edition, 2008.

OPTICAL NETWORK ARCHITECTURES

Introduction to Optical Networks - SONET - SDH - Metro Networks - Layered Architecture - Broadcast and Select Networks - Topologies for Broadcast Networks - Media Access Control Protocols - Testbeds for Broadcast & Select WDM - Wavelength Routing Architecture. **(9)**

WAVELENGTH ROUTING NETWORKS

Optical layer - Light path topology Design - Cost trade-off - Routing and Wavelength assignment - Wavelength conversion - Virtual topology Design - Wavelength re-routing - VPN over WDN optical networks. **(8)**

PACKET SWITCHING AND ACCESS NETWORKS

Photonic Packet Switching - OTDM - Multiplexing and Demultiplexing - Synchronization - Broadcast OTDM networks - Switch based networks - Access Networks - Network Architecture overview - Future Access Networks - Optical Access Network Architectures: G.709 OTN, Gigabit-capable Passive Optical Network (GPON) , Ethernet Passive Optical Network (EPON), Broadband Passive Optical Network (BPON) - OTDM networks. **(10)**

Total : 45

TEXT BOOKS

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, Morgan Kaufmann, Second Edition, 2002.
2. Gerd Keiser, “Optical Fiber Communication” McGraw-Hill International, New Delhi, Forth Edition, 2008.

09EC82 - OPTICAL COMMUNICATION AND NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the basic concepts of optical fibers, the principles of operation of optical transmission system and it's components , the concepts of optical networks, the concepts of wavelength routing networks and the principles of operation of photonic packet switching and access networks.

EXPECTED OUTCOME

On completion of this course, the student will become thoroughly knowledgeable on the fundamentals, concepts and principles of operation of various optical fibre based communication systems and networks.

INTRODUCTION TO OPTICAL FIBERS

Elements of an Optical Fiber Transmission link - Optical Fiber Modes and Configurations - Single mode fiber - Graded index fiber structure - Signal Degradation in Optical Fibers: attenuation, distortion - Optical Sources: LEDs, Laser Diodes - Detectors: PIN diode, APD. **(9)**

OPTICAL SYSTEM COMPONENTS AND TRANSMISSION SYSTEM

Non-Linear effects - Solitons - Optical Components: Couplers, Isolators, Circulators, Multiplexers & Filters - Optical Amplifiers - Switches - Wavelength Converters.

Transmission System Engineering - System model - Power penalty - Transmitter - Receiver - Optical amplifiers - Crosstalk - Dispersion - Wavelength stabilization - Overall design considerations. **(9)**

3. Flood J.E., "Telecommunication Switching, Traffic and Networks", Pearson Education, First Edition, 2006.

4. Tanenbaum .A.S, "Computer Networks", Prentice Hall of India, Fourth Edition, 2003.

5. Srinivasan Keshav, "An Engineering Approach to Computer Networking", Addision Wesley Professional, 2009.

09EC62 - EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVES

To study the principles, process models, and practical methods for developing embedded systems design.

EXPECTED OUTCOME

Upon completion of this course, students will be able to understand the interfacing techniques, system programming and task management needed for developing Embedded Systems.

INTRODUCTION TO EMBEDDED SYSTEMS & ARCHITECTURE OF 8051

Definition and Classification - Overview of Processors and Hardware units in Embedded system - Software Embedded into the System - Exemplary Embedded systems.

8051 Instruction set - Addressing modes - Assembly language programming - I/O port programming - Timer and counter programming - Serial Communication - Interrupt Programming - 8051 interfacing: LCD, ADC, Sensors, Stepper Motors, Keyboard and DAC. (**11)**

DEVICES, BUSES AND DEVICE DRIVERS

Devices and Communication Buses for Device Networks - Device Drivers and Interrupt Servicing Mechanism. (**8)**

PROGRAM MODELLING TECHNIQUES

Program models - DFG model - State machine programming models for event controlled program flow - Modeling a multiprocessor system - UML modeling - Inter process communication and Synchronization of process, Threads and Tasks. **(11)**

Objectives - Job Analysis - Recruitment - Selection and Placement and Training Development. **(9)**

MARKETING AND INSURANCE

Marketing - Definition , Aims, Need for Marketing - Marketing function - Marketing management and its functions - Marketing versus Selling - Concept of Insurance - Life Insurance, Fire Insurance, Marine Insurance. **(9)**

Total : 45

TEXT BOOK

Mehta P.L., “Managerial Economics”, S.Chand & Co, 2007.

REFERENCE BOOKS

1. Varshney R.L., and Maheswari K.L., “Managerial Economics”, S.Chand & Co, 2007.
2. Khanna O.P., “Industrial Engineering and Management”, Dhanpat Rai Publication (P) Ltd-2006.

09EC81 - INDUSTRIAL ECONOMICS AND CORPORATE MANAGEMENT

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVES

To introduce the students the basic principles governing the industrial management and corporate management.

EXPECTED OUTCOME

The Learners will have a sound understanding of the determinants of market supply and Demand, the process of obtaining market equilibrium in competitive market and how prices are determined in various other market structures which in turn comprehend the basic pricing strategies and principles.

ECONOMICS

Definition - Relationship between Economics and Engineering - Demand Analysis and Supply Analysis, Elasticity of Demand and Supply - Cost of Production - Break-even Analysis - Pricing under perfect competition, monopoly and monopolistic market. **(9)**

INDUSTRIAL FINANCE AND ACCOUNTING

Need for Finance, Types of Finance - Sources of Finance - Contribution of various sources of Finance in Indian Situation - Stock market. **(9)**

MONEY AND EMPLOYMENT

Estimation of National Income, Methods and Problems - Inflation and Deflation – Unemployment - Money and Changes in Value of Money, Commercial Banks, Central Banking - New Economic Environment - Privatisation, Liberalisation and Globalisation - Importance of Patent Rights. **(9)**

HUMAN RESOURCE MANAGEMENT

Principles of Management, Evolution of Management, Development of Managerial Skills - Human Resource Management - Importance -

RTOS

Real Time Operating System Concepts - Task and Task states - Tasks and Data - Semaphores and shared Data - Message Queues - Mailboxes and Pipes - Timer functions - Events - Memory management - Interrupt routines in an RTOS environment - RTOS Programming Tools: Micro C/OS-II. **(9)**

EMBEDDED SOFTWARE DEVELOPMENT PROCESS AND TOOLS

Introduction - Host and Target Machines - Linking and Locating Software - Getting Embedded Software into the Target system - Issues in Hardware - Software design and co-design.

Testing, Simulation and Debugging Techniques and Tools: Testing on Host machine - Simulators - Integrated Development Environment. **(6)**

Total : 45

TEXT BOOK

Raj Kamal, “Embedded Systems Architecture, Programming and Design”, Second Edition, Tata McGraw Hill, 2008.

REFERENCE BOOKS

1. David E Simon, “An Embedded Software Primer”, Addison Wesley, Seventh Edition, 2009.
2. Kenneth J Ayala, “The 8051 Micro Controller Architecture, Programming and Applications”, Penram International, Third Edition, 2007.
3. Steve Heath, “Embedded Systems Design”, Newness, Second Edition, 2003.
4. Mohammed Ali Mazidi and Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Prentice Hall of India Private Limited, New Delhi, 2005.

09EC63 - VLSI DESIGN

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamentals of CMOS circuits & logic gate design, chip design, VLSI subsystems and testing.

EXPECTED OUTCOME

On completion of this course, the students will understand the fundamentals of CMOS circuits & logic gate design, chip design, VLSI subsystems and testing.

INTRODUCTION TO CMOS CIRCUITS AND PROCESSING TECHNOLOGY

An overview of Silicon Semiconductor technology - VLSI Design flow - CMOS logic - nMOS Enhancement transistor - pMOS Enhancement transistor - Threshold voltage - MOS Device design equations: Basic DC equations, Small signal AC characteristics - CMOS Inverter-DC characteristics - Transmission Gate - Basic CMOS Technology - CMOS process enhancement: Interconnections, Circuit elements - Layout design rules: Layout representation, CMOS n-well design rules. **(9)**

CMOS LOGIC CIRCUIT DESIGN

CMOS logic gate design - Basic Physical Design of Simple logic gates: Inverter, NAND and NOR gates - Clocking strategies: Clocked systems, Latches and Registers, System timing, Setup and Hold time, Phase Locked Loop clock Technique, Metastability and Synchronization failures - Single phase memory structures - Single phase Logic structures - Two phase clocking - Two phase memory structures - Two phase logic structures - Four phase logic structures - Clock distribution. **(9)**

REFERENCE BOOKS

1. R.R. Gulati , "Modern Television Practice: : Principles, Technology & Servicing ", Third Edition, New Age International Publishers
2. S. P. Bali, "Consumer Electronics", Pearson Education, First Indian Print, 2005.
3. Arch.C.Luther., "Principles of Digital Audio & Video", Art Institute of Chicago, 1997
4. Dr.B.R.Gupta, "Consumer Electronics", S.K.Kataria & Sons, Second Edition, 2000
5. Ian R.Sirklair., "Audio and Hifi Handbook", Third Edition, Newnes Publications
6. Arvind M.Dhake, "Television and Video Engineering", Tata Mc Graw Hill, New Delhi, 1995.

FUNDAMENTALS OF VIDEO SYSTEMS

Principles of picture scanning - Interlaced scanning - Factors affecting Bandwidth and resolution - Aspect ratio - Kell factor - Composite monochrome video signal - Physiological aspects of human vision - Chromaticity diagram - Primary colours and color reproduction in TV - Composite colour video signal. **(8)**

VIDEO SIGNAL GENERATION AND RECEPTION

TV Cameras - Image orthicon - Vidicon - Plumbicon - Charge Coupled Device - Colour TV cameras - TV Transmitter block diagram - Studio - NTSC - PAL - SECAM - Encoders and Decoders - Block diagram of TV receiver: Monochrome and Colour - Choice of IF - Picture tubes: Monochrome, Color - Defects in Image reproduction - Flat panel Displays and Projection Devices. **(10)**

APPLICATIONS AND DEVELOPMENTS

CCTV - Audio and Video Magnetic tape recording and Play back system - CDs and DVDs - Blue Ray Disc - Film recording - Electronic Tuner and Remote Control Unit -Video games - Digital Satellite Television - Direct to home Satellite TV - Digital TV receiver - Hi-Fi Audio Systems - Mono - Stereo Systems - HDTV - EDTV. **(10)**

Total : 45

TEXT BOOKS

1. E.Kinsler and R.Frey., "Fundamentals of Acoustics", Wiley Eastern Ltd., Fifth Edition, 2003.
2. Gulati R.R., "Monochrome and Colour television", New Age International Publishers, 2007.

CMOS CHIP DESIGN

VLSI Design process - Architectural design - Logic design - Physical design - CMOS Chip design options: Programmable Logic, Programmable Logic Structures, Programmable Interconnect, Reprogrammable gate arrays, Xilinx programmable gate array - Standard Cell Design - ASIC Design flow. **(9)**

CMOS SUB SYSTEM DESIGN

Shifters - ALU Design - Adders: Single bit Adder, Design of Carry look ahead Adder - Parity generators - Comparators: Magnitude Comparator, Equality Comparator - Zero/One Detectors - Serial Multiplier - Division: Serial Division, Parallel Division - Counters - Memory Elements: RAM, LIFOs and FIFOs, Read Only Memory. **(9)**

CMOS TESTING

Need for testing - Manufacturing test principles: Fault Models, Observability, Controllability, Fault Coverage, Automatic Test Pattern Generation (ATPG) - Design for Testability - Scan based test: LSSD - Built in Self Test (BIST) - IDDQ Testing - Boundary Scan Test. **(9)**

Total : 45

TEXT BOOKS

1. Neil H.E. Weste and Kamran Eshraghian, “Principles of CMOS VLSI Design- A System Perspective”, Pearson Education Pvt. Ltd, Second Edition, 2004.
2. Stephen Brown and Zvonka Vranesic, “Fundamental of Digital Logic with VHDL Design”, McGraw Hill International Edition, 2000.

REFERENCE BOOKS

1. Neil H.E. Weste, David Harris, Ayan Banerjee, “CMOS VLSI Design- A Circuits and Systems Perspective”, Pearson Education Pvt. Ltd, Third Edition, 2006.
2. Douglas A Pucknel and Kamran Eshraghian, “Basic VLSI Design”, Prentice Hall of India, New Delhi, Third Edition, 2001.
3. Fabricious E., “Introduction to VLSI Design”, Tata McGraw Hill, 1990.
4. Wayne Wolf, “Modern VLSI Design”, Pearson Education Asia Pvt. Ltd, Third Edition, 2003.

09EC73 - AUDIO AND VIDEO SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVES

To study the basic concepts of audio wave propagation, speech and hearing, the principles of operation of basic audio devices, the basic concepts of video systems and vision of eye, the fundamentals of video signal generation and reception, to know the practical applications of these concepts and to know about the modern developments in this field.

EXPECTED OUTCOME

On completion of this course, the student will get thorough knowledge on the fundamentals of acoustic waves, audio devices, and fundamentals of video systems including video signal sources & display devices and new developments in this field.

INTRODUCTION TO FUNDAMENTALS OF AUDIO

Audio wave propagation : Plane wave propagation - Wave equation - Energy density - Acoustic intensity - Specific acoustic impedance - Acoustic standards and reference conditions - Spherical waves - Intensity - Helmholtz resonator - Mechanical and acoustic analogy - Acoustic filter.

Speech and hearing : The voice mechanism - Intelligibility - Speech spectrum - characteristics of the human ear - Thresholds of ear - Loudness - Pitch and Frequency- beats, aural harmonics and combinational tones - Masking. **(9)**

AUDIO DEVICES

Microphones: Principle of working - constructional details, frequency response and directional characteristics of carbon, condensor, crystal, moving coil and velocity microphones - Unidirectional cardioid microphone. Loudspeakers: Moving Coil loudspeaker - Loudspeaker Cabinets - Horn, Crystal, Electrostatic, Dynamic, and Permanent magnet loudspeaker.**(8)**

REFERENCE BOOKS

1. Lee, “Wireless & Cellular Telecommunications”, third Edition, McGraw Hill, 2006.
2. Feher K., “Wireless Digital Communications”, PHI, New Delhi,1995.
3. Jochen Schiller, “Mobile Communications”, Pearson Education Asia Ltd., 2000.
4. Gordon L.Stubler, “Principles of Mobile Communication,” Kluwer Publishers, 1996.

09EC64 MICROWAVE ENGINERING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the two port analysis methods for Microwave devices and understand the principle of operation of Passive microwave devices, Microwave Vacuum tube devices, Microwave solid state devices & Circuits and the methods of Microwave measurements.

EXPECTED OUTCOME

On completion of this course, the students will have thorough knowledge about various Microwave devices, sources and basic Microwave measurement methods.

TWO PORT RF NETWORK ANALYSIS AND CIRCUIT REPRESENTATION

Impedance and Admittance (Z and Y) Matrices - Scattering Matrix - Generalized Scattering Matrix - Transmission (ABCD) Matrix - Relation between Impedance, Admittance, Scattering and Transmission Matrices - Impedance matching using Micro strip line sections. **(8)**

MICROWAVE PASSIVE DEVICES

Dividers and Couplers - Three port Network - Four port Network - Lossless Divider - Resistive Divider - Quadrature Hybrid (Branch line Coupler) - 180^{o} Hybrid Junction - Ferri Magnetic Devices: Ferrite Isolators, Ferrite Phase Shifters, Ferrite Circulators. **(8)**

MICROWAVE VACUUM TUBE DEVICES

Problems of operating Microwave vacuum tube devices at high frequencies - Klystrons - Velocity and Density Modulation - Reflex Klystron Oscillator - Mechanism of oscillation - Modes - Power output and Efficiency - Electronic Admittance - Two Cavity Klystron Amplifier - Power Output - Travelling Wave Tube Amplifier - Wave propagation in Helix - Magnetron

Oscillator - Mechanism of oscillation - Cut off field and Voltage - Modes - Power output. **(10)**

MICROWAVE SOLID STATE DEVICES AND CIRCUITS

Problems of operating Microwave Solid State Devices and Circuits at high frequencies - PIN Diode and its Applications - Gunn Diode and its modes of operation - IMPATT, TRAPATT and BARITT Diodes - Tunnel Diode Amplifier and Oscillator - Varactor Diodes - Parametric Amplifiers. **(10)**

MICROWAVE MEASUREMENTS

Tunable Detector - Slotted line Carriage - VSWR Meter - Spectrum Analyzer - Network Analyzer - Power measurements - Insertion Loss, Attenuation and VSWR measurements - Impedance measurement by Slotted line method - Frequency measurement methods - Dielectric constant measurement by waveguide method. **(9)**

Total : 45

TEXT BOOKS

1. David M.Pozar, “Microwave Engineering”, John Wiley and Sons, Inc, Third Edition, 2007.
2. Annapurna Das and Sisir Das, “Microwave Engineering”, Tata McGraw Hill, New Delhi, 2009.

REFERENCES

1. Terman F.E., “Electronic and Radio Engineering”, McGraw Hill International Students Edition, Fourth Edition, 1995.
2. George Kennedy, “Electronic Communication Systems”, McGraw Hill Book Company, Fourth Edition, 2008.
3. R.E.Colin, “Foundations of Microwave Engineering”, McGraw Hill, 1995.
4. Samuel Y. Liao, “Microwave Devices and Circuits”, Prentice Hall of India Pvt Ltd, Third Edition,2000

EQUALIZATION & DIVERSITY TECHNIQUES

Fundamentals of Equalization - Equalizers in communication receiver - Linear equalizer - Non-linear equalization - Adaptive equalization - Fractional equalizer.

Diversity Techniques: Derivation of Selection Diversity Improvement, Derivation of Maximal Ratio Combining Improvement - Practical Space Diversity Considerations: Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining - Polarization Diversity - Frequency Diversity - Time Diversity - Rake Receiver. **(9)**

WIRELESS SYSTEMS

Global System for Mobile: GSM Architecture, Layer Modeling, Transmission, GSM channels, Channel coding and interleaving, Radio resource management, Mobility management, Communication management, Network management - CDMA: Output Power Limits and Control, Modulation Characteristics, Joint Detection, Authentication, Encryption and Privacy, Malfunction Detection, Call Processing, Hand-off Procedure. **(8)**

WIRELESS NETWORKS

CT2 - DECT - PDC - PCN - GPRS: Architecture, Transmission Plan and Signaling Plan, Traffic Performance - EDGE Architecture - UMTS Network Architecture - IEEE 802.11a/b/g - Wi-Fi - 802.16 – WiMAX - LTE. **(8)**

Total : 45

TEXT BOOKS

1. Rappaport T.S., “Wireless Communications”, Pearson Education, Asia, New Delhi, Second Edition, 2002.
2. Rajpandya, “Mobile and Personal Communication Systems and Services”, Prentice Hall of India pvt Limited, New Delhi, 2004

09EC72 - WIRELESS COMMUNICATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the concepts of the basic technology, architecture, applications of current & future wireless communication systems, services and standards.

EXPECTED OUTCOME

On completion of this course, the student will get in-depth knowledge on mobile and personal communication systems and networks.

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS

Evolution of Mobile Radio Communications - Examples of Wireless Communication Systems - Basic Cellular Telephone operation - Comparison of Common Wireless Communication Systems.

Cellular Concept fundamentals : Introduction - Frequency Reuse - Channel Assignment Strategies - Handoff Strategies - Interference and System Capacity - Trunking and Grade of Service - Improving Coverage and Capacity in Cellular Systems - Multiple Access Techniques for Wireless Communications - Basic concepts of FDMA, TDMA, CDMA and SDMA. **(10)**

MOBILE RADIO PROPAGATION

Radio Wave Propagation - Free Space Propagation Model - Basic Propagation Mechanisms - Reflection - Ground Reflection Model - Diffraction - Scattering - Practical link budget design - Outdoor and Indoor propagation Models - Small scale multipath propagation - Impulse Response Model of Multipath Channel - Parameters of Mobile Multipath Channels - Types of Small- Scale Fading - Statistical models for multipath channels. **(10)**

09EC65 - ANTENNAS AND WAVE PROPAGATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVES

To study the fundamental antenna concepts, construction and principles of operation of VLF, LF, MF & HF antennas, measurement methods and principles of radio wave propagation.

EXPECTED OUTCOME

On completion of this course, the students will have complete knowledge about the fundamental antenna concepts, construction and principles of operation of VLF, LF, MF & HF antennas, measurement methods and principles of radio wave propagation.

RADIATION

Retarded potentials - Radiation from an alternating element - Power radiated by a current element - Monopoles and Dipoles - Half Wave Dipole - Antenna Terminology: Isotropic Radiators - Radiation pattern - EIRP - Radiation Intensity - Directive Gain - Power Gain - Antenna Efficiency - Effective area - Effective length and Aperture - Reciprocity theorem - Radiation resistance - Self and Mutual impedance of antennas - Antenna beam width. **(10)**

ANTENNA ARRAYS AND SPECIAL ANTENNAS

Two element array - Linear array - Broad side array - End fire array - Phased array - Multiplication of arrays - Binomial array - Stacked arrays - Folded dipole - Yagi-Uda antenna - Horn antenna - Helical Antenna - Log periodic antenna - Parabolic reflector - Cassegrain feed - Cheese feed - Micro strip antennas - Programmable phased array - Smart antennas. **(8)**

LF, MF & HF ANTENNAS (Qualitative Treatment only)

VLF and LF transmitting antennas - Effects of ground on antenna

performance -Grounded antennas - Effects of antenna height - Physical height and Effective height of antenna - Beverage antenna - Medium Frequency antennas - Tower radiator - High Frequency antennas - Half wave dipole - Dipole antennas - Long wire antennas - V and Inverted V antennas - Rhombic antenna - Travelling wave antennas - Radio direction finding - Loop antennas - Adcock direction finders - Bellini Tosi type. **(10)**

WAVE PROPAGATION

Modes of propagation - Structure of atmosphere - Characteristics of different ionized regions - Sky wave propagation - Effects of the earth's magnetic field on ionospheric radio wave propagation - Virtual height - Maximum usable frequency - Critical angle - Skip distance - Ionospheric abnormalities - Space wave propagation - Duct propagation. **(10)**

MEASUREMENTS

Antenna measurements: Input impedance - Bridge method - SWR method - Radiation pattern measurement - Beam width measurement - Gain measurement - Measurement of radiation efficiency - Polarization measurement. **(8)**

Total : 45

TEXT BOOK

1. Prasad.K.D, "Antennas and Wave Propagation", Sathya Prakashan, Third Edition, 2009.
2. Edward C. Jordan and Keith.G.Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, Second Edition, 2005.

REFERENCES

1. Balanis E.S., "Antenna Theory Analysis and Design", John Wiley & Sons Inc Singapore, Third Edition, 2005.
2. Terman F.E., "Electronic and Radio Engineering", McGraw Hill International Students Edition, Fourth Edition, 1995.
3. John Daniel Kraus, Ronald J. Marhefka , "Antennas for all Applications", McGraw Hill, Second Edition, 2006.
4. Annapurna Das and Sisir K.Das, "Microwave Engineering", Tata McGraw Hill, New Delhi, 2009.

- Feedback and RF Stability Criteria - Gain and Phase Margins - Compensation Techniques.

Power amplifiers: Class A,B,C,D,E,F - PA Characteristics - PA Design examples. **(10)**

IC BASED RF BUILDING BLOCKS

Mixers: Fundamentals, Non Linear Mixers, Multiplier based Mixers and Sub-Sampling Mixers -Linearized PLL Model - Noise Properties of PLLs - Phase Detectors - Loop Filters - Charge Pumps - PLL Design Examples - Oscillators - Describing functions - Resonators - Detailed considerations of Phase noise**.** **(10)**

Total : 45

TEXT BOOKS

1. Reinhold Ludwig Pavel Bretchko, "RF Circuit Design", Pearson Education Asia Publication, New Delhi, 2001.
2. Thomas Lee, "The design of Radio Frequency CMOS Integrated Circuits", Cambridge University Press, Second Edition,2004

REFERENCE BOOKS

1. Matthew M. Radmanesh "Radio Frequency and Microwave Electronics illustrated", Pearson Education Asia Publication, New Delhi, 2001.
2. Ulrich Rhode, "RF/Microwave Circuit Design for Wireless Applications", John Wiley, 2000.
3. Peter P. Kenington "High linearity RF Amplifier Design", Artech House, Mumbai, 2002.

09EC71 RF SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the fundamental aspects of circuits, systems and IC's operating at Radio Frequency.

EXPECTED OUTCOME

On completion of this course the student is expected to have thorough knowledge of various RF Circuits, Amplifiers, LNAs, Oscillators and Mixers.

PASSIVE RF COMPONENTS AND TRANSMISSION LINE ANALYSIS

Importance of Radiofrequency design - Dimensions and units - Frequency Spectrum - RF behavior of Passive components - Transmission line analysis - General Transmission line equation - Micro strip Transmission line - Terminated lossless Transmission line - Special termination - Sourced and Loaded Transmission line - Smith Chart - Impedance transformation - Admittance transformation. **(9)**

DESIGN OF FILTERS AND MATCHING NETWORKS

Basic Resonator and Filter configurations - Special Filter Realizations - Filter Implementation - Impedance matching using discrete components - Micro-stripline Matching Networks. **(8)**

RF ACTIVE COMPONENTS AND MODELING

Components: RF Diode, RF Bipolar Junction Transistor, RF Field Effect Transistor - Modeling: Diode model, Transistor model and FET model - Noise model of FET. **(8)**

IC BASED RF LNA AND POWER AMPLIFIERS

Noise Definition and Noise Models - Two Port noise parameters of MOSFET - LNA Topologies - Noise match and Power match Considerations - Linearity and Large Signal Performance of LNAs

09EC66 - INFORMATION THEORY AND CODING

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

OBJECTIVES

To study the principles of Discrete sources, Information theory, Source coding and Channel coding.

EXPECTED OUTCOME

Upon completion of this syllabus, learners will be able to understand the principles of Information theory, Source coding and Channel coding.

DISCRETE SOURCES AND ENTROPY

Entropy and Information - Concepts of Probability Theory - Surprise and Entropy - Units of Entropy - Minimum and Maximum Values of Entropy - Joint Probability Distribution Functions - Conditional Probability and Baye's Theorem - Conditional Probability Distributions and Conditional Entropy - Information Sources - Memoryless Information Sources - Markov Sources - Entropy of Markov Sources - Sequences of Symbols - Adjoint Source of a Markov Source. **(8)**

INFORMATION CHANNELS

BSC and BEC Channels - Mutual Information - Noiseless and Deterministic Channels - Cascaded Channels - Additivity of Mutual Information - Channel Capacity: Maximum Mutual Information - Continuous Channels and Gaussian Channels - Information Capacity Theorem - Rate Distortion Theory. **(8)**

SOURCE CODING

Instantaneous Codes - Kraft Inequality and McMillan's Theorem - Average Length and Compact Codes - Shannon's Noiseless Coding Theorem - Fano Coding - Huffman Coding - Dictionary Coding and Lempel-Ziv coding - Arithmetic Coding - Data Compression - Run-length Coding - Block-sorting Compression.

(9)

RANDOM ERROR CORRECTING CODES

Code Rate - Decoding Rules - Hamming Distance - Error Probabilities - Shannon's Fundamental Coding Theorem - Error Correcting Codes - Linear block Codes - Encoding and Decoding - Codes Derived from Hadamard Matrices - Cyclic Codes - Rings of Polynomials - Cyclic Codes - Encoding and Decoding of Cyclic Codes - Implementation of Cyclic Codes - Golay Code - Hamming Codes - Cyclic Redundancy Check Codes - Reed-Muller Codes. **(9)**

BURST ERROR CORRECTING CODES & CODES FOR CRYPTOGRAPHY

Bose-Chaudhuri-Hocquenghem Codes - Reed-Solomon Codes - Convolutional Codes - Simple Example - Binary Convolutional Codes - Decoding Convolutional Codes - Viterbi Algorithm - Sequential Decoding - Trellis Modulation - Turbo Codes.

Cryptosystems - Attacks on Cryptosystems - Perfect Secrecy - Language Entropy and Successful Ciphertext Attacks - Computational Security - Diffusion and Confusion - Product Cipher Systems - Codes - Public-Key Cryptosystems. **(11)**

Theory : 45

Tutorial : 15

Total : 60

TEXT BOOK

1. Roberto Togneri, Christopher J.S DeSilva, "Fundamentals of Information Theory and Coding Design", CRC Press, 2003.
2. Ranjan Bose, "Information Theory Coding and Cryptography", Tata McGraw Hill, 2007.

REFERENCE BOOKS

1. Richard B.Wells, "Applied Coding and Information Theory for Engineers", Pearson Education, First Indian reprint, 2004.

4. Traffic light controller
5. Function generator

Assembly Language Programming and testing of 8051:

1. Arithmetic, logical and bit manipulation programs
2. Timer / Counter Programming: time calculations - counting events - Setting baud rates for the serial port.
3. Data communication through Serial Port
4. Port programming
5. Interrupt Service Routines

Assembly Language Programming and testing of 8051: Using **Keil IDE**

1. Study of IDE features such as debug, watch window, memory window
2. Arithmetic, logical and bit manipulation programs
3. Timers /Counter usage
4. Parallel ports usage
5. Serial ports usage

Assembly Language Programming and testing of ARM processor

1. Study of ARM Processor kits
2. ARM 7/9 Programming Exercises

Total : 60

09EC68 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

OBJECTIVE

To provide the students with a practical exposure to programming of 8085, 8051, 8086 and ARM Processor.

EXPECTED OUTCOME

After completion of the experiments, the students will get exposure to programming of 8085, 8051, 8086 and ARM Processor.

LIST OF EXPERIMENTS

Assembly Language Programming and testing of 8085 and 8086:

1. Single byte, Multi-byte Addition and Subtraction
2. Multiplication and Division
3. Searching and Sorting
4. Block Move
5. Code Conversion
6. String Manipulation
7. Factorial
8. Simulation of Digital Clock, Stop Watch and Elevator
9. Use of monitor programs for display of data, data entry through keyboard, etc

Interfacing experiments:

1. Interfacing A/D and D/A converters
2. Stepper motor
3. DC Motor

2. Thomas M. Cover and Joy A. Thomas, “Elements of Information Theory”, John Wiley & Sons, Second Edition, 2006.
3. John G. Proakis, “Digital Communications”, McGraw-Hill, Fifth Edition, 2007.
4. Robert J. McEliece, “The Theory of Information and Coding”, Cambridge University Press, Second Edition, 2002.
5. Bernard Sklar, “Digital Communications: Fundamentals and Applications”, Pearson Education, Second Edition, 2001.

09EC67 - LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

OBJECTIVE

To provide the students with a practical exposure to the design and test of Linear and Digital Integrated Circuits and design of digital circuits using VHDL.

EXPECTED OUTCOME

After completion of the experiments, the students will get exposure to the design aspects, operational characteristics and applications of Linear and Digital Integrated Circuits and design of digital circuits using VHDL.

LIST OF EXPERIMENTS

LINEAR INTEGRATED CIRCUITS LAB

1. Operational Amplifier Characteristics
2. Design and testing of Inverting, Non Inverting and Differential Amplifiers, Integrator and Differentiator using Operational amplifier
3. Design and testing of Precision Rectifiers using Operational amplifier
4. Design and testing of Active Filters using Operational amplifier
5. Design and testing of Astable, Monostable Multivibrators and Schmitt Trigger using Operational amplifier
6. Design and testing of RC phase shift and Wien bridge oscillators using Operational amplifier
7. Design and testing of Instrumentation Amplifier using Operational amplifier
8. Design and testing of Astable and Monostable Multivibrators using NE 555 Timer
9. PLL characteristics and Frequency Multiplier using PLL

10. DC Power supply using LM317 and LM723 and Switching Regulator
11. Design and testing of Non linear wave form generator, Pulse Width Modulator, D/A converters and A/D converters
12. Series and Shunt regulators using operational amplifier

DIGITAL INTEGRATED CIRCUITS

1. Study of TTL & CMOS characteristics
2. Study of Flip flops
3. Design and Implementation of Adders, Subtractors, Code converters, Magnitude Comparator, Parity checker using Logic gates
4. Multiplexer and Demultiplexer using Logic gates
5. Encoder and Decoder using Logic gates
6. Design and implementation of Ring counter & Johnson counter, Ripple counter, Modulo-N and up/down counters
7. Testing of various shift register operations
8. Study of various IC function chips

VLSI EXPERIMENTS USING VHDL :

1. Study of CPLD, FPGA Kits
2. Design , implementation & testing of Basic Gates, Multiplexer, De-multiplexer, Encoders and Decoders on FPGA Board
3. Design , implementation & testing of Flip flops, Counters and Shift Registers on CPLD Board
4. Design , implementation & testing of Adders and Subtractors on FPGA Board

Total : 60

09ECE24 - INTERNET WORKING MULTIMEDIA

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

OBJECTIVE

To study the various aspects of fundamentals, subnetwork technology, multicast and transport protocol and applications in Multimedia.

EXPECTED OUTCOME

On completion of this course, the student will understand the fundamentals, subnetwork technology, multicast and transport protocol and applications in Multimedia.

INTRODUCTION

Digital sound - Video and Graphics - Basic Multimedia Networking - Multimedia Characteristics - Evolution of internet services model - Network requirements for audio/video transform - Multimedia coding and compression for text, image, audio and video - Multimedia communication in wireless network. **(9)**

SUBNETWORK TECHNOLOGY

Broadband services - ATM and IP - IPV6 - High speed switching - Resource reservation- Buffer management - Traffic shaping , Caching, Scheduling and policing, throughput, delay and jitter performance. **(9)**

MULTICAST AND TRANSPORT PROTOCOL

Multicast over shared media network - Multicast routing and addressing - Scaping multicast and NBMA networks - Reliable transport protocols - TCP adaptation algorithm- RTP - RTCP. **(9)**

MEDIA - ON – DEMAND

Storage and media servers - Voice and video over IP- MPEG-2 over ATM/ IP - Indexing synchronization of requests - Recording and remote control. **(9)**

VI Semester

Subject Code	Subject	L	T	P	C
09EC61	Data and Voice Communication Networks	3	0	0	3
09EC62	Embedded Systems	3	0	0	3
09EC63	VLSI Design	3	0	0	3
09EC64	Microwave Engineering	3	0	0	3
09EC65	Antennas and Wave Propagation	3	0	0	3
09EC66	Information Theory and Coding	3	1	0	4
Practical					
09EC67	Linear and Digital Integrated Circuits Laboratory	0	0	3	4
09EC68	Microprocessors and Microcontrollers Laboratory	0	0	3	4
09EC69	Mini Project	0	0	3	2
	Total Credits				**26**

VII Semester

Subject **Code**	Subject	L	T	P	C
09EC71	RF Systems	3	0	0	3
09EC72	Wireless Communication	3	0	0	3
09EC73	Audio and Video Systems	3	0	0	3
09EC74	Elective I	3	0	0	3
09EC75	Elective II	3	0	0	3
Practical					
09EC86	Communication and Digital Signal Processing Laboratory	0	0	3	-
09EC87	RF, Fiber Optics and Networking Laboratory	0	0	3	-
09EC88	Project	0	0	6	-
	Total Credits				**15**

Laboratory 0 0 3 -