CS15102/CS15202 COMPUTER PROGRAMMING LABORATORY 0 0 2 1

COURSE OBJECTIVES

The student should be made to:

- Be familiar with the use of Office software
- Be exposed to presentation and visualization tools
- Be exposed to problem solving techniques and flow charts
- Learn to use Arrays, strings, functions, structures and unions

LIST OF EXERCISES

a) Word Processing **10**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

b) Spread Sheet **10**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

c) Techpub software

9. CorelDraw – SGML – Illustrator

d) C Programming **10**

10. Data types, Expression Evaluation, Condition Statements.
11. Arrays
12. Structures and Unions
13. Functions
14. File Handling
15. Pointers

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Standalone desktops with C compiler 30 Nos. (or)
2. Server with C compiler supporting 30 terminals or more

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes(POs)**												**Programme Specific Outcomes (PSOs)**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	3	3	3	-	1	1	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	-	-	-	-	-	2	3	3
CO4	1	3	3	3	-	-	-	-	-	-	-	2	1	3

GE15101 ENGINEERING PRACTICES LABORATORY 0 0 4 2

(COMMON TO ALL BRANCHES)

COURSE OBJECTIVES

To enable the students to

- develop their knowledge in basic civil engineering practices such as plumbing, carpentry and its tool usages.
- practice some of mechanical basics such as welding, basic machining, sheet metal work, fitting.
- experience with basic electrical wiring circuits
- know about the electronic components, color coding signal generation, soldering practice..

GROUP A (CIVIL AND MECHANICAL)

I CIVIL ENGINEERING PRACTICE

BUILDINGS

- Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBING WORKS

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows inhousehold fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise:
- Basic pipe connections – Mixed pipe material connection – Pipe connections with different joiningcomponents. (e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise:

Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

WELDING

- Preparation of arc welding of butt joints, lap joints and tee joints.
- Gas welding practice

BASIC MACHINING

- Simple Turning, Facing, Thread cutting and Taper turning
- Drilling Practice

SHEET METAL WORK

- Model making – Trays, funnels, etc.
- Different type of joints.

FITTING

- Square fitting
- Vee – fitting models

DEMONSTRATION ON

(a) Smithy operations, upsetting, swaging, setting down and bending. Example –

Exercise –Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

TOTAL: 30 PERIODS

GROUP B (ELECTRICAL AND ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Study of electrical tools and safety measures
2. Basic wiring practices - Stair-case wiring, Fluorescent lamp wiring and Residential house wiring
3. Measurement of electrical parameters such as voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Earthing Practices &Measurement of earth resistance using megger.
6. Study of electrical equipments such as iron box, induction heater.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, color coding measurement of AC signalparameter (Peak-Peak, RMS, Period, and Frequency) using CRO.
2. Study of logic gates AND, OR, Ex-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR.
6. Construction and verification of half adder circuit.
7. Construction and verification of half subtractor circuit.
8. Study of Telephone, F.M Radio and Cell Phone.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of this course, students will be able to

- use the tools for plumbing and carpentry works
- prepare models by -welding, machining, sheet metal and fitting
- construct electrical wiring circuit and demonstrate practically
- analyse the signal generation, solder the electronic components based on the circuits

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
COs	**Programme Outcomes(POs)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO2	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO3	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO4	2	2	2	2	2	-	-	-	1	-	-	1	2	3

EC 15201 ELECTRIC CIRCUIT ANALYSIS 3 0 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To know the concepts of duality

UNIT I BASIC CIRCUITS ANALYSIS 9

Ohm's Law – Kirchhoff's laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion - Thevenin and Norton Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits – Double tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9

Transient response of RL, RC, RLC circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z, Y, h and ABCD parameters.

UNIT V CONCEPTS OF DUALITY 9

Concept of duality, Dual network, Graphs of a network, Trees, twig, link and branches, Incidence matrix, Tieset matrix and cutset matrix of a graph, Inverse networks and equalizers - Applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student will be able to:

- Analyze electrical circuits
- Apply circuit theorems
- Analyze AC and DC Circuits
- Design resonance circuits
- Understand the concepts of Duality

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.
3. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2007.

REFERENCES:

1. M Russell, Mersereau and Joel R. Jackson, "Circuit Analysis- A System Approach", Pearson Education, 2007.
2. Chakrabati A, "Circuits Theory (Analysis and synthesis)", Dhanpath Rai & Sons, New Delhi, 1999.
3. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.
4. Robert L. Boylestad, "Experiments in Circuit Analysis to Accompany Introductory Circuit Analysis", Prentice Hall, 2000.

WEB LINKS:

1. http://www.electronics-tutorials.ws/
2. www.electrical 4u.com
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/esc102/index.html
4. http://www.tina.com/1200_problems_and_examples
5. www.circuits-magic.com
6. www.zen22142.zen.co.uk

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

	Programme Outcomes(POs)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO4	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	3	-	3	3

EC 15202 ELECTRON DEVICES 3 0 0 3

OBJECTIVES:

The student should be made to:

- To know about the basics of diode and rectifiers
- To know about the basics and characteristics of BJT
- To know about the basics and characteristics of FET
- To know about the basics of special semiconductor devices, power devices and display devices
- Be familiar with the theory, construction, and operation of Basic electronic devices.

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics. Clipping & Clamping Circuits – Voltage multipliers using diodes-Half wave and full wave rectifier.

UNIT II BIPOLAR JUNCTION 9

NPN -PNP -Junctions-Early effect-Current equations – Input and Output characteristics of CE, CB CC-Hybrid -π model - h-parameter model, Ebers Moll Model- Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET-Current equation - Equivalent circuit model and its parameters, FINFET, DUAL GATE MOSFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction- MESFET, Schottky barrier diode - Zener diode - PIN Diode- Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS - LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student will be able to:

- Explain the theory, construction, and operation of semiconductor diode

- Explain the basics and characteristics of BJT
- Explain the basics and characteristics of FET
- Familiar with the concepts of special semiconductor devices, power devices and display devices.
- Use the basic electronic devices

TEXT BOOKS

1. J Millman, C. Halkias & Satyabrata JIT, "Electronic Devices and Circuits", Tata McGraw-Hill, 2007.
2. Donald A Neaman, "Semiconductor Physics and Devices", Third Edition, Tata Mc GrawHill Inc.2007.
3. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Education 2006.

REFERENCES:

1. Christo Papadopoulos, "Solid State Electronic Devices", Springer-Verlag, New York, 2014
2. Thomas L.Floyd, "Electronic Devices", Merrill, 1992
3. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.
4. David A.Bell, " Electronic Devices and Circuits", Prentice Hall, 1986

WEB LINKS:

1. www.electronics-tutorials.ws/
2. http://www.radio-electronics.com
3. www.allabout circuits.com
4. http://textofvideo.nptel.iitm.ac.in/122106025/
5. www.electronicsforu.com
6. www.chegg.com

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

	Programme Outcomes(POs)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO4	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	3	-	3	3

EC15203 CIRCUITS AND DEVICES LABORATORY 0 0 2 1

COURSE OBJECTIVES

This lab experiments enable the students to develop the practical knowledge by analyzing and verifying the devices and the circuit theorems.

LIST OF EXPERIMENTS

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems
3. Verification of superposition Theorem
4. Verification of Maximum power transfer and reciprocity theorems
5. Frequency response of series and parallel resonance circuits
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac
12. Characteristics of Photodiode and Phototransistor

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of this course, the students will be able to

- impart knowledge by analyzing and verifying the circuit theorems.
- analyze the characteristics of electronic devices
- acquire the knowledge of Photo devices

Mapping of Course Outcomes with Programme Outcomes:
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

Cos	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	3	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	3	-	-	-	-	-	-	-	3	3

5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Sixth Edition, Tata Mc Graw Hill Education Pvt Ltd, New Delhi, 2012.
6. Datta.K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi, 2013.

EE6352 ELECTRICAL ENGINEERING AND INSTRUMENTATION L T P C
3 1 0 4

OBJECTIVES:

- To introduce three phase supply and power measurement.
- To understand concepts in electrical generators, motors and transformers.
- To introduce power generation, transmission and distribution concepts.
- To learn basic measurement concepts.
- To learn the concepts of electronic measurements.
- To learn about importance of digital instruments in measurements

UNIT I DC MACHINES 9

Three phase circuits, a review. Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators- Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors- Applications.

UNIT II TRANSFORMER 9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no–load phasor diagram — Transformer on–load phasor diagram — Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES 9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit – Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

UNIT IV BASICS OF MEASUREMENT AND INSTRUMENTATION 9

Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive – Strainguage, thermistor RTD – transducer - Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer – LVDT, RVDT

UNIT V ANALOG AND DIGITAL INSTRUMENTS 9

DVM, DMM – Storage Oscilloscope. Comparison of Analog and Digital Modes of operation, Application of measurement system, Errors. Measurement of R, L and C, Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges Measurement of Inductance, Capacitance, Effective resistance at high frequency, Q-Meter.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Students will be able to understand

- The three phase supply and power measurement.
- The concepts in electrical generators, motors and transformers.
- The basic measurement and instrumentation based devices.
- The relevance of digital instruments in measurements.

TEXT BOOKS:

1. I.J Nagarath and Kothari DP, "Electrical Machines", McGraw-Hill Education (India) Pvt Ltd 4th Edition ,2010
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.

REFERENCES:

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.
2. W.D.Cooper & A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.
3. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.
5. H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.
6. J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.

EC6301 OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES L T P C
3 0 0 3

OBJECTIVES:

- To comprehend the fundamentals of object oriented programming, particularly in C++.
- To use object oriented programming to implement data structures.
- To introduce linear, non-linear data structures and their applications.

UNIT I DATA ABSTRACTION & OVERLOADING 9

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

UNIT II INHERITANCE & POLYMORPHISM 9

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT III LINEAR DATA STRUCTURES 10

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees – Binary Trees – Binary tree representation and traversals – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

UNIT V SORTING and SEARCHING 8

Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search –Binary Search

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the concepts of Object oriented programming.
- Write simple applications using C++.
- Discuss the different methods of organizing large amount of data.

TEXT BOOKS:

1. Deitel and Deitel, “C++, How To Program”, Fifth Edition, Pearson Education, 2005.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Third Edition, Addison-Wesley, 2007.

REFERENCES:

1. Bhushan Trivedi, “Programming with ANSI C++, A Step-By-Step approach”, Oxford University Press, 2010.
2. Goodrich, Michael T., Roberto Tamassia, David Mount, “Data Structures and Algorithms in C++”, 7th Edition, Wiley. 2004.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Second Edition, Mc Graw Hill, 2002.
4. Bjarne Stroustrup, “The C++ Programming Language”, 3rd Edition, Pearson Education, 2007.
5. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamentals of Data Structures in C++”, Galgotia Publications, 2007.

EC6302 DIGITAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits
- and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9

Minimization Techniques: Boolean postulates and laws – De-Morgan’s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions –– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don’t care conditions – Quine - Mc Cluskey method of minimization.

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

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV MEMORY DEVICES 9

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to:

- Analyze different methods used for simplification of Boolean expressions.
- Design and implement Combinational circuits.
- Design and implement synchronous and asynchronous sequential circuits.
- Write simple HDL codes for the circuits.

TEXT BOOK:

1. M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

REFERENCES:

1. John F.Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006.
5. Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, “Digital Principles and Design”, TMH, 2003.

EC6303 SIGNALS AND SYSTEMS L T P C
3 1 0 4

OBJECTIVES:

- To understand the basic properties of signal & systems and the various methods of classification
- To learn Laplace Transform &Fourier transform and their properties
- To know Z transform & DTFT and their properties
- To characterize LTI systems in the Time domain and various Transform domains

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 9

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Difference Equations-Block diagram representation-Impulse response - Convolution sum- Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon the completion of the course, students will be able to:

- Analyze the properties of signals & systems
- Apply Laplace transform, Fourier transform, Z transform and DTFT in signal analysis
- Analyze continuous time LTI systems using Fourier and Laplace Transforms
- Analyze discrete time LTI systems using Z transform and DTFT

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2007.

REFERENCES:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
4. M.J.Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.

EC6304 ELECTRONIC CIRCUITS – I L T P C
3 1 0 4

OBJECTIVES:

The student should be made to

- Learn about biasing of BJTs and MOSFETs
- Design and construct amplifiers
- Construct amplifiers with active loads
- Study high frequency response of all amplifiers

UNIT I POWER SUPPLIES AND BIASING OF DISCRETE BJT AND MOSFET 9

Rectifiers with filters- DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET

UNIT II BJT AMPLIFIERS 9

Small signal Analysis of Common Emitter-AC Load line, Voltage swing limitations, Common collector and common base amplifiers – Differential amplifiers- CMRR- Darlington Amplifier- Bootstrap technique - Cascaded stages - Cascode Amplifier-**Large signal Amplifiers – Class A , Class B and Class C Power Amplifiers .**

UNIT III JFET AND MOSFET AMPLIFIERS 9

Small signal analysis of JFET amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiMOS Cascode amplifier

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS 9

Low frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage and multistage amplifiers

UNIT V IC MOSFET AMPLIFIERS 9

IC Amplifiers- IC biasing Current steering circuit using MOSFET- MOSFET current sources- PMOS and NMOS current sources. Amplifier with active loads - enhancement load, Depletion load and PMOS and NMOS current sources load- CMOS common source and source follower- CMOS differential amplifier- CMRR.

TOTAL (L: 45+T: 15): 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

Design circuits with transistor biasing.

Design simple amplifier circuits.

Analyze the small signal equivalent circuits of transistors.

Design and analyze large signal amplifiers.

TEXT BOOK:

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw Hill, 2009.

REFERENCES:

1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010.
2. David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata Mc Graw Hill, 2007.
4. Paul Gray, Hurst, Lewis, Meyer "Analysis and Design of Analog Integrated Circuits", 4th Edition ,John Willey & Sons 2005
5. Millman.J. and Halkias C.C, "Integrated Electronics", Mc Graw Hill, 2001.
6. D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, Mc Graw Hill, 1989.
7. **Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.**

EC6311 ANALOG AND DIGITAL CIRCUITS LABORATORY L T P C

0 0 3 2

OBJECTIVES:

The student should be made to:

- Study the characteristic of CE,CB and CC Amplifier
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristic of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Perform SPICE simulation of **E**lectronic **C**ircuits

LIST OF ANALOG EXPERIMENTS:

1. Half Wave and Full Wave Rectifiers, Filters, Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers- Transfer characteristic, CMRR Measurement
5. Cascode / Cascade amplifier
6. Class A and Class B Power Amplifiers
7. Determination of bandwidth of single stage and multistage amplifiers
8. Spice Simulation of Common Emitter and Common Source amplifiers

LIST OF DIGITAL EXPERIMENTS

9. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
10. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
11. Design and implementation of Multiplexer and De-multiplexer using logic gates

12. Design and implementation of encoder and decoder using logic gates
13. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
14. Design and implementation of 3-bit synchronous up/down counter
15. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Differentiate cascade and cascade amplifier.
- Analyze the limitation in bandwidth of single stage and multi stage amplifier
- Simulate amplifiers using Spice
- Measure CMRR in differential amplifier

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS, 2 STUDENTS / EXPERIMENT:

Equipments for Analog Lab

CRO (30MHz)	– 15 Nos.
Signal Generator /Function Generators (3 MHz)	– 15 Nos
Dual Regulated Power Supplies (0 – 30V)	– 15 Nos.
Standalone desktop PCs with SPICE software	– 15 Nos.
Transistor/FET (BJT-NPN-PNP and NMOS/PMOS)	– 50 Nos
Components and Accessories	

Equipments for Digital Lab

Dual power supply/ single mode power supply	- 15 Nos
IC Trainer Kit	- 15 Nos
Bread Boards	- 15 Nos
Computer with HDL software	- 15 Nos
Seven segment display	-15 Nos
Multimeter	- 15 Nos

ICs each 50 Nos

7400/ 7402 / 7404 / 7486 / 7408 / 7432 / 7483 / 74150 / 74151 / 74147 / 7445 / 7476/7491/ 555 / 7494 / 7447 / 74180 / 7485 / 7473 / 74138 / 7411 / 7474

EC6312 OOPS AND DATA STRUCTURES LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Learn C++ programming language.
- Be exposed to the different data structures
- Be familiar with applications using different data structures

LIST OF EXPERIMENTS:

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files

i. Program source files for Stack Application 1
ii. Array implementation of Stack ADT
iii. Linked list implementation of Stack ADT
iv. Program source files for Stack Application 2
v. An appropriate header file for the Stack ADT should be included in (i) and (iv)

7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iv) and (iii))
11. Queue ADT – Array and linked list implementations
12. Search Tree ADT - Binary Search Tree
13. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.
14. Quick Sort

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org.

OUTCOMES:
At the end of the course, the student should be able to:

- Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++ Compiler - 30 Nos.
(or)
Server with C++ compiler supporting 30 terminals or more.

MA6451 PROBABILITY AND RANDOM PROCESSES L T P C
3 1 0 4

OBJECTIVES:
To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems etc in communication engineering.

UNIT I RANDOM VARIABLES 9+3
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT III RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and Cross correlation functions of input and output.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Stark. H., and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd Edition,Pearson Education, Asia, 2002.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
4. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 2004.
5. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

EC6401 ELECTRONIC CIRCUITS II L T P C

3 0 0 3

OBJECTIVES:

- To understand the advantages and method of analysis of feedback amplifiers.
- To understand the analysis and design of LC and RC oscillators, amplifiers, multivibrators, and time base generators.

UNIT I FEEDBACK AMPLIFIERS 9

General Feedback Structure – Properties of negative feedback – Basic Feedback Topologies – Feedback amplifiers – Series – Shunt, Series – Series, Shunt – Shunt and Shunt – Series Feedback – Determining the Loop Gain – Stability Problem – Nyquist Plot – Effect of feedback on amplifier poles – Frequency Compensation.

UNIT II OSCILLATORS 9

Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators - Hartley, Colpitts,Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators - phase shift –Wienbridge - Twin-T Oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers – large signal tuned amplifiers – Class C tuned amplifier – Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RC & RL Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capaitor - Diode clippers, Diode comparator - Clampers. Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator - Bistable multivibrators - Triggering methods for Bigtable multivibrators - Schmitt trigger circuit

UNIT V BLOCKING OSCILLATORS AND TIMEBASE GENERATORS 9

UJT saw tooth waveform generator, Pulse transformers – equivalent circuit – response - applications, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with base timing – Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit – Linearization through adjustment of driving waveform.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Design and analyze feedback amplifiers.
- Design LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time base generators.
- Analyze performance of tuned amplifiers.

TEXT BOOK:

1. Sedra and Smith, “Micro Electronic Circuits”; Sixth Edition, Oxford University Press, 2011.

REFERENCES:

1. Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education / PHI, 2008
2. David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2008.
3. Millman J. and Taub H., “Pulse Digital and Switching Waveforms”, TMH, 2000.
4. Millman and Halkias. C., Integrated Electronics, TMH, 2007.

EC6402 **COMMUNICATION THEORY** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
- To study the limits set by Information Theory.

UNIT I AMPLITUDE MODULATION **9**

Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Pre-envelope & complex envelope - SSB and VSB –comparison -Superheterodyne Receiver.

UNIT II ANGLE MODULATION **9**

Phase and frequency modulation-Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator - Transmission bandwidth.

UNIT III RANDOM PROCESS **9**

Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT IV NOISE CHARACTERIZATION **9**

Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems. Narrow band noise – PSD of in-phase and quadrature noise –Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect.

UNIT V INFORMATION THEORY **9**

Entropy - Discrete Memoryless channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon - Fano codes

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students would

- Design AM communication systems.
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, Pearson Education 2006.
2. S. Haykin, “Digital Communications”, John Wiley, 2005.

REFERENCES:

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford University Press, 2007.
2. B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education 2007
3. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006
4. Couch.L., "Modern Communication Systems", Pearson, 2001.

EC6403 **ELECTROMAGNETIC FIELDS** **L T P C**
3 1 0 4

OBJECTIVES:

- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.
- To make students have depth understanding of antennas, electronic devices, Waveguides is possible.

UNIT I STATIC ELECTRIC FIELD 9

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT II CONDUCTORS AND DIELECTRICS 9

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson's equation, Laplace's equation, Solution of Laplace equation, Application of Poisson's and Laplace's equations.

UNIT III STATIC MAGNETIC FIELDS 9

Biot -Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere's Circuital Law, Point form of Ampere's Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

UNIT IV MAGNETIC FORCES AND MATERIALS 9

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions involving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

UNIT V TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 9

Fundamental relations for Electrostatic and Magnetostatic fields, Faraday's law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell's equations, Integral form of Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Poynting's theorem, Time harmonic fields, Electromagnetic Spectrum.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of the course, the students would be able to

- Analyze field potentials due to static changes and static magnetic fields.
- Explain how materials affect electric and magnetic fields.
- Analyze the relation between the fields under time varying situations.
- Discuss the principles of propagation of uniform plane waves.

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, “Engineering Electromagnetics” , Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2008
2. Sadiku MH, “Principles of Electromagnetics”, Oxford University Press Inc, New Delhi, 2009

REFERENCES:

1. David K Cheng, “Field and Wave Electromagnetics”, Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, “Electromagnetics with Applications”, Mc Graw Hill Book Co, 2005
3. Karl E Longman and Sava V Savov, “Fundamentals of Electromagnetics”, Prentice Hall of India, New Delhi, 2006
4. Ashutosh Pramanic, “Electromagnetism”, Prentice Hall of India , New Delhi, 2006

EC6404 LINEAR INTEGRATED CIRCUITS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits.
- To learn the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To learn the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode *R* □ *2R* Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design linear and non linear applications of op – amps.
- Design applications using analog multiplier and PLL.
- Design ADC and DAC using op – amps.
- Generate waveforms using op – amp circuits.
- Analyze special function ICs.

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2000.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Edition, Tata Mc Graw-Hill, 2007.

REFERENCES:

1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2001.
2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3. B.S.Sonde, “System design using Integrated Circuits” , 2nd Edition, New Age Pub, 2001
4. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International, 2005.
5. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India, 1996.
6. William D.Stanley, “Operational Amplifiers with Linear Integrated Circuits”, Pearson Education, 2004.
7. S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH, 2008.

EC6405 CONTROL SYSTEM ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems
- To introduce the state variable analysis method

UNIT I CONTROL SYSTEM MODELING 9

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT II TIME RESPONSE ANALYSIS 9

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III FREQUENCY RESPONSE ANALYSIS 9

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Perform time domain and frequency domain analysis of control systems required for stability analysis.
- Design the compensation technique that can be used to stabilize control systems.

TEXTBOOK:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCES:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, "Feed back and Control Systems" Tata Mc Graw-Hill, 2007.
4. John J.D'Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design'", Tata Mc Graw-Hill, Inc., 1995.
5. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

EC6411 CIRCUITS AND SIMULATION INTEGRATED LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To gain hands on experience in designing electronic circuits.
- To learn simulation software used in circuit design.
- To learn the fundamental principles of amplifier circuits
- To understand Bias in Amplifier circuits
- **To differentiate feedback amplifiers and oscillators**.
- To study the characteristic of source follower
- **To understand the concepts of multivibrators**

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance calculation
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers
8. Free running Blocking Oscillators

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Monostable multivibrator with emitter timing and base timing
7. Voltage and Current Time base circuits

TOTAL: 45 PERIODS

OUTCOMES:

On completion of this lab course, the students will be able to

- Analyze various types of feedback amplifiers
- Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
- Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:

CRO (Min 30MHz) – 15 Nos.
Signal Generator /Function Generators (2 MHz) – 15 Nos
Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
Digital Multimeter – 15 Nos
Digital LCR Meter – 2 Nos
Standalone desktops PC – 15 Nos.
Transistor/FET (BJT-NPN-PNP and NMOS/PMOS) – 50 Nos
Components and Accessories:
Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers.
SPICE Circuit Simulation Software: (any public domain or commercial software)

EC6412 **LINEAR INTEGRATED CIRCUITS LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

- To expose the students to linear and integrated circuits
- To understand the basics of linear integrated circuits and available ICs
- To understand characteristics of operational amplifier.
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use PICE software for circuit design

LIST OF EXPERIMENTS:

DESIGN AND TESTING OF

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.

SIMULATION USING SPICE

1. Simulation of Experiments 3, 4, 5, 6 and 7.
2. D/A and A/D converters (Successive approximation)
3. Analog multiplier
4. CMOS Inverter, NAND and NOR

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Opamp and perform experiment on frequency response.
- Analyse the working of PLL and use PLL as frequency multiplier.
- Design DC power supply using ICs.
- Analyse the performance of oscillators and multivibrators using SPICE

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS (2 students per Experiment)

CRO (Min 30MHz) – 15 Nos.
Signal Generator /Function Generators (2 MHz) – 15 Nos
Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
Digital Multimeter – 15 Nos
IC tester - 5 Nos
Standalone desktops PC – 15 Nos.
SPICE Circuit Simulation Software: (any public domain or commercial software)
Components and Accessories: - 50 Nos
Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D and D/A convertors, LEDs
Note: Op-Amps uA741, LM 301, LM311, LM 324, LM317, LM723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used.

EE6461 ELECTRICAL ENGINEERING AND CONTROL SYSTEM LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- To provide hands on experience with generators and motors.
- To Understand the working of DC/AC motors and generators
- To study the characteristics of transducers
- To learn the use of transformer
- To understand the behavior of linear system through simulation
- To gain knowledge of controllers

LIST OF EXPERIMENTS:

1. Study of DC & AC motor starters
2. Study of three phase circuits
3. Speed Control of DC shunt motor
4. Load Test on DC shunt motor
5. OCC & Load Characteristics of DC shunt generator
6. Transfer Function of separately excited D.C.Generator.
7. Regulation of three phase alternator
8. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
9. Load test on single-phase transformer
10. Load test on single phase and three-phase Induction motor
11. Measurement of passive elements using Bridge Networks.
12. Study of transducers and characterization.
13. Digital simulation of linear systems.
14. Stability Analysis of Linear system using MATLAB or equivalent Software.
15. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software.
16. Design of Lead and Lag compensator.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Perform experiments to study the load characteristics of DC motors / generators.
- Design bridge network circuit to measure the values of passive component.
- Analyse the stability of linear system through simulation software.
- Obtain transfer function of DC generators.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement 2
2. 3HP,220V,14A,750RPM,0.6A(Shunt field)
3. DC Shunt Motor Coupled With Three phase Alternator 1
4. DC Shunt Motor - kW: 5.2 / volts: 220 / Amps: 27.5/
5. Speed: 1500 RPM/ Field current: 0.9A
6. Three phase Alternator - kVA: 7.5/ volts: 415/ Amps: 10.4
   Speed: 1500 RPM/ Field current: 2A.
7. Single Phase Transformer; 2 KVA,230/110-166 V 1
8. Three Phase Induction Motor with Loading Arrangement 1
9. (3.7KW,415v,7.5A,1430 RPM)
10. Single Phase Induction Motor with Loading Arrangement 1
11. (230V,5HP,17A)
12. DC Shunt Motor Coupled With DC Compound Generator 1

13. (DC Shunt Motor: kW: 7.4/ volts: 220/ Amps: 38.5/ Speed: 960 RPM Field current1.2A)
14. (DC Compound Generator: kW: 7.5/ volts: 220/ Amps: 38.5/ Speed: 960 RPM / Field current1.2A)
15. Tachometer –Digital/Analog 8
16. Single Phase Auto Transformer;(0-270)V 2
17. Three Phase Auto Transformer;(0-270)V 1
18. MC Voltmeter-(0-300/600)V 5
19. MC Ammeter (0-10/20)A 5
20. MC Ammeter (0-2/1)A 4
21. MI Voltmeter (0-300/600)V 5
22. MI Ammeter (0-10/20)A 6
23. MI Ammeter (0-1/2)A 4
24. UPF Wattmeter (300/600V,10/20A) 4
25. LPF Wattmeter (300/600V,10/20A) 4
26. Single Phase Resistive Loading Bank(10KW) 2
27. Three Phase Resistive Loading Bank(10KW) 2
28. SPST switch 2
29. Fuse various ranges As per the requirement
30. Wires As per the requirement
31. Rheostats(100Ω,1A;250Ω,1.5A;75Ω,16A,1000Ω,1A) Each 2
32. Computers with MATLAB or equivalent Software.

EC6501 DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various Band pass signaling schemes
- To know the fundamentals of channel coding

UNIT I SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM - TDM

UNIT II WAVEFORM CODING 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding

UNIT III BASEBAND TRANSMISSION 9

Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern - Equalization

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - structure of Non-coherent Receivers - Principle of DPSK.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Vitterbi Decoder

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Design PCM systems
- Design and implement base band transmission schemes
- Design and implement band pass signaling schemes
- Analyze the spectral characteristics of band pass signaling schemes and their noise performance
- Design error control coding schemes

TEXT BOOK:

1. S. Haykin, "Digital Communications", John Wiley, 2005

REFERENCES:

1. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd Edition, Pearson Education, 2009
2. B.P.Lathi, "Modern Digital and Analog Communication Systems" 3rd Edition, Oxford University Press 2007.
3. H P Hsu, Schaum Outline Series - "Analog and Digital Communications", TMH 2006
4. J.G Proakis, "Digital Communication", 4th Edition, Tata Mc Graw Hill Company, 2001.

EC6502 PRINCIPLES OF DIGITAL SIGNAL PROCESSING L T P C

3 1 0 4

OBJECTIVES:

- To learn discrete Fourier transform and its properties
- To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals
- To understand Finite word length effects
- To study the concept of Multirate and adaptive filters

UNIT I DISCRETE FOURIER TRANSFORM 9

Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

UNIT II IIR FILTER DESIGN 9

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT III FIR FILTER DESIGN 9

Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

UNIT IV FINITE WORDLENGTH EFFECTS 9

Fixed point and floating point number representations – ADC –Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT V DSP APPLICATIONS 9

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- apply DFT for the analysis of digital signals & systems
- design IIR and FIR filters
- characterize finite Word length effect on filters
- design the Multirate Filters
- apply Adaptive Filters to equalization

TEXT BOOK:

1. John G. Proakis & Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES:

1. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.
4. Andreas Antoniou, “Digital Signal Processing”, Tata Mc Graw Hill, 2006.

EC6503 TRANSMISSION LINES AND WAVE GUIDES L T P C
3 1 0 4

OBJECTIVES:

- To introduce the various types of transmission lines and to discuss the losses associated.
- To give thorough understanding about impedance transformation and matching.
- To use the Smith chart in problem solving.
- To impart knowledge on filter theories and waveguide theories

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV PASSIVE FILTERS 9

Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K - Low Pass, High Pass, Band Pass, Band Elimination, m- derived sections - low pass, high pass composite filters.

UNIT V WAVE GUIDES AND CAVITY RESONATORS 9

General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel's differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the propagation of signals through transmission lines.
- Analyze signal propagation at Radio frequencies.
- Explain radio propagation in guided systems.
- Utilize cavity resonators.

TEXT BOOKS

1. John D Ryder, “Networks, lines and fields”, 2nd Edition, Prentice Hall India, 2010.

REFERENCES

1. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2006.
2. G.S.N Raju "Electromagnetic Field Theory and Transmission Lines" , Pearson Education, First edition 2005.

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

To the study of nature and the facts about environment.

- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and

desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.
Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, ‘Environmental Science and Engineering’, Tata Mc Graw-Hill, New Delhi, 2006.

REFERENCES:

1. R.K. Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard”, Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, “Environmental law”, Prentice Hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2005

EC6504 MICROPROCESSOR AND MICROCONTROLLER L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.

EC6513 MICROPROCESSOR AND MICROCONTROLLER LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

The student should be made to:

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2's complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

OUTCOMES:

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

- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

8086 development kits	- 30 nos
Interfacing Units	- Each 10 nos
Microcontroller	- 30 nos

SOFTWARE:

Intel Desktop Systems with MASM	- 30 nos
8086 Assembler	
8051 Cross Assembler	

REFERENCE:

1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”,TMH,2012

EC6511 DIGITAL SIGNAL PROCESSING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To demonstrate Finite word length effect

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolutions
3. Spectrum Analysis using DFT
4. FIR filter design
5. IIR filter design
6. Multirate Filters
7. Equalization

DSP PROCESSOR BASED IMPLEMENTATION

8. Study of architecture of Digital Signal Processor
9. MAC operation using various addressing modes
10. Linear Convolution
11. Circular Convolution
12. FFT Implementation
13. Waveform generation
14. IIR and FIR Implementation
15. Finite Word Length Effect

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Analyze Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement adaptive filters for various applications of DSP

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS (2 STUDENTS PER SYSTEM)

PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards) 15 Units

LIST OF SOFTWARE REQUIRED:

MATLAB with Simulink and Signal Processing Tool Box or Equivalent Software in desktop systems -15 Nos

Signal Generators (1MHz) – 15 Nos

CRO (20MHz) -15 Nos

EC6512 **COMMUNICATION SYSTEMS LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

The student should be made to:

- To visualize the effects of sampling and TDM
- To Implement AM & FM modulation and demodulation
- To implement PCM & DM
- To implement FSK, PSK and DPSK schemes
- To implement Equalization algorithms
- To implement Error control coding schemes

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
8. Line coding schemes
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes - Linear Block Codes (Simulation)
11. Communication link simulation
12. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL: 45 PERIODS

OUTCOMES:

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

- Simulate end-to-end Communication Link
- Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK
- Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
- Simulate & validate the various functional modules of a communication system

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS (3 STUDENTS PER EXPERIMENT):

i) Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
ii) CROs – 15 Nos
iii) MATLAB / SCILAB or equivalent software package for simulation experiments
iv) PCs - 10 Nos

MG6851 **PRINCIPLES OF MANAGEMENT** **LT P C**
3 0 0 3

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization .

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES :

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, “Management”, 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata Mc Graw Hill, 1998.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999.

REFERENCES:

1. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, Mc Graw Hill Publisher, 2011.
4. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011.

EC6601 VLSI DESIGN L T P C

3 0 0 3

OBJECTIVES:

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore’s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students should

- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

TEXTBOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

REFERENCES:

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

EC6602 ANTENNA AND WAVE PROPAGATION L T P C
3 0 0 3

OBJECTIVES:

- To give insight of the radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the different types of propagation of radio waves at different frequencies

UNIT I FUNDAMENTALS OF RADIATION 9

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT II APERTURE AND SLOT ANTENNAS 9

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS 9

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS 9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

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

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the application of electronics in diagnostic and therapeutic area.
- Measure biochemical and various physiological information.
- Describe the working of units which will help to restore normal functioning.

TEXTBOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007

REFERENCES:

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA Mc Graw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004.

EC6002 ADVANCED DIGITAL SIGNAL PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

UNIT I DISCRETE-TIME RANDOM SIGNALS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton's Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

UNIT V WAVELET TRANSFORM 9

Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the parametric methods for power spectrum estimation.
- Discuss adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
- Analyze the wavelet transforms.

TEXTBOOKS:

1. Monson H, Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons Inc., New York, Indian Reprint, 2007.
2. John G.Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Pearson, Fourth 2007.
3. Dwight F. Mix, "Random Signal Processing", Prentice Hall, 1995.

REFERENCE:

1. Sophocles J. Orfanidis, "Optimum Signal Processing, An Introduction", Mc Graw Hill, 1990.

CS6401 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

EC6003 **ROBOTICS AND AUTOMATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

UNIT I BASIC CONCEPTS **9**

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS **9**

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS **9**

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING **9**

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V CASE STUDIES **9**

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write program to use a robot for a typical application
- Use Robots in different applications

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", Mc Graw-Hill Singapore, 1996.
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES:

1. Deb. S.R.,"Robotics Technology and flexible Automation", John Wiley, USA 1992.
2. Klafter R.D., Chimielewski T.A., Negin M., "Robotic Engineering – An integrated approach", Prentice Hall of India, New Delhi, 1994.
3. Mc Kerrow P.J. "Introduction to Robotics", Addison Wesley, USA, 1991.
4. Issac Asimov "Robot", Ballantine Books, New York, 1986.
5. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.
6. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.
7. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence" McGraw Hill International Editions, 1987.

UNIT V PROPAGATION OF RADIO WAVES **9**

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the various types of antennas and wave propagation.
- Write about the radiation from a current element.
- Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

TEXT BOOK:

1. John D Kraus," Antennas for all Applications", 3rd Edition, Mc Graw Hill, 2005.

REFERENCES:

1. Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006
2. R.E.Collin,"Antennas and Radiowave Propagation", Mc Graw Hill 1985.
3. Constantine.A.Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 2006.
4. Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.
5. S. Drabowitch, "Modern Antennas" Second Edition, Springer Publications, 2007.
6. Robert S.Elliott "Antenna Theory and Design" Wiley Student Edition, 2006.
7. H.Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

EC6611 COMPUTER NETWORKS LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

The student should be made to:

- Learn to communicate between two desktop computers.
- Learn to implement the different protocols
- Be familiar with socket programming.
- Be familiar with the various routing algorithms
- Be familiar with simulation tools.

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model
6. Write a socket Program for Echo/Ping/Talk commands.
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm

10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Encryption and decryption.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Communicate between two desktop computers.
- Implement the different protocols
- Program using sockets.
- Implement and compare the various routing algorithms
- Use simulation tool.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE

- C / C++ / Java / Equivalent Compiler
- Network simulator like NS2/ NS3 / Glomosim/OPNET/ Equivalent — 30

HARDWARE

Standalone desktops — 30 Nos

EC6612 **VLSI DESIGN LABORATORY** **L T P C**

0 0 3 2

OBJECTIVES:

- To learn Hardware Descriptive Language(Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarise fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms.

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LIST OF EXPERIMENTS

FPGA BASED EXPERIMENTS.

1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (I) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (I). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC DESIGN EXPERIMENTS: (BASED ON CADENCE / MENTOR GRAPHICS / EQUIVALENT)

4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (I)
6. Synthesis and Standard cell based design of an circuits simulated in 1(I) above. Identification of critical paths, power consumption.

7. For expt (c) above, P&R, power and clock routing, and post P&R simulation.
8. Analysis of results of static timing analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Synthesize, Place and Route the digital IPs.
- Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENSTS:

Xilinx or Altera FPGA	10 nos
Xilinx software	
Cadence/MAGMA/Tanner or equivalent software package	10 User License
PCs	10 No.s

GE6674 COMMUNICATION AND SOFT SKILLS- LABORATORY BASED L T P C
0 0 4 2

OBJECTIVES:

To enable learners to,

- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

UNIT I LISTENING AND SPEAKING SKILLS 12

Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

UNIT II READING AND WRITING SKILLS 12

Reading different genres of tests ranging from newspapers to creative writing. Writing job applications- cover letter- resume- emails- letters- memos- reports. Writing abstracts- summaries- interpreting visual texts.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS 12

International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.

EC2401 **WIRELESS COMMUNICATION** **L T P C**
3 0 0 3

AIM

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

OBJECTIVES:

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

UNIT I SERVICES AND TECHNICAL CHALLENGES 9

Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

UNIT II WIRELESS PROPAGATION CHANNELS 9

Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.

UNIT III WIRELESS TRANSCEIVERS 9

Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, $\pi/4$-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

UNIT IV SIGNAL PROCESSING IN WIRELESS SYSTEMS 9

Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

UNIT V ADVANCED TRANSCEIVER SCHEMES 9

Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS–95) and Third Generation Wireless Networks and Standards

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.

REFERENCES:

1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

EC2402 OPTICAL COMMUNICATION AND NETWORKING L T P C
3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I INTRODUCTION 9

Introduction**,** Ray theory transmission- Total internal reflection-Acceptance angle – Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation – EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers – SM fibers.

UNIT II TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS 9

Attenuation – Material absorption losses in silica glass fibers – Linear and Non linear Scattering losses - Fiber Bend losses – Midband and farband infra red transmission – Intra and inter Modal Dispersion – Over all Fiber Dispersion – Polarization- non linear Phenomena. Optical fiber connectors**,** Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers.

UNIT III SOURCES AND DETECTORS 9

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, injection laser diode structures - comparison of LED and ILD

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise -Noise sources , Signal to Noise ratio , Detector response time.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration – Probability of Error – Quantum limit.

Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

UNIT V OPTICAL NETWORKS 9

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks – Wavelength Routed Networks – Non linear effects on Network performance – Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000

REFERENCES

1. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001
2. Rajiv Ramaswami, “Optical Networks “ , Second Edition, Elsevier , 2004.
3. Govind P. Agrawal, “ Fiber-optic communication systems”, third edition, John Wiley & sons, 2004.
4. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.

EC2403 RF AND MICROWAVE ENGINEERING L T P C

3 0 0 3

AIM:

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

OBJECTIVES:

- To study about multi- port RF networks and RF transistor amplifiers
- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

UNIT I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 9

Low frequency parameters-impedance ,admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor, applications of RF

UNIT II RFTRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 9

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks, frequency response, T and Π matching networks, microstripline matching networks

UNIT III MICROWAVE PASSIVE COMPONENTS 9

Microwave frequency range, significance of microwave frequency range - applications of microwaves. Scattering matrix -Concept of N port scattering matrix representation-Properties of S matrix- S matrix formulation of two-port junction. Microwave junctions - Tee junctions -Magic Tee - Rat race - Corners - bends and twists - Directional couplers - two hole directional couplers- Ferrites - important microwave properties and applications – Termination - Gyrator- Isolator-Circulator - Attenuator - Phase changer – S Matrix for microwave components – Cylindrical cavity resonators.

UNIT IV MICROWAVE SEMICONDUCTOR DEVICES 9

Microwave semiconductor devices- operation - characteristics and application of BJTs and FETs -Principles of tunnel diodes - Varactor and Step recovery diodes - Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT devices. Parametric devices -Principles of operation - applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) - Materials and fabrication techniques

UNIT V MICROWAVE TUBES AND MEASUREMENTS 9

Microwave tubes- High frequency limitations - Principle of operation of Multicavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron. Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Samuel Y Liao, “Microwave Devices & Circuits” , Prentice Hall of India, 2006.
2. Reinhold.Ludwig and Pavel Bretshko ‘RF Circuit Design”, Pearson Education, Inc., 2006

REFERENCES:

1. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill.
2. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Inc., 2004.
3. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
4. Robert E.Colin, 2ed “Foundations for Microwave Engineering”, McGraw Hill, 2001
5. D.M.Pozar, “Microwave Engineering.”, John Wiley & sons, Inc., 2006.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL : 45 PERIODS

TEXTBOOK

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

REFERENCES

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

EC2030 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

AIM

To introduce the student to advanced digital signal processing techniques.

OBJECTIVES

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To introduce the student to wavelet transforms.

UNIT I DISCRETE RANDOM PROCESS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRAL ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton's Steepest descent algorithm – Derivation of first order adaptive filter – LMS adaptation algorithms – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellors.

UNIT V ADVANCED TRANSFORM TECHNIQUES 9

2-D Discrete Fourier transform and properties– Applications to image smoothing and sharpening – Continuous and Discrete wavelet transforms – Multiresolution Analysis – Application to signal compression.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Monson H Hayes," Statistical Digital Signal processing and Modeling", Wiley Student Edition, John Wiley and Sons, 2004.
2. R.C. Gonzalez and R.E. Woods, " Digital Image Processing", Pearson, Second Edition, 2004.

REFERENCES

1. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.

EC2031 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY L T P C
3 0 0 3

AIM

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

OBJECTIVES

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

UNIT I BASIC CONCEPTS 9

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

UNIT II EMI MEASUREMENTS 9

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

EC2035 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

AIM:

To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms**.**

OBJECTIVES:

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory
- To understand authentication and Hash functions.
- To know the network security tools and applications.
- To understand the system level security used.

UNIT I INTRODUCTION 10

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality

UNIT II PUBLIC KEY CRYPTOGRAPHY 10

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

UNIT III AUTHENTICATION AND HASH FUNCTION 9

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard

UNIT IV NETWORK SECURITY 8

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

UNIT V SYSTEM LEVEL SECURITY 8

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems**.**

TOTAL : 45 PERIODS

TEXT BOOKS

1. William Stallings, “Cryptography And Network Security – Principles and Practices”, Pearson Education, Third Edition, 2003.
2. Behrouz A. Foruzan, “Cryptography and Network Security”, Tata McGraw-Hill, 2007

REFERENCES:
1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, Pearson Education, 2003
3. Wade Trappe and Lawrence C. Washington , “ Introduction to Cryptography with
4. coding theory” , Pearson Education, 2007.
5. Wenbo Mao, “ Modern Cryptography Theory and Practice” , Pearson Education, 2007
6. Thomas Calabrese, “Information Security Intelligence : Cryptographic Principles and Applications”, Thomson Delmar Learning,2006.
7. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003.

EC2036 INFORMATION THEORY L T P C
3 0 0 3

AIM

To introduce the fundamental concepts of information theory.

OBJECTIVES

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I QUANTITATIVE STUDY OF INFORMATION 8

Basic inequalities, Entropy, Kullback-Leibler distance, Mutual information, Bounds on entropy, Fisher information , Cramer Rao inequality, Second law of thermodynamics , Sufficient statistic , Entropy rates of a Stochastic process

UNIT II CAPACITY OF NOISELESS CHANNEL 8

Fundamental theorem for a noiseless channel ,Data compression , Kraft inequality , Shannon-Fano codes , Huffman codes , Asymptotic equipartition , Rate distortion theory

UNIT III CHANNEL CAPACITY 9

Properties of channel capacity , Jointly typical sequences , Channel Coding Theorem, converse to channel coding theorem, Joint source channel coding theorem ,

UNIT IV DIFFERENTIAL ENTROPY AND GAUSSIAN CHANNEL 9

AEP for continuous random variables, relationship between continuous and discrete entropy, properties of differential entropy, Gaussian channel definitions, converse to coding theorem for Gaussian channel, channels with colored noise, Gaussian channels with feedback .

UNIT V NETWORK INFORMATION THEORY 11

Gaussian multiple user channels , Multiple access channel , Encoding of correlated sources , Broadcast channel , Relay channel , Source coding and rate distortion with side information , General multi-terminal networks.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999

REFERENCE:

1. Information theory, inference & learning algorithms – David Mackay year?

EC2037 MULTIMEDIA COMPRESSION AND COMMUNICATION L T P C
3 0 0 3

AIM

To introduce the fundamental concepts of information theory.

OBJECTIVES

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their chacracteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel ziv-welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TEXT BOOKS:

1. Fred HAlshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: making it work”, 7/e, TMH 2007
3. Kurose and W.Ross” Computer Networking “a Top down approach, Pearson education.

TEXT BOOK:

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES:

1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.

GE2025 PROFESSIONAL ETHICS IN ENGINEERING

L	T	P	C
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UNIT I ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS **9**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES **9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL :45 PERIODS

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

REFERENCES:

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)

EC2042 EMBEDDED AND REAL TIME SYSTEMS L T P C
3 0 0 3

AIM

To give sufficient background for undertaking embedded and real time systems design.

OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real time operating systems and inter-task communication.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING 9

Complex systems and microprocessors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

UNIT II COMPUTING PLATFORM AND DESIGN ANALYSIS 9

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

UNIT III PROCESS AND OPERATING SYSTEMS 9

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems –Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT IV HARDWARE ACCELERATES & NETWORKS 9

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

UNIT V CASE STUDY 9

Hardware and software co-design - Data Compressor - Software Modem – Personal Digital Assistants – Set–Top–Box. – System-on-Silicon – FOSS Tools for embedded system development.

TOTAL: 45 PERIODS

EC2027 **ADVANCED MICROPROCESSORS** **L T P C**
3 0 0 3

AIM

To learn the architecture and programming of advanced microprocessors.

OBJECTIVES

- To introduce the concepts of advanced microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of advanced microprocessors.
- To introduce the concepts and architecture of RISC processor.

UNIT I 80186, 80286, 80386 AND 80486 MICROPROCESSORS 9

80186 Architecture, Enhancements of 80186 – 80286 Architecture – Real and Virtual Addressing Modes – 80386 Architecture – Special Registers – Memory Management – Memory Paging Mechanism – 80486 Architecture – Enhancements – Cache Memory Techniques – Exception Handling – Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486).

UNIT II PENTIUM MICROPROCESSORS 9

Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

UNIT III RISC PROCESSORS I 9

PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching – dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basics of P6 micro architecture – Pipelining – our-of-order core pipeline – Memory subsystem.

UNIT IV RISC PROCESSORS II(SUPERSCALAR PROCESSORS) 9

Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

UNIT V PC HARDWARE OVERVIEW 9

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces and Controller, Memory and I/O Port Addresses.

TOTAL : 45 PERIODS

TEXT BOOKS

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson Education , 2004.
2. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata Mcgraw Hill, 2006.

REFERENCES:

1. Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, II Edition 2006
2. Mohamed Rafiquzzaman, “Microprocessors and Microcomputer Based System Design”, II Edition, CRC Press, 2007.

EC2028	INTERNET AND JAVA	L	T	P	C
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AIM

To learn the basics of Internetworking, Routing, World Wide Web, Java Programming with simple case studies.

OBJECTIVES:

- To learn Internetworking with TCP/IP.
- To learn routing for high speed multimedia traffic
- To learn the fundamentals in WWW, HTML and XML.
- To learn Java for Networking application
- To understand the basic concepts in E-com, Network operating system and Web design.

UNIT I INTERNETWORKING WITH TCP / IP 9

Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT II INTERNET ROUTING 9

Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation (RSVP), IP switching.

UNIT III WORLD WIDE WEB 9

HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design, HTML, Dynamic HTML, CGI, Java script.

UNIT IV INTRODUCTION TO JAVA 9

The java programming environment, Fundamental Programming structures, Objects and Classes, Inheritance, Event handling, Exceptions and Debugging, Multithreading , RMI.

UNIT V JAVA PROGRAMMING 9

Networking with Java, Swing: Applets and Applications, Menu’s & Tool Bars, Java and XML – Creating packages, Interfaces, JAR files & Annotations, Javabeans, JDBC.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5th edition, Pearson Education, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education. (Unit-III), 2007.
3. Steven Holzner et. al, "Java 2 Programming" , Black Book, Dreamtech Press, 2006. (Unit –IV & V)

REFERENCES:

1. Cay S.Hortsmann, Gary Cornwell, "Core Java 2", Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, " TCP/IP Illustrated, The Protocol" , Vol I , Pearson Education, 1st Edition, 2006.
3. Behrouz A. Farouzon , "TCP/IP Protocol Suite, 3rd edition , Tata McGraw Hill, 2007
4. Chris Bates, " Web Programming Building Internet Applications", Wiley Publications.
5. Kogent Solutions Inc., " Java Server Programming", Black Book, Dreamtech Press, 2007 Platinum edition.

EC2029 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

AIM

To introduce the student to various image processing techniques.

OBJECTIVES

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

CS2053 **SOFT COMPUTING** **L T P C**
3 0 0 3

UNIT I FUZZY SET THEORY 10

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – 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.

UNIT II OPTIMIZATION 8

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III ARTIFICIAL INTELLIGENCE 10

Introduction, Knowledge Representation – Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainity Basic knowledge Representation Issues Knowledge acquisition – Heuristic Search: Techniques for Heuristic search Heuristic Classification - State Space Search: Strategies Implementation of Graph Search Search based on Recursion Patent-directed Search Production System and Learning.

UNIT IV NEURO FUZZY MODELING 9

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.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TOTAL: 45 PERIODS

TEXT BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

REFERENCES

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
6. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008.

TEXT BOOK:

1. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999

REFERENCE:

1. Information theory, inference & learning algorithms – David Mackay year?

EC2037 MULTIMEDIA COMPRESSION AND COMMUNICATION L T P C
3 0 0 3

AIM

To introduce the fundamental concepts of information theory.

OBJECTIVES

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their chacracteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel ziv-welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TEXT BOOKS:

1. Fred HAlshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: making it work”, 7/e, TMH 2007
3. Kurose and W.Ross” Computer Networking “a Top down approach, Pearson education.

REFERENCES:

1. Marcus goncalves “Voice over IP Networks”, Mcgaraw hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education
4. Ranjan Parekh, “Principles of Multimedia”, TMH 2006

EC2038 NANO ELECTRONICS L T P C

3 0 0 3

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9

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

UNIT II FUNDAMENTALS OF NANOELECTRONICS 9

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

UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV CARBON NANOTUBES 9

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

UNIT V MOLECULAR ELECTRONICS 9

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

TOTAL: 45 PERIODS

TEXTBOOKS

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

EC2039 PARALLEL AND DISTRIBUTED PROCESSING L T P C
3 0 0 3

AIM

To learn the concepts of parallel processing and distributed computing bringing out the differences among various architectures and systems.

OBJECTIVES

i To introduce parallel processing and parallel architectures
II. To introduce the concepts of shared memory based and thread based implementations.
III. To learn the two modes of distributed computing using message passing and remote procedure calls.
IV To learn introductory techniques of parallel debugging, and be introduced to other parallel paradigms.
V. To introduce basic concepts of distributed data bases and distributed operating systems.

UNIT I INTRODUCTION TO PARALLEL PROCESSING AND PARALLEL ARCHITECTURES 9

Need and definition of parallel processing, shared memory multiprocessing, Distributed memory, using parallelism, tools and languages, Parallelism in sequential machines, Multiprocessor architecture, Pipelining, Array processors.

UNIT II SHARED MEMORY PROGRAMMING AND THREAD BASED IMPLEMENTATION 9

Shared Memory Programming and its general model, Process model under UNIX, Thread management, Example with threads, Attributes of Threads, Mutual Exclusion with threads and Thread implementation..

UNIT III DISTRIBUTED COMPUTING – MESSAGE PASSING AND RPC MODEL **9**

Message-passing model, General model, programming model, PVM, Remote procedure calls (RPC), Parameter passing, JAVA Remote Method Invocation, Distributed computing environment(DCE), Developing Applications in DCE.

UNIT IV DEBUGGING PARALLEL PROGRAMS AND OTHER PARALLELISM PARADIGMS **9**

Debugging Techniques, Debugging Message passing parallel programs and shared memory parallel programs, Dataflow computing, systolic architectures, functional and logic paradigms, distributed shared memory.

UNIT V DISTRIBUTED DATABASES AND DISTRIBUTED OPERATING SYSTEMS **9**

Reasons for and objectives of distributed databases, issues and systems, distribution options, concurrency control, DDBMS structure. Need for Distributed operating systems, network operating systems, distributed OS, Goals of DOS and Design issues.

TOTAL: 45 PERIODS

TEXT BOOKS

1. M.Sasikumar, D.Shikhare and P. Ravi Prakash, "Introduction to Parallel processing".PHI 2006.
2. Rajaraman, C. Siva Ram Murthy, "Parallel computers: Architecture and programming", PHI 2006.

REFERENCES

1. Harry F. Jordan, Gita Alaghband, "Fundamentals of parallel processing", PHI 2006.
2. Quinn, M.J., "Designing Efficient Algorithms for Parallel Computers", McGraw -Hill, 1995.
3. Culler, D.E., "Parallel Computer Architecture", A Hardware – Software approach, Harcourt Asia Pte. Ltd., 1999

EC2041 AVIONICS **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Introduction to aircraft – Axes system – Parts, importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.

UNIT II RADIO NAVIGATION **9**

Types of Radio Navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS

UNIT III INERTIAL AND SATELLITE NAVIGATION SYSTEMS **9**

Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Block diagram, Platform and strap down INS. Satellite Navigation - GPS

TEXT BOOKS:

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5th edition, Pearson Education, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education. (Unit-III), 2007.
3. Steven Holzner et. al, "Java 2 Programming" , Black Book, Dreamtech Press, 2006. (Unit –IV & V)

REFERENCES:

1. Cay S.Hortsmann, Gary Cornwell, "Core Java 2", Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, " TCP/IP Illustrated, The Protocol" , Vol I , Pearson Education, 1st Edition, 2006.
3. Behrouz A. Farouzon , "TCP/IP Protocol Suite, 3rd edition , Tata McGraw Hill, 2007
4. Chris Bates, " Web Programming Building Internet Applications", Wiley Publications.
5. Kogent Solutions Inc., " Java Server Programming", Black Book, Dreamtech Press, 2007 Platinum edition.

EC2029 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

AIM

To introduce the student to various image processing techniques.

OBJECTIVES

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL : 45 PERIODS

TEXTBOOK

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

REFERENCES

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

EC2030 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

AIM

To introduce the student to advanced digital signal processing techniques.

OBJECTIVES

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To introduce the student to wavelet transforms.

UNIT I DISCRETE RANDOM PROCESS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRAL ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton's Steepest descent algorithm – Derivation of first order adaptive filter – LMS adaptation algorithms – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellors.

UNIT V ADVANCED TRANSFORM TECHNIQUES 9

2-D Discrete Fourier transform and properties– Applications to image smoothing and sharpening – Continuous and Discrete wavelet transforms – Multiresolution Analysis – Application to signal compression.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Monson H Hayes," Statistical Digital Signal processing and Modeling", Wiley Student Edition, John Wiley and Sons, 2004.
2. R.C. Gonzalez and R.E. Woods, " Digital Image Processing", Pearson, Second Edition, 2004.

REFERENCES

1. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.

EC2031 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY L T P C
3 0 0 3

AIM

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

OBJECTIVES

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

UNIT I BASIC CONCEPTS 9

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

UNIT II EMI MEASUREMENTS 9

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

UNIT III EMC STANDARD AND REGULATIONS 8

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

UNIT IV EMI CONTROL METHODS AND FIXES 10

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

UNIT V EMC DESIGN AND INTERCONNECTION TECHNIQUES 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Prasad Kodali.V – Engineering Electromagnetic Compatibility – S.Chand&Co – New Delhi – 2000
2. Clayton R.Paul – Introduction to Electromagnetic compatibility – John Wiley & Sons –1992

REFERENCES

1. Keiser – Principles of Electromagnetic Compatibility – Artech House – 3rd Edition – 1994
2. Donwhite Consultant Incorporate – Handbook of EMI / EMC – Vol I – 1985

CS2060 HIGH SPEED NETWORKS L T P C
3 0 0 3

AIM

To highlight the features of different technologies involved in High Speed Networking and their performance.

OBJECTIVES

- Students will get an introduction about ATM and Frame relay.
- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- Students will be provided with different levels of quality of service (Q.S) to different applications.

UNIT I HIGH SPEED NETWORKS 9

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

UNIT II CONGESTION AND TRAFFIC MANAGEMENT 8

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

UNIT III TCP AND ATM CONGESTION CONTROL 11

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

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 8

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

UNIT V PROTOCOLS FOR QOS SUPPORT 9

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

TOTAL : 45 PERIODS

TEXT BOOK

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

REFERENCES

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition , Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

EC2033 POWER ELECTRONICS L T P C
3 0 0 3

AIM

Application of Electronic knowledge in industry for rectification of polyphase supply voltage and for control of motor speed and for thermal heating.

OBJECTIVES

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

UNIT I POWER ELECTRONICS DEVICES 9

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

UNIT II TRIGGERING TECHNIQUES 9

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

UNIT III CONTROLLED RECTIFIERS 9

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

UNIT IV INVERTERS 9

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

UNIT V INDUSTRIAL APPLICATIONS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3rd Edition. 2004 PHI.
2. M.D. Singh and K.B. Kanchandani, Power Electronics, 2nd Edition, TMH, 2007.

REFERENCES

1. Sen: Power Electronics, TMH, 1987.
2. Dubey: Thyristorised Power Controllers, Wiley Eastern 1986.
3. Vithayathil: Power Electronics – Principles and Applications, McGraw-Hill, 1995.
4. Lander: Power Electronics, 3rd Edition, McGraw-Hill, 1994.
5. Jacob, Power Electronics, Thomson Learning, 2002.
6. V.R. Moorthy, Power Electronics, Oxford University Press, 2005.

EC2034 TELEVISION AND VIDEO ENGINEERING L T P C
3 0 0 3

AIM

Television Technology has now become a vital tool to the information revolution that is sweeping across the countries of the world. The syllabus aims at a comprehensive coverage of Television Systems with all the new developments in Television Engineering

OBJECTIVES

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

UNIT I FUNDAMENTALS OF TELEVISION 9

Aspect ratio-Image continuity-Number of scanning lines-Interlaced scanning-Picture resolution-Camera tubes-Image Orthicon-Vidicon- Plumbicon- Silicon Diode Array Vidicon- Solid-state Image scanners- Monochrome picture tubes- Composite video signal- video signal dimension-horizontal sync. Composition-vertical sync. Details-functions of vertical pulse train- Scanning sequence details. Picture signal transmission-positive and negative modulation- VSB transmission- Sound signal transmission-Standard channel bandwidth.

UNIT II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER 9

TV transmitter-TV signal Propagation- Interference- TV Transmission Antennas-Monochrome TV receiver- RF tuner- UHF, VHF tuner-Digital tuning techniques-AFT-IF subsystems-AGC Noise cancellation-Video and Sound inter-carrier detection-Vision IF subsystem- DC re-insertion-Video amplifier circuits-Sync operation- typical sync processing circuits-Deflection current waveforms, Deflection oscillators- Frame deflection circuits- requirements- Line deflection circuits-EHT generation-Receiver antennas.

UNIT III ESSENTIALS OF COLOUR TELEVISION 9

Compatibility- Colour perception-Three colour theory- Luminance, Hue and saturation-Colour television cameras-Values of luminance and colour difference signals-Colour television display tubes-Delta-gun Precision-in-line and Trinitron colour picture tubes-Purity and convergence- Purity and static and Dynamic convergence adjustments-Pincushion-correction techniques-Automatic degaussing circuit- Gray scale tracking-colour signal transmission- Bandwidth-Modulation of colour difference signals-Weighting factors-Formation of chrominance signal.

UNIT IV COLOUR TELEVISION SYSTEMS 9

NTSC colour TV systems-SECAM system- PAL colour TV systems- Cancellation of phase errors-PAL-D Colour system-PAL coder-PAL-Decoder receiver-Chromo signal amplifier-separation of U and V signals-colour burst separation-Burst phase Discriminator-ACC amplifier-Reference Oscillator-Ident and colour killer circuits-U and V demodulators- Colour signal matrixing. Sound in TV

UNIT V ADVANCED TELEVISION SYSTEMS 9

Satellite TV technology-Geo Stationary Satellites-Satellite Electronics-Domestic Broadcast System-Cable TV-Cable Signal Sources-Cable Signal Processing, Distribution & Scrambling- Video Recording-VCR Electronics-Video Home Formats-Video Disc recording and playback-DVD Players-Tele Text Signal coding and broadcast receiver- Digital television-Transmission and reception –Projection television-Flat panel display TV receivers-LCD and Plasma screen receivers-3DTV-EDTV.

TOTAL = 45 PERIODS

TEXTBOOKS:

1. R.R.Gulati, “Monochrome Television Practice, Principles, Technology and servicing.” Third Edition 2006, New Age International (P) Publishers.
2. R.R.Gulati, Monochrome & Color Television, New Age International Publisher, 2003.

REFERENCES:

1. A.M Dhake, “Television and Video Engineering”, 2nd ed., TMH, 2003.
2. R.P.Bali, Color Television, Theory and Practice, Tata McGraw-Hill, 1994

EC2038 **NANO ELECTRONICS** **L T P C**
3 0 0 3

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9

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

UNIT II FUNDAMENTALS OF NANOELECTRONICS 9

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

UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV CARBON NANOTUBES 9

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

UNIT V MOLECULAR ELECTRONICS 9

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

TOTAL: 45 PERIODS

TEXTBOOKS

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard
2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
3. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
4. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

UNIT III DISTRIBUTED COMPUTING – MESSAGE PASSING AND RPC MODEL **9**

Message-passing model, General model, programming model, PVM, Remote procedure calls (RPC), Parameter passing, JAVA Remote Method Invocation, Distributed computing environment(DCE), Developing Applications in DCE.

UNIT IV DEBUGGING PARALLEL PROGRAMS AND OTHER PARALLELISM PARADIGMS **9**

Debugging Techniques, Debugging Message passing parallel programs and shared memory parallel programs, Dataflow computing, systolic architectures, functional and logic paradigms, distributed shared memory.

UNIT V DISTRIBUTED DATABASES AND DISTRIBUTED OPERATING SYSTEMS **9**

Reasons for and objectives of distributed databases, issues and systems, distribution options, concurrency control, DDBMS structure. Need for Distributed operating systems, network operating systems, distributed OS, Goals of DOS and Design issues.

TOTAL: 45 PERIODS

TEXT BOOKS

1. M.Sasikumar, D.Shikhare and P. Ravi Prakash, "Introduction to Parallel processing".PHI 2006.
2. Rajaraman, C. Siva Ram Murthy, "Parallel computers: Architecture and programming", PHI 2006.

REFERENCES

1. Harry F. Jordan, Gita Alaghband, "Fundamentals of parallel processing", PHI 2006.
2. Quinn, M.J., "Designing Efficient Algorithms for Parallel Computers", McGraw -Hill, 1995.
3. Culler, D.E., "Parallel Computer Architecture", A Hardware – Software approach, Harcourt Asia Pte. Ltd., 1999

EC2041 AVIONICS **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Introduction to aircraft – Axes system – Parts, importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.

UNIT II RADIO NAVIGATION **9**

Types of Radio Navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS

UNIT III INERTIAL AND SATELLITE NAVIGATION SYSTEMS **9**

Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Block diagram, Platform and strap down INS. Satellite Navigation - GPS

UNIT IV AIR DATA SYSTEMS AND AUTOPILOT 9

Air data quantities – Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Stall warning, Altitude warning. Autopilot – basic principles – longitudinal and lateral autopilot.

UNIT V AIRCRAFT DISPLAYS 9

Display technologies – LED, LCD, CRT, Flat Panel Display. Primary Flight parameter displays - Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit.

TOTAL= 45 PERIODS

TEXT BOOKS

1. Albert Helfrick. D, 'Principles of Avionics', Avionics communications Inc., 2004
2. Collinson, R.P.G, 'Introduction to Avionics', Chapman and Hall, 1996.

REFERENCES

1. Middleton, D.H, 'Avionics Systems', Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.
2. Spitzer, C.R. 'Digital Avionics Systems', Prentice Hall, Englewood Cliffs, N.J., USA 1993.
3. Spitzer, C.R, 'The Avionics Handbook', CRC Press, 2000.
4. Pallet, E.H.J, 'Aircraft Instruments and Integrated Systems', Longman Scientific

GE2071 INTELLECTUAL PROPERTY RIGHTS (IPR) L T P C
3 0 0 3

UNIT I 5

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

UNIT II 10

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III 10

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV 10

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V 10

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL : 45 PERIODS

1. Design of a 4-20 mA transmitter for a bridge type transducer.

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

2. Design of AC/DC voltage regulator using SCR

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

3. Design of process control timer

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

4. Design of AM / FM modulator / demodulator

Design AM signal using multiplier IC for the given carrier frequency and modulation index and demodulate the AM signal using envelope detector.Design FM signal using VCO IC NE566 for the given carrier frequency and demodulate the same using PLL NE 565.

5. Design of Wireless data modem.

Design a FSK modulator using 555/XR 2206 and convert it to sine wave using filter and transmit the same using IR LED and demodulate the same PLL NE 565/XR 2212.

6. PCB layout design using CAD

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

7. Microcontroller based systems design

Design of microcontroller based system for simple applications like security systems combination lock.

8. DSP based system design

Design a DSP based system for echo cancellation, using TMS/ADSP DSP kit.

9. Psuedo-random Sequence Generator

11. Arithmetic Logic Unit Design

Note: Kits should not be used. Instead each experiment may be given as mini project.

EC2405 **OPTICAL & MICROWAVE LAB** **L T P C**
0 0 3 2

MICROWAVE EXPERIMENTS:

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

OPTICAL EXPERIMENTS:

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers

EC2021 **MEDICAL ELECTRONICS** **L T P C**
3 0 0 3

AIM

To make students to understand the applications of electronics in diagnostic and therapeutic area.

OBJECTIVES

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

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

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

REFERENCES:

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)

EC2042 EMBEDDED AND REAL TIME SYSTEMS L T P C
3 0 0 3

AIM

To give sufficient background for undertaking embedded and real time systems design.

OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real time operating systems and inter-task communication.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING 9

Complex systems and microprocessors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

UNIT II COMPUTING PLATFORM AND DESIGN ANALYSIS 9

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

UNIT III PROCESS AND OPERATING SYSTEMS 9

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems –Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT IV HARDWARE ACCELERATES & NETWORKS 9

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

UNIT V CASE STUDY 9

Hardware and software co-design - Data Compressor - Software Modem – Personal Digital Assistants – Set–Top–Box. – System-on-Silicon – FOSS Tools for embedded system development.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, Morgan Kaufmann Publisher, 2006.

REFERENCES:

1. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007.
2. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, dreamtech press, 2005.
3. Tim Wilmshurst, “An Introduction to the Design of Small Scale Embedded Systems”, Pal grave Publisher, 2004.
4. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
5. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier,2006.

EC2043 WIRELESS NETWORKS L T P C
3 0 0 3

AIM

To study some fundamental concepts in wireless networks.

OBJECTIVES

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

UNIT I MULTIPLE RADIO ACCESS 9

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks , Handoff and Roaming Support, Security and Privacy.

UNIT II WIRELESS WANS 9

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000)

UNIT III WIRELESS LANS 9

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, hysical Layer- MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

UNIT IV ADHOC AND SENSOR NETWORKS 9

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

REFERENCES:
1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech HouseBostan London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book Co., 1983.
6. Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP professional Books, 1990.
7. G.B.Bleazard, ' Introducing Satellite communications NCC Publication, 1985.
8. M.Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003

EC2046 ADVANCED ELECTRONIC SYSTEM DESIGN L T P C
3 0 0 3

AIM

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

OBJECTIVES

- To study RF component such as resonator, filter, transmission lines, etc…
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

UNIT I INTRODUCTION TO RF DESIGN 9

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

UNIT II RF TRANSISTOR AMPLIFIER DESIGN 9

Impedance matching using discrete components. Microstrip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design (S_{12} = 0) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT III DESIGN OF POWER SUPPLIES 9

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

UNIT IV DESIGN OF DATA ACQUISITION SYSTEMS 9

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

UNIT V DESIGN OF PRINTED CIRCUIT BOARDS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. Keith H.Billings, Handbook of Switched Mode Supplies, McGraw-Hill Publishing Co., 1989.
2. Michael Jaacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1991.
3. Otmar Kigenstein, Switched Mode Power Supplies in Practice, John Wiley and Sons, 1989.
4. Muhammad H.Rashid, Power Electronics – Circuits, Devices and Applications, Prentice Hall of India, 2004.

EC2047 OPTO ELECTRONIC DEVICES L T P C
3 0 0 3

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVES

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

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

UNIT II DISPLAY DEVICES AND LASERS 9

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

UNIT III OPTICAL DETECTION DEVICES 9

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

UNIT IV OPTOELECTRONIC MODULATOR 9

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

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Pallab Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, McGraw-Hill International Edition, 1998

REFERENCES

1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India,2005.
2. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall, 1995.

EC2048 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION

L	T	P	C
3	0	0	3

AIM

To model the random variables and random process applied to telecommunication system and to learn the methods of system simulation and performance evaluation.

OBJECTIVES

- To learn simulation of random variables and random process
- To learn modeling of radio communication channels
- To understand various simulation techniques
- To understand simulation methodologies and performance evaluation
- To analyse some digital communication optical communication and satellite communication techniques as case studies through simulation.

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

UNIT V DME AND TACAN 9

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

TOTAL : 45 PERIODS

TEXTBOOKS

1. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2003.
2. N.S.Nagaraja, Elements of Electronic Navigation Systems, 2nd Edition, TMH, 2000.

REFERENCES

1. Peyton Z. Peebles:, "Radar Principles", Johnwiley, 2004
2. J.C Toomay, " Principles of Radar", 2nd Edition –PHI, 2004

EC2050 MOBILE ADHOC NETWORKS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction to adhoc networks – definition, characteristics features, applications. Charectristics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV END-END DELIVERY AND SECURITY 9

Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G **9**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

TEXT BOOKS

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education. 2007
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCES

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network
4. Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
5. A survey of integrating IP mobility protocols and Mobile Ad hoc networks, Fekri M. Abduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, v no.1 2007
6. V.T. Raisinhani and S.Iyer "Cross layer design optimization in wireless protocol stacks"Comp. communication, vol 27 no. 8, 2004.
7. V.T.Raisinhani and S.Iyer,"ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks",World Wireless cong., San francisco,CA,May 2004.
8. V.Kawadia and P.P.Kumar,"A cautionary perspective on Cross-Layer design,"IEEE Wireless commn., vol 12, no 1,2005.

EC2051 WIRELESS SENSOR NETWORKS **L T P C**
3 0 0 3

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS **8**

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II ARCHITECTURES **9**

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING SENSORS **10**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

EC2052 REMOTE SENSING L T P C
3 0 0 3

UNIT I REMOTE SENSING 9

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

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9

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

UNIT III OPTICAL AND MICROWAVE REMOTE SENSING 9

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

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

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

UNIT V MISCELLANEOUS TOPICS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. M.G. Srinivas(Edited by), Remote Sensing Applications, Narosa Publishing House, 2001. (Units 1 & 2).
2. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001 (Units 3, 4 & 5).

REFERENCES

1. Jensen, J.R., Remote sensing of the environment, Prentice Hall, 2000.
2. Kang-Tsung Chang,"Introduction to Geograhic Information Systems", TMH, 2002
3. Lillesand T.M. and Kiefer R.W., "Remote Sensing and Image Interpretation", John Wiley and Sons, Inc, New York, 1987.
4. Burrough P A, "Principle of GIS for land resource assessment", Oxford Mischael Hord, "Remote Sensing Methods and Applications", John Wiley & Sons, New York, 1986.
5. Singal, "Remote Sensing", Tata McGraw-Hill, New Delhi, 1990.
6. Floyd F. Sabins, Remote sensing, "Principles and interpretation", W H Freeman and Company 1996.

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EC2053 ENGINEERING ACOUSTICS L T P C
3 0 0 3

AIM

This course aims at providing an overview of engineering acoustics.

OBJECTIVE

- To provide mathematical basis for acoustics waves
- To introduce the concept of radiation reception absorption and attenuation of acoustic waves.
- To present the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To describe the architecture and environmental inclusive of reverberation and noise.
- To give a detailed study on loud speakers and microphones.

UNIT I ACOUSTICS WAVES 9

Acoustics waves - Linear wave equation – sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.

Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence – method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES 9

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source - radiation impedance - Fundamental properties of transducers.

Absorption and attenuation of sound

Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS 9

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass.

Noise, Signal detection, Hearing and speech

Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – detection threshold – the ear – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS: 9

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

Environmental Acoustics:

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

UNIT V TRANSDUCTION 9

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

TOTAL : 45 PERIODS

TEXT BOOK

1. Lawrence E.Kinsler, Austin, R.Frey, Alan B.Coppens, James V.Sanders, Fundamentals of Acoustics, 4th edition, Wiley, 2000.

REFERENCE

1. L.Beranek , “Acoustics” - Tata McGraw-Hill

EC2054	OPTICAL NETWORKS	L T P C
		3 0 0 3

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropoliton-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment,Virtual topology design, Wavelength Routing Testbeds, Architectural variations.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL : 45 PERIODS

TEXT BOOK

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition 2004.

REFERENCES

1. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, Ist Edition, 2002.
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.

TEXT BOOK:

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, Morgan Kaufmann Publisher, 2006.

REFERENCES:

1. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007.
2. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, dreamtech press, 2005.
3. Tim Wilmshurst, “An Introduction to the Design of Small Scale Embedded Systems”, Pal grave Publisher, 2004.
4. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
5. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier,2006.

EC2043 WIRELESS NETWORKS L T P C
3 0 0 3

AIM

To study some fundamental concepts in wireless networks.

OBJECTIVES

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

UNIT I MULTIPLE RADIO ACCESS 9

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks , Handoff and Roaming Support, Security and Privacy.

UNIT II WIRELESS WANS 9

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000)

UNIT III WIRELESS LANS 9

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, hysical Layer- MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

UNIT IV ADHOC AND SENSOR NETWORKS 9

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT V WIRELESS MANS AND PANS 9

Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

TOTAL : 45 PERIODS

TEXT BOOKS

1. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007.
2. Dharma Prakash Agrawal & Qing-An Zeng, “Introduction to Wireless and Mobile Systems”, Thomson India Edition, 2nd Ed., 2007.

REFERENCES

1. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, 2007.
2. Kaveth Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks",Pearson Education Asia, 2002.
3. Gary. S. Rogers & John Edwards, “An Introduction to Wireless Technology”, Pearson Education, 2007.
4. Clint Smith, P.E. & Daniel Collins, “3G Wireless Networks”, Tata McGraw Hill, 2nd Ed,. 2007.

EC2044 TELECOMMUNICATION SWITCHING AND NETWORKS L T P C
3 0 0 3

AIMS

- To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.
- To introduce a mathematical model for the analysis of telecommunication traffic.

OBJECTIVES

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

UNIT I MULTIPLEXING 9

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

UNIT II DIGITAL SWITCHING 9

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT 9

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

UNIT IV DIGITAL SUBSCRIBER ACCESS 9

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

UNIT V TRAFFIC ANALYSIS 9

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

TOTAL: 45 PERIODS

TEXTBOOKS

1. J. Bellamy, “Digital Telephony”, John Wiley, 2003, 3rd Edition.
2. JE Flood, “Telecommunications Switching, Traffic and Networks”, Pearson.

REFERENCES

1. R.A.Thomson, “Telephone switching Systems”, Artech House Publishers, 2000.
2. W. Stalling, “ Data and Computer Communications”, Prentice Hall, 1993.
3. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, “Fundamentals of Telecommunication Networks”, Wiley Interscience, 1994.
4. W.D. Reeve, “Subscriber Loop Signaling and Transmission Hand book”, IEEE Press(Telecomm Handbook Series), 1995.
5. Viswanathan. T., “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.

EC2045 **SATELLITE COMMUNICATION** **L T P C**
3 0 0 3

AIM

To enable the student to become familiar with satellites and satellite services.

OBJECTIVES

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

UNIT I SATELLITE ORBITS 8

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN 12

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

UNIT III SATELLITE ACCESS: 10

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Brocast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption

UNIT IV EARTH SEGMENT 5

Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

UNIT V SATELLITE APPLICATIONS 10

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

REFERENCES:
1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech HouseBostan London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book Co., 1983.
6. Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP professional Books, 1990.
7. G.B.Bleazard, ' Introducing Satellite communications NCC Publication, 1985.
8. M.Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003

EC2046 ADVANCED ELECTRONIC SYSTEM DESIGN L T P C
3 0 0 3

AIM

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

OBJECTIVES

- To study RF component such as resonator, filter, transmission lines, etc…
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

UNIT I INTRODUCTION TO RF DESIGN 9

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

UNIT II RF TRANSISTOR AMPLIFIER DESIGN 9

Impedance matching using discrete components. Microstrip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design (S_{12} = 0) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

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

UNIT II DISPLAY DEVICES AND LASERS 9

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

UNIT III OPTICAL DETECTION DEVICES 9

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

UNIT IV OPTOELECTRONIC MODULATOR 9

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

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Pallab Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, McGraw-Hill International Edition, 1998

REFERENCES

1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India,2005.
2. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall, 1995.

EC2048 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION

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AIM

To model the random variables and random process applied to telecommunication system and to learn the methods of system simulation and performance evaluation.

OBJECTIVES

- To learn simulation of random variables and random process
- To learn modeling of radio communication channels
- To understand various simulation techniques
- To understand simulation methodologies and performance evaluation
- To analyse some digital communication optical communication and satellite communication techniques as case studies through simulation.

UNIT I SIMULATION METHODOLOGY 9

Introduction, Aspects of methodology, Performance Estimation, Sampling frequency, Low pass equivalent models for bandpass signals, multicarrier signals, Non-linear and time varying systems, Post processing, Basic Graphical techniques and estimations

UNIT II SIMULATION OF RANDOM VARIABLES RANDOM PROCESS 9

Generation of random numbers and sequence, Guassian and uniform random numbers Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelated noise, Goodness of fit test.

UNIT III MODELING OF COMMUNICATION SYSTEMS 9

Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.

UNIT IV ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION 9

Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.

UNIT V SIMULATION AND MODELING METHODOLOGY 9

Simulation environment, Modeling considerations, Performance evaluation techniques, error source simulation, Validation.

TOTAL : 45 PERIODS

TEXTBOOK:

1. MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.

REFERENCES:

1. Averill.M.Law and W.David Kelton,Simulation Modeling and Analysis, McGraw-Hill Inc., 2000.
2. Geoffrey Gorden, System Simulation, 2nd Edition, Prentice Hall of India, 1992.
3. W.Turin, Performance Analysis of Digital Communication Systems, Computer Science Press, New York, 1990.
4. Jerry banks and John S.Carson, Discrete Event System Simulation, Prentice Hall of India, 1984.
5. William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.Kurt L.Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore) Pvt Ltd, 2004.

EC2049 RADAR AND NAVIGATIONAL AIDS L T P C
3 0 0 3

AIM

To make the student understand the principles of Radar and its use in military and civilian environment

Also to make the student familiar with navigational aids available for navigation of aircrafts and ships.

OBJECTIVES:

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

UNIT I INTRODUCTION TO RADAR 9

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

THE RADAR EQUATION

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

UNIT II MTI AND PULSE DOPPLER RADAR 9

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

UNIT III DETECTION OF SIGNALS IN NOISE 9

Introduction – Matched –Filter Receiver –Detection Criteria – Detectors –-Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction -Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays

Radar Transmitters- Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter.

Radar Receivers - The Radar Receiver - Receiver noise Figure - Superheterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

UNIT IV 9

Introduction Introduction - Four methods of Navigation .

Radio Direction Finding - The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders

Radio Ranges - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments.

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

UNIT V DME AND TACAN 9

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

TOTAL : 45 PERIODS

TEXTBOOKS

1. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2003.
2. N.S.Nagaraja, Elements of Electronic Navigation Systems, 2nd Edition, TMH, 2000.

REFERENCES

1. Peyton Z. Peebles:, "Radar Principles", Johnwiley, 2004
2. J.C Toomay, " Principles of Radar", 2nd Edition –PHI, 2004

EC2050 MOBILE ADHOC NETWORKS L T P C
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UNIT I INTRODUCTION 9

Introduction to adhoc networks – definition, characteristics features, applications. Charectristics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV END-END DELIVERY AND SECURITY 9

Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

EC2054	OPTICAL NETWORKS	L T P C
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UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropoliton-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment,Virtual topology design, Wavelength Routing Testbeds, Architectural variations.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL : 45 PERIODS

TEXT BOOK

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition 2004.

REFERENCES

1. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, Ist Edition, 2002.
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.