PRIST DEEMED UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

B.TECH – ECE - [PART TIME]

[REGULATION 2019]

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.
PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.
PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO1: To analyze, design and develop solutions by applying foundational concepts of electronics and communication engineering.
PSO2: To apply design principles and best practices for developing quality products for scientific and business applications.
PSO3: To adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions to existing/novel problems.

PROGRAMME OUTCOMES:

B.Tech (ECE) Graduates will be able to:
PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	2	3	2	1	1	2	1	1	3	1
PEO2	3	3	3	3	3	1	1	1	1	1	1	2
PEO3	3	3	3	3	3	2	2	3	1	2	2	2

Contribution 1: Reasonable 2: Significant 3: Strong

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSO1	3	3	2	3	2	1	1	1	1	1	1	2
PSO2	3	3	3	3	3	2	2	3	1	3	3	3
PSO3	3	3	3	3	3	3	3	2	1	1	1	3

Contribution 1: Reasonable 2: Significant 3: Strong

B.TECH (PART TIME) – ECE - R2019

SEMESTER-I

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19148S11BP	Transforms and Partial Differential Equations	**3**	**1**	**0**	**4**
2	19152H12P	Electromagnetic Theory	**3**	**1**	**0**	**4**
3	19152H13P	Digital Electronics	**4**	**0**	**0**	**4**
4	19152H14P	Electronic Circuits - I	**3**	**0**	**0**	**3**
5	19152H15P	Signals and Systems	**3**	**1**	**0**	**4**
TOTAL CREDITS						**19**

SEMESTER-II

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19148S21P	Numerical Methods	**3**	**1**	**0**	**4**
2	19153S22P	Electrical Engineering and Control Systems	**4**	**0**	**0**	**4**
3	19152H23P	Linear Integrated Circuits	**4**	**0**	**0**	**4**
4	19152H24P	Electronic Circuits - II	**3**	**0**	**0**	**3**
5	19152H25P	Transmission Lines and Waveguides	**4**	**0**	**0**	**4**
TOTAL CREDITS						**19**

SEMESTER-III

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1.	19148S31BP	Probability and Random Processes	**3**	**1**	**0**	**4**
2.	19152H32P	Microprocessor Interfacing and Applications	**4**	**0**	**0**	**4**
3.	19152H33P	Digital Signal Processing	**3**	**1**	**0**	**4**
4.	19152H34P	Communication Theory	**4**	**0**	**0**	**4**
5.	19152L35P	Digital Signal Processing and Microprocessor Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-IV

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19152H41P	Digital Communication	**4**	**0**	**0**	**4**
2	19152H42P	Antenna and Wave Propagation	**4**	**0**	**0**	**4**
3	19152H43P	Computer Networks	**4**	**0**	**0**	**4**
4	191__E44_P	**Elective-I**	**4**	**0**	**0**	**4**
5	19152L45P	Networks and Communication Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-V

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19152H51P	Optical Communication and Networks	**4**	**0**	**0**	**4**
2	19152H52P	Microwave Engineering	**4**	**0**	**0**	**4**
3	19152H53P	VLSI Design	**4**	**0**	**0**	**4**
4	191__E54_P	**Elective II**	**4**	**0**	**0**	**4**
5	19152L55P	Optical Communication and Microwave Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-VI

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19152H61P	Mobile and Wireless Communication	**4**	**0**	**0**	**4**
2	19152H62P	Medical Electronics	**4**	**0**	**0**	**4**
3	19152H63P	Microcontroller and Embedded Systems	**4**	**0**	**0**	**4**
4	191__E64_P	**Elective III**	**4**	**0**	**0**	**4**
5	19152L65P	VLSI and Embedded Systems Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-VII

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	19160S71P	Total Quality Management	**4**	**0**	**0**	**3**
2	19152H72P	Wireless Networks	**4**	**0**	**0**	**4**
3	19152H73P	Telecommunication Switching and Networks	**4**	**0**	**0**	**4**
4	191__E74_P	**Elective IV**	**3**	**0**	**0**	**3**
5	19152P75P	Project Work & Viva Voce	**0**	**0**	**12**	**6**
TOTAL CREDITS						**20**

LIST OF ELECTIVES

ELECTIVE-I (SEMESTER-IV)

S.No	Sub Code	Sub Name	L	T	P	C
1	19152E44AP	High Speed Networks	**4**	**0**	**0**	**4**
2	19152E44BP	Advanced Digital Signal Processing	**4**	**0**	**0**	**4**
3	19152E44CP	Speech Processing	**4**	**0**	**0**	**4**
4	19152E44DP	Fuzzy Logic and Neural Networks	**4**	**0**	**0**	**4**
5	19152E44FP	Digital Audio Engineering	**4**	**0**	**0**	**4**

ELECTIVE-II (SEMESTER-V)

S.No	Sub Code	Sub Name	L	T	P	C
1	19152E54BP	Optoelectronic Devices	**4**	**0**	**0**	**4**
2	19152E54CP	Radar and Navigational Aids	**4**	**0**	**0**	**4**
3	19152E54DP	Digital Image Processing	**4**	**0**	**0**	**4**
4	19152E54EP	Engineering Acoustics	**4**	**0**	**0**	**4**
5	19152E54FP	Software Engineering	**4**	**0**	**0**	**4**

ELECTIVE-III (SEMESTER-VI)

S.No	Sub Code	Sub Name	L	T	P	C
1	19160E64AP	Principles of Management	**4**	**0**	**0**	**4**
2	19152E64BP	Satellite Communication	**4**	**0**	**0**	**4**
3	19152E64CP	Robotics	**4**	**0**	**0**	**4**
4	19152E64DP	Remote Sensing	**4**	**0**	**0**	**4**
5	19152E64FP	Transducer Engineering	**4**	**0**	**0**	**4**

ELECTIVE-IV (SEMESTER-VII)

S.No	Sub Code	Sub Name	L	T	P	C
1	19152E74AP	Power Electronics	**3**	**0**	**0**	**3**
2	19152E74BP	Advanced Microprocessors	**3**	**0**	**0**	**3**
3	19152E74CP	Electromagnetic Interference and Compatibility	**3**	**0**	**0**	**3**
4	19152E74DP	Solid State Electronic Drives	**3**	**0**	**0**	**3**
5	19152E74FP	Space Time Wireless Communication	**3**	**0**	**0**	**3**

B.TECH (PART TIME) – ECE – R2019

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Semester	Foundation Course	Core Theory	Core Practical	Electives	Open Electives	Others	Total
I	4	15	-	-	-	-	**19**
II	4	15	-	-	-	-	**19**
III	4	12	2	-	-	-	**18**
IV	-	12	2	4	-	-	**18**
V	-	12	2	4	-	-	**18**
VI	-	12	2	4	-	-	**18**
VII	3	8	6	3	-	-	**20**
TOTAL CGPA CREDITS							**130**

HOD **DEAN**

SEMESTER I

19148S11P TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to CSE, IT, ECE) **L T P C**

3 1 0 4

AIM:

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

OBJECTIVES:

At the end of the course the students would

- Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
- Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.

UNIT I FOURIER SERIES 9

Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9

Fourier integral theorem (without proof) – Sine and Cosine transforms – Properties (without Proof) – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier transform – Sine and Cosine transform.

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9

Solution of First order partial differential equation reducible to standard forms – Lagrange's linear equation – Linear partial differential equations of second order and higher order with constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS 9

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

TUTORIAL :15 TOTAL: 60

OUTCOMES:

At the end of the course, the students would

- Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
- Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.

TEXT BOOKS

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen , New York ,1988.
2. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCES

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

SEMESTER I

19152H12P ELECTROMAGNETIC THEORY **L T P C**

3 1 0 4

AIM

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

OBJECTIVES

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

UNIT I STATIC ELECTRIC FIELDS 9

Vector field. Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co-ordinate System –calculation of length area and volume. Definition of Curl, Divergence and Gradient – Meaning of Strokes theorem and Divergence theorem .

Coulomb's Law– Definition of Electric Field Intensity –Electric Field due to discrete charges – charges distributed uniformly on an infinite line – Electric Scalar Potential – Relationship between potential and electric field - Potential due to infinite uniformly charged line –Electric Flux Density – Gauss Law – Proof of Gauss Law.

UNIT II STATIC MAGNETIC FIELD 9

The Biot-Savart Law in vector form –Magnetic field and Magnetic flux density- Magnetic Field intensity due to a infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I –Calculation of field using Ampere's circuital law for symmetrical distributions a) infinitely long solenoid and b) coaxial cable. The Lorentz force equation for a moving charge and applications –Scalar and Vector Magnetic Potential.

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9

Poisson's and Laplace's equation – Electric Polarization- Definition of Capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law – Definition of Inductance - Inductance of loops– Definition of mutual inductance. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability - magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faraday's law – Displacement current – Generalization of Ampere's circuital law. Maxwell's Equation in integral form from Faraday's Law – Maxwell's Equation expressed in point form from Faraday's Law. Poynting Vector Poynting Theorem and the flow of power – Power flow in a coaxial cable – Instantaneous Average and Complex Poynting Vector.

UNIT V ELECTROMAGNETIC WAVES 9 Derivation of Wave Equation –. Properties of Uniform Plane Wave — Wave equation for a conducting medium– Plane waves Propagation in good dielectrics --- Plane waves Propagation in good conductors – Skin effect.Linear, Elliptical and circular polarization –normal incidence and Oblique incidence – Reflection of Plane Waves by a perfect dielectric Brewster angle .Surface impedance

TUTORIAL 15 TOTAL : 60

OUTCOMES:

By the end of this course, the student should be able to:

- Display an understanding of fundamental electromagnetic laws and concepts
- Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning
- Explain electromagnetic wave propagation in lossy and in lossless media
- Solve simple problems requiring estimation of electric and magnetic field quantities based on these concepts and law

TEXTBOOKS

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

REFERENCES

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

SEMESTER I

19152H13P DIGITAL ELECTRONICS L T P C

4 0 0 4

AIM

To learn the fundamental concepts that are useful for designing digital systems or circuits.

OBJECTIVES

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

UNIT I: BOOLEAN ALGEBRA AND MINIMIZATION 9

Basic theorems – Boolean functions – Canonical and Standard forms – Minimization techniques – K-map up to five variables – NAND and NOR implementation – Exclusive-OR function - Hardware Description Language (HDL).

UNIT II: DIGITAL LOGIC FAMILIES 9

Switching operation of PN junction diode – bipolar and MOS devices – Bipolar logic families – RTL – DTL – DCTL – HTL – TTL – ECL – MOS and CMOS – Tristate logic –Interfacing of CMOS and TTL families.

UNIT III: COMBINATIONAL LOGIC DESIGN 9

Design using gates – BCD arithmetic circuits – Binary adder – Subtractor – Multiplier – Divider – Design using MSI devices – Multiplexer and Demultiplexer as logic elements – Encoder and decoder – Parity checker – Parity generator – Code converter – Magnitude comparator.

UNIT IV: SEQUENTIAL LOGIC DESIGN 9

Flip Flops and their conversions – Analysis and synthesis of synchronous sequential circuits – Excitation table – State table and state diagram – Design of synchronous counters – Analysis of asynchronous sequential circuits – Reduction of state and flow table – Race free state assignment – Design of Asynchronous counters – Timing diagram – Shift registers and their applications.

UNIT V : MEMORY DEVICES 9

Classification of memories – ROM organization – PROM – EPROM – EEPROM – EAPROM – RAM organization – Write operation – Read operation – Memory cycle – Timing waveforms – 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).

TOTAL : 45 PERIODS

COURSE OUTCOMES:

By the end of this course, the student should be able to:

- Display an understanding of fundamental electromagnetic laws and concepts
- Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning
- Explain electromagnetic wave propagation in lossy and in lossless media
- Solve simple problems requiring estimation of electric and magnetic field quantities based on these concepts and law

TEXT BOOKS

1. Morris Mano M., “Digital Design”, 3rd Edition, Pearson Education, 2007.
2. John M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2002.

REFERENCES

1. John F.Wakerly, “Digital Design”, 4th Edition, Pearson/PHI, 2006
2. Charles H.Roth, “ Fundamentals of Logic Design”, Thomson Learning, 2003.

3. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2003.

SEMESTER I

19152H14P ELECTRONIC CIRCUITS –I **L T P C**

3 0 0 3

AIM

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

OBJECTIVE

On completion of this course the student will understand

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

UNIT – I TRANSISTOR BIASING & STABILIZATION 9

Biasing circuits for BJT- DC load line-AC load line – Stability factor- Methods of Transistor Biasing- Bias Compensation – Thermal runaway- heat sink- FET Biasing

UNIT-II LOW FREQUENCY AMPLIFIER ANALYSIS & DESIGN 9

Transistor- FET amplifiers - Low frequency Small signal hybrid parameter model : C_B, C_E, Cc Amplifier- Analysis of Transistor Amplifier Using h-parameter.

JFET as an Amplifier- Analysis of low frequency common Source & Common Drain Amplifier Using h-parameter.

UNIT – III MULTISTAGE AMPLIFIERS 9

Cascading of BJT Amplifiers- Analysis of RC coupled Amplifiers Methods of Increasing Input impedance using Darlington and Boot strapping- Emitter coupled Differential Amplifier,Differential gain, CMRR, Transfer Characteristics – Cascode amplifier.

UNIT – IV HIGH FREQUENCY ANALYSIS OF THE AMPLIFIERS 9

Frequency response-Effect of Coupling and Bypass capacitor- Effect of internal transistor capacitance-Miller Effect – High Frequency π model for C_E Amplifier-C_E Short circuit Current gain- Cut off frequencies f_α, f_β ,f_T - Gain Bandwidth product.

UNIT – V POWER SUPPLIES 9

Haif wave,Full Wave, Rectifiers- Capacitor Filter- Linear Regulator :Shunt Regulator, Series Regulator- Shunt Regulator using Zener Diode- Switch Mode Power Supply.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On completion of this course the student will understand

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

TEXT BOOK

1. Millman and Halkias.c.“Integrated Electronics” Tata McGraw -Hill,1991

REFERENCE BOOKS

1. David A. Bell,”Electonic Devices And Circuits “ Prentic Hall of India,1998.
2. Donald L. Schilling, Charles ,Belove “Electronic Circuits” Third Edition 2002.
3. Salivahanan “Electronic Devices And Circuits”
4. Boylestead, Robert L. and Louis Nasheresky- “Electronic Devices And Circuit Theory”-Pearson Education
5. J.B.Gupta - “Electronic Devices And Circuits”-S.K.Kataria and sons 2004.

SEMESTER I

19152H15P SIGNALS AND SYSTEMS L T P C

(Common to ECE & IT) **3-1-0-4**

AIM

To study and analyze the characteristics of continuous, discrete signals and systems.

OBJECTIVES

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

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals), discrete time signals (DT signals) - step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, Random signals, Classification of systems (CT systems and DT systems)-Linear time invariant systems.

UNIT II ANALYSIS OF CT SIGNALS 9

Fourier Transform and Laplace Transform in Signal Analysis. Fourier series, Fourier Transform and Laplace Transform properties, Parseval's relation.

UNIT III LTI-CT SYSTEMS 9

Differential equation, Block diagram representation, Impulse response, Convolution Integral, Frequency response, Fourier Methods and Laplace transforms in analysis.

UNIT IV SAMPLING THEOREM AND ANALYSIS OF DT- SIGNALS 9

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

z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform, Relationship between z-transform and Fourier transform.

UNIT V LTI-DT SYSTEMS 9

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, Z-transform analysis.

TUTORIAL 15 TOTAL : 60

OUTCOMES:

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

TEXT BOOK

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

REFERENCES

1. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
3. K.Lindner, “Signals and Systems”, McGraw Hill International, 1999.

SEMESTER II

19148S21P NUMERICAL METHODS L T P C

(Common to CSE, IT, ECE) **3 1 0 4**

AIM

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

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods ,

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large systems of linear equations and eigenvalue problems of a matrix can be obtained numerically where analytical methods fail to give solutions.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing an approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Newton Raphson's method – Iteration method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION 9

Newton's forward and backward difference formulas – Central difference formula: Bessels and Stirling's formula - Lagrangian Polynomials – Divided difference method .

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

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

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TUTORIAL 15 TOTAL : 45

OUTCOMES:

At the end of the course, the students would be acquainted with the basic concepts in numerical methods

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large systems of linear equations and eigenvalue problems of a matrix can be obtained numerically where analytical methods fail to give a solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing an approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES
1. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

SEMESTER II

19153S22P ELECTRICAL ENGINEERING AND CONTROL SYSTEMS

L	T	P	C
4	0	0	4

AIM

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

OBJECTIVES

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

UNIT-I: D.C MACHINES AND TRANSFORMERS 12

Construction and operation of D.C. generators – emf equation – characteristics – principle of operation of D.C. motors. Principle of operation of transformers -parameters of transformers – regulation, losses and efficiency - introduction to three phase transformers.

UNIT-II SPECIAL MACHINES 9

Constructional details and principle of operation of single phase induction motors and Three Phase Induction motors– servo motor, stepper motor, variable reluctance motors.-applications.

UNIT III INTRODUCTION TO CONTROL THEORY 6

The control problem – differential equation of physical systems – control over system dynamics by feedback – regenerative feedback – transfer function – block diagram - algebra – signal flow graphs.

UNIT IV TIME RESPONSE AND FREQUENCY RESPONSE ANALYSIS 12

Time response of first and second order systems – steady state errors – error constants – design specification of second order systems – state variable analysis – simple problems.
Correlation between time and frequency response – polar plots , Bode plots – stability in frequency domain using Nyquist stability criterion – simple problems.

UNIT V STABILITY **6**

Concept of stability – stability conditions and criteria – Hurwitz and Routh criterion – relative Stability analysis.

TUTORIAL :15 **TOTAL :45**

COURSE OUTCOMES:

- To understand the operation of Electrical machines and transformers
- To understand the open loop and closed loop (feedback) systems
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control system

TEXT BOOK:

1. D.P.Kothari and I.J. Nagrath "Basic Electrical Engineering", Tata McGraw Hill Ltd, second edition, 2002.
2. I.J.Nagrath and M.Gopal "Control system Engineering" New age International Publishing Company Ltd, third edition 2003.

REFERENCES:

1. Stephen J.Chapman "Electrical Machinery Fundamentals", McGraw Hill Publishing Company Ltd, third edition, 1999.
2.K.Murugesh Kumar, "Electric Machines", Vikas Publishing House (P) Ltd, 2002.
3. M.Gopal "Control Systems – Principle and Design", McGraw Hill Publishing Company Ltd, second edition, 2003.

SEMESTER II

19152H23P LINEAR INTEGRATED CIRCUITS L T P C

4 0 0 4

AIM

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

OBJECTIVES

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

UNIT I OP AMP CHARACTERISTICS AND APPLICATIONS 9

Ideal op amp, IC op amp, DC characteristics: bias, offset and drift, AC characteristics: bandwidth, slew rate, noise and frequency compensation, basic op amp application: scale changer, inverter and non inverter, summer & subtractor, , differentiator & integrator, instrumentation amplifier, V to I and I to V converter, RC active filters: low pass and band pass filters op amp circuits using diodes: precision rectifier, clipper and clamper,

UNIT II COMPARATORS AND SIGNAL GENERATORS 9

Comparator and applications of comparator, regenerative comparator (Schmitt trigger), square wave generator (astable multivibrator), monostable multivibrator Triangular wave generator, sawtooth wave generator sine wave generators

UNIT III ANALOG MULTIPLIER AND PLL 9

Multiplier, Applications of multiplier: multiplying DC voltages, frequency doubling, phase angle detection, AM modulation/demodulation. PLL: Basic principles, analog and digital phase detector and comparator Voltage controlled Oscillator, Applications of PLL

UNIT IV ADC AND DAC 9

Analog switches, High speed sample and hold circuits, characteristics DAC, Types of D/A converter, Current driven DAC, Switches for DAC, characteristics of A/D converter Types of A/D converter, - Single slope, Successive approximation.

UNIT V SPECIAL FUNCTION ICS 9

555 timer functional diagram,Astable and Monostable Multivibrators using 555 Timer, Voltage regulators-linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, and Isolation Amplifiers, Fiber optic ICs and Opto-couplers.

TOTAL : 45 PERIODS

OUTCOMES:

- To introduce the basic building blocks of linear integrated circuits.

- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce a few special function integrated circuits.

TEXT BOOK:

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

REFERENCES:

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

SEMESTER II

19152H24P ELECTRONIC CIRCUITS -II **L T P C**

3 0 0 3

AIM

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

OBJECTIVES

On completion of this course the student will understand

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

UNIT I : POWER AMPLIFIERS 9

Classification, Efficiency of Class A , RC coupled, Transformer coupled, Class B push pull, Complementary symmetry power amplifier, Power Output, Efficiency and Power Dissipation, cross over distraction & Elimination, Heat sink.

UNIT II: FEEDBACK AMPLIFIERS 9

Feedback concept, Four basic types of feedback, Equivalent Circuits of voltage amplifier, Current Amplifier ,Trans conductance, Trans resistance amplifier, Transfer ratio for negative feedback, Effect of feedback on noise, distortion gain input & output, impedance of the amplifier. Method of identifying feedback topology, Analysis of four types of feedback amplifier.

UNIT III: OSCILLATORS 9

Theory of Oscillator, Closed loop gain of the circuits, Barhausen Criterion. Analysis & Design of RC Phase Shift Oscillators, Wien Bridge Oscillator, Hartley Oscillator Colpitts Oscillator, crystal Oscillator, frequency Stability.

UNIT IV: TUNED AMPLIFIERS 9

Tuned Circuit, Resonance, Q factor, Classification of tuned amplifier, Analysis of single tuned amplifier, Capacitance coupling, Effect of cascading single tuned amplifier on Bandwidth, Double tuned amplifier, instability of tuned amplifiers- stabilization techniques, Narrow band neutralization using coil, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.

UNIT V: WAVE SHAPING, SWEEP & MULTIVIBRATOR CIRCUITS 9

RL & RC Integrator and Differentiator circuits. Voltage sweep circuit , Miller sweep generator, UJT sawtooth generator, current time base generator, Collector coupled Astable Multivibrator, Collector coupled Monosatble Multivibrator - Bistable Multivibrator - Schmitt trigger circuits.

TOTAL : 45 PERIODS

OUTCOMES:

On completion of this course the student will understand

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

Text Books:

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill 1991
2. Schilling Charles Belove, " Electronic Circuits ", Third Edition, 2002.

3. Millman J. and Taub H., " Pulse Digital and Switching waveform ",
4. McGraw Hill International.
5. Robert L. Boylest and Louis Nasheresky, “Electronic Devices and Circuits theory” 8th edn., PHI, 2002.

References:

1. Sedra / Smith, “MicroElectronic Circuits” Oxford University Press, 2004.
2. David A.Bell, “Solid State Pulse Circuits”, Prentice Hall of India, 1992.

SEMESTER II

19152H25P TRANSMISSION LINES AND WAVEGUIDES L T P C
4 0 0 4

AIM

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

OBJECTIVES

- To become familiar with propagation of signals through lines

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

UNIT I TRANSMISSION LINE THEORY 9

Different types of transmission lines – Definition of Characteristic impedance and Propagation Constant, General Solution of the transmission line –wavelength and velocity of propagation. Waveform distortion – distortion less transmission line –Input impedance of lossless lines – reflection on a line not terminated by Z_o - reflection factor and reflection loss – Numerical problems.

UNIT II THE LINE AT RADIO FREQUENCIES 9

Standing waves and standing wave ratio on a line – One-eighth wave line – The quarter wave line and impedance matching – the half wave line.
– The Smith Chart – Application of the Smith Chart – Problems using smith chart (how to use smith chart and mark impedances, finding input impedance, SWR, reflection coefficient, finding load impedance) single stub matching - Numerical problems.

UNIT III GUIDED WAVES 9

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation. – Wave impedances – Numerical problems.

UNIT IV RECTANGULAR WAVEGUIDES 9

Transverse Magnetic Waves in Rectangular Waveguides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – cut-off wavelength and phase velocity - Dominant mode in rectangular waveguide –Wave impedance, Characteristic impedance - Numerical problems.

UNIT V CIRCULAR WAVEGUIDES AND RESONATORS 9

TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator – Q factor of cavity resonator for TE101 mode - Numerical problems.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS

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

REFERENCES

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

SEMESTER III

19148S31P PROBABILITY AND RANDOM PROCESSES **L T P C**

(Common to ECE & BM) 3 **1 0 4**

AIM

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

OBJECTIVES

At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.

- Have a well – founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand and characterize phenomena which evolve with respect to time in a probabilistic manner.
- Be able to analyze the response of random inputs to linear time invariant systems.

UNIT I PROBABILITY AND RANDOM VARIABLE 9

Axioms of probability - Conditional probability - Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 9

Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable (excluding theorm).

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression (for distributions only) - Transformation of random variables - Central limit theorem.

UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Relationship between cross power spectrum and cross correlation function – Auto correlation and cross correlation functions of input and output.

TUTORIAL 15 TOTAL : 60

OUTCOMES:

At the end of the course, the students would

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

TEXT BOOKS

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

SEMESTER III

19152H32P MICROPROCESSOR, INTERFACING AND APPLICATIONS

L T P C

4 0 0 4

AIM

To learn the architecture programming ,interfacing and applications of microprocessors.

OBJECTIVES

- To introduce the architecture and programming of 8085 microprocessors.
- To introduce the interfacing of peripheral devices with 8085 microprocessors.
- To introduce the architecture and programming of an 8086 microprocessor.
- To introduce the applications, programming with an 8085 microprocessor.

UNIT I 8085 CPU 9

8085 Architecture – Instruction set – Addressing modes — Assembly language programming – Interrupts – Memory interfacing – Interfacing, I/O devices.

UNIT II PERIPHERALS INTERFACING 9

Interfacing Serial I/O (8251) - parallel I/O (8255) –Keyboard and Display controller (8279) – ADC/DAC interfacing –

UNIT III 8086 CPU 9

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

UNIT IV 8086 SYSTEM DESIGN 9

8086 signals and timing – MIN/MAX mode of operation – Addressing memory and I/O – Multiprocessor configurations – System design using 8086

UNIT V 8085 APPLICATIONS 9

Stepper motor control – DC motor control –Traffic light control —Digital Clock – Square wave generation –

TOTAL : 45 PERIODS

OUTCOMES:

- To introduce the architecture and programming of 8085 microprocessors.
- To introduce the interfacing of peripheral devices with 8085 microprocessors.
- To introduce the architecture and programming of an 8086 microprocessor.
- To introduce the applications, programming with an 8085 microprocessor.

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000. (Unit I, II)
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3. S.P.Chowdhury , Sunetra Chowdhury,Microprocessor & Peripherals ,First Edition ,Scitech Publications(INDIA)Pvt. Ltd.(Unit V)

REFERENCES

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000(Unit III,IV)
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

SEMESTER III

19152H33P DIGITAL SIGNAL PROCESSING **L T P C**

3 1 0 4

AIM

To study the signal processing methods and processors.

OBJECTIVES

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

UNIT I FAST FOURIER TRANSFORM **9**

Discrete Time Fourier Transform (DTFT), Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms

UNIT II IIR FILTER DESIGN 9

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT III FIR FILTER DESIGN 9

Symmetric & Antisymmetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Hamming– Frequency sampling techniques

UNIT IV FINITE WORD LENGTH EFFECTS 9

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – overflow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling –

UNIT V POWER SPECTRUM ESTIMATION 9

Computation of Energy density spectrum – autocorrelation and power spectrum of random signals. Periodogram – use of DFT in power spectrum estimation – Non parametric methods for power spectral estimation: Bartlett methods –Application of DSP – Model of Speech Waveform – Vocoder.

TUTORIAL 15 TOTAL : 60

OUTCOMES:

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

TEXT BOOK

1. John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education, 2000, 3rd Edition.

REFERENCES

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2000, 2nd Edition.
2. Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2002.
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill, 2001, Second Edition.

SEMESTER III

19152H34P COMMUNICATION THEORY L T P C

4 0 0 4

AIM

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

OBJECTIVE

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

UNIT 1 AMPLITUDE MODULATION SYSTEMS 10

Review of spectral characteristics of periodic and non-periodic signals – Generation and demodulation of AM, DSBSC, SSB and VSB signals – Comparison of amplitude modulation systems – Frequency translation – FDM – Non-linear distortion.

UNIT II ANGLE MODULATION SYSTEMS 8

Phase and frequency modulation – Single tone – Narrow band and wideband FM – Transmission bandwidth – Generation and demodulation of FM signal.

UNIT III NOISE THEORY 8

Review of probability – Random variables and random process – Gaussian process –Noise – Shot noise – Thermal noise and white noise – Narrow band noise – Noise temperature – Noise figure.

UNIT IV PERFORMANCE OF CW MODULATION SYSTEMS 10

Superheterodyne radio receiver and its characteristic – SNR – Noise in DSBSC systems using coherent detection – Noise in AM system using envelope detection FM system – FM threshold effect – Pre-emphasis and de-emphasis in FM – Comparison of performances.

UNIT V INFORMATION THEORY 9

Discrete messages and information content – Concept of amount of information - Average information – Entropy – Information rate – Source coding to increase average information per bit – Shannon-fano coding – Huffman coding – Lempel-Ziv (LZ) coding – Shannon's theorem – Channel capacity – Bandwidth – S/N trade-off – Mutual information and channel capacity – Rate distortion theory – Lossy source coding.

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS

1. Dennis Roddy and John Coolen., "Electronic Communication", 4th Edition, PHI,1995.
2. Herbert Taub and Donald L Schilling., "Principles of Communication Systems", 3rd Edition, TMH, 2008.

REFERENCES

1. Simon Haykin., "Communication Systems", 4th Edition, John Wiley and Sons, 2001.
2. Bruce Carlson., "Communication Systems", 3rd Edition, TMH, 1996.
3. Lathi, B. P., "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford Press, 2007.
4. John G. Proakis, Masoud Salehi., "Fundamentals of Communication Systems", 5th Edition, Pearson Education, 2006.

SEMESTER III

19152L35P DIGITAL SIGNAL PROCESSING AND MICROPROCESSOR LAB

L T P C

0 0 3 2

OBJECTIVE:

The student should be made:

- To perform basic signal processing operations such as Linear Convolution, Circular Convolution, Autocorrelation, Cross Correlation and Frequency analysis in MATLAB
- To implement FIR and IIR filters in MATLAB and DSP Processor
- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8085 and 8086
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors

PART-I DSP LAB

Using Processor & MATLAB:

1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display
3. Implementation of FIR filter
4. Calculation of FFT
5. Linear & Circular Convolution

PART –II MICROPROCESSOR LAB

1. Programs for 8/16 bit Arithmetic operations (Using 8085).
2. Programs for Sorting and Searching (Using 8085, 8086).
3. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
4. Interfacing and Programming 8253
5. Serial Communication between two MP Kits using 8251.

Interfacing and Programming of Stepper Motor and DC Motor Speed control

TOTAL 45 PERIODS

UTCOMES:

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

- Carryout basic signal processing operations
- Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8085

SEMESTER IV

19152H41P DIGITAL COMMUNICATION **L T P C**

4 0 0 4

AIM

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

OBJECTIVES

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

UNIT I: Digital communication Introduction and Pulse modulation 9

Block Diagram of digital communication systems Advantages, Disadvantages, Sampling, Aliasing, Pulse Amplitude Modulation, Pulse Duration and Pulse position Modulation, Pulse Coded Modulation, Delta Modulation, TDM

UNIT II: Baseband Pulse Transmission 9

Matched Filters , ,Intersymbol Interference , Nyquist Pulse Shaping, M-ary PAM Transmission Linear Equalizers , Adaptive Equalizers

UNIT III: Digital Bandpass Transmission 9

Representations of Bandpass Signals and Systems Correlation, Signal-space representations ,Detection of Known Signals in AWGN , Generation ,detection, spectra, applications, signal space diagram of FSK, PSK, MSK.

UNIT IV: Spread Spectrum Communications 9

Advantages, characteristic of Spread Spectrum Communication. Direct Sequence spreqad spectrum systems, Frequency Hopping spread spectrum communication, Psedu Noise sequences: Types and Characteristics, code-division multiplexing (CDM). Application to CDMA wireless communication systems

UNIT V: Error Control coding 9

Linear block codes, convolutional codes, Hamming codes

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. S. Haykin, Communication Systems, Fourth Edition, Wiley, 2001. TK5101.H37 2000

REFERENCES:

1. L.W. Couch II, *Digital and Analog Communication Systems*, Sixth Edition, Prentice-Hall,2001.
2. B.P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 1998. TK5101.L333
3. John Proakis "Digital Communications" , McGraw-Hill Science/Engineering/Math; 4 edition 2000

SEMESTER IV

19152H42P ANTENNA AND WAVE PROPAGATION **L T P C**

4 0 0 4

AIM

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

OBJECTIVES

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

UNIT I : RADIATION 9

Concept of Vector potentials- Modification for Time varying , retarded case- Fields and radiation resistance of an alternating current element- -Radiation resistance –Effective length – Radiation intensity-Gain and Directivity-Field patterns- Beamwidth – Effective area-Relation between gain, effective length and radiation resistance.

UNIT II: ANTENNA ARRAYS 9

Arrays of two point sources- Broadside array and End fire arrays – Binomial arrays - Pattern multiplication- Uniform linear array-

UNIT III : SPECIAL PURPOSE ANTENNAS 9

Radiation from traveling wave on wire- Rhombic antenna – Loop antennas- Three element Yagi antenna- Log periodic antenna- Horn antenna -

UNIT IV: PROPAGATION 9

Ground wave propagation: Attenuation characteristics – Calculation of field strength – Sky wave Propagation: Structure of Ionosphere – Effective dielectric constant of ionized region-Mechanism

of Refraction and Refractive index- Critical Frequency- Skip distance- Maximum usable frequency –Fading and Diversity Techniques.Space Wave Propagation: Calculation of Field strength –-Duct propagation.

UNIT V : MEASUREMENTS 9

Impedance – Field Pattern and Gain of Antennas- Radiation Pattern –Ionospheric measurements- Vertical incidence measurements of the ionosphere- Relation between oblique and vertical incidence transmission.

TOTAL: 45 PERIODS

OUTCOMES:

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

Text Books:

1. EDWARD C.JORDAN- Electromagnetic waves and Radiation systems – Asia Publication House, PHI, 1978, Reprint 2003.

Reference Books:

1. John .D. Kraus and Ronalatory Marhefka- Antenna-T McGraw Hill – 2002
2. R.E.Collins-Antennas and Radio Propagation- McGrawhill- 1987
3. Balanis – Antenna Theory- John wiley & sons – 2nd edition 2003.

SEMESTER IV

19152H43P COMPUTER NETWORKS L T P C

4 0 0 4

AIM

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

OBJECTIVES

- To introduce the students the functions of different layers.
- To introduce IEEE standards employed in computer networking.
- To make students familiarize themselves with different protocols and network components.

UNIT I DATA COMMUNICATIONS 8

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

UNIT II DATA LINK LAYER 12

Error – detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – go back N ARQ – selective repeat ARQ- sliding window techniques – HDLC.

LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

UNIT III NETWORK LAYER 10

Internetworks - Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT IV TRANSPORT LAYER 8

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

UNIT V APPLICATION LAYER 7

Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

TOTAL : 45

OUTCOMES:

- To introduce the students the functions of different layers.
- To introduce IEEE standards employed in computer networking.
- To make students familiarize themselves with different protocols and network components.

TEXT BOOKS

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

REFERENCES

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

SEMESTER IV

19152L45P NETWORKS AND COMMUNICATION LAB L T P C

0 0 3 2

COURSE OBJECTIVE:

The student should be made to:

- Learn to communicate between two desktop computers
- Learn to implement the different protocols
- Be familiar with IP Configuration
- Be familiar with the various routing algorithms
- visualize the effects of sampling and TDM
- Implement AM & FM modulation and demodulation
- implement PCM & DM
- simulate Digital Modulation schemes

Part I: NETWORKS

1. PC to PC Communication

Parallel Communication using 8 bit parallel cable

Serial communication using RS 232C

2. Ethernet LAN protocol

To create scenario and study the performance of CSMA/CD protocol ethrol simulation

3. Token bus and token ring protocols

To create scenario and study the performance of token bus and token ring protocols through simulation

4. Wireless LAN protocols

To create scenarios and study the performance of networks with CSMA / CA protocol and compare with CSMA/CD protocols.

5. Implementation and study of stop and wait protocol

Part II: COMMUNICATION

1. Modulation and Demodulation Characteristics of AM/FM Transmitter And Receiver.
2. Pulse modulation- PAM / PWM /PPM
3. Pulse code modulation
4. Digital modulation –ASK, PSK, QPSK, FSK
5. Experiments on Antenna:

To plot and analyse the radiation patterns of the following antennas.

Dipole

Half Wave Dipole

Monopole

Yagi Antenna

6. Experiments on Coaxial Line Section:

Measurement of VSWR

. Stub matching

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
- Implement and compare the various routing algorithms
- Use the simulation tool.
- Simulate & validate the various functional modules of a communication system
- Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
- Simulate end-to-end communication Link

SEMESTER IV

ELECTIVE - I

19152E44AP HIGH SPEED NETWORKS L T P C

4 **0 0 4**

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 Cell – ATM Service Categories – AAL.

High Speed LANs: Fast Ethernet, Gigabit Ethernet, Wireless LANs: applications, requirements – Architecture of 802.11

UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts, switch forwarding techniques, switch path control, LAN switching, cut through forwarding, store and forward, Virtual LANs

UNIT III TCP AND ATM CONGESTION CONTROL 9

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm — Performance of TCP over ATM.

Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Framework, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats,– GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 9

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

UNIT V IP SWITCHING 9

Addressing model, IP Switching types-flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting.

TOTAL : 45 PERIODS

OUTCOMES:

- 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.

TEXT BOOK

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

REFERENCES

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003

SEMESTER IV

ELECTIVE - I

19152E44BP ADVANCED DIGITAL SIGNAL PROCESSING L T P C

4 0 0 4

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 algorithms and to study the applications of adaptive filtering.
- To study multirate signal processing fundamentals.
- To study the analysis of speech signals.
- To introduce the student to wavelet transforms.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes-, Autocorrelation and Autocovariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram -, Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method.
Parametric Methods - AR, MA, and ARMA model based spectral estimation.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction- Forward and backward predictions, - Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation for sampling rate conversion- Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

TOTAL: 45 PERIODS

OUTCOMES:

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithms and to study the applications of adaptive filtering.
- To study multirate signal processing fundamentals.
- To study the analysis of speech signals.
- To introduce the student to wavelet transforms.

REFERENCES:

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.

2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.

SEMESTER IV

ELECTIVE - I

19152E44CP	**SPEECH PROCESSING**	**L T P C**
		4 0 0 4

AIM

To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech analysis and speech compression

OBJECTIVE

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

UNIT I: NATURE OF SPEECH SIGNAL 9

Speech production mechanism – Classification of speech – Sounds – Nature of speech signal – Models of speech production

Speech Signal Processing: Purpose of speech processing – Digital models for speech signal – Digital processing of speech signals – Significance – Short time analysis.

UNIT II: TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of speech – Methods for extracting the parameters – Zero crossings – Auto correlation function – Pitch estimation.

UNIT III: FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9

Short time fourier analysis – Filter bank analysis – Spectrographic analysis – Format extraction – Pitch extraction – Analysis – Synthesis systems.

UNIT IV: LINEAR PREDICTIVE CODING OF SPEECH 9

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

UNIT V: HOMOMORPHIC SPEECH ANALYSIS 9

Central analysis of speech – Format and pitch estimation – Applications of speech processing – Speech recognition – Speech synthesis and speaker verification.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOK

1. Rabiner L.R. and Schafer R.E, “Digital Processing of Speech Signals”, Prentice Hall, 1978.

REFERENCES

1. Flanagan J.L, “Speech Analysis Synthesis and Perception”, 2nd Edition, Springer Vertag, 1972.
2. Witten I.H., “Principles of Computer Speech”, Academic Press, 1983.

SEMESTER IV

ELECTIVE - I

19152E44DP FUZZY LOGIC AND NEURAL NETWORKS L T P C

4 0 0 4

AIM

To introduce the techniques of soft computing and adaptive neuro-fuzzy inference systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

OBJECTIVES

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning

- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

UNIT I: Primer on Fuzzy Sets **9**

Crisp sets, from crisp sets to fuzzy sets , Linguistic variables ,Membership functions Some terminology , Set theoretic operations for crisp sets , Set theoretic operations for fuzzy sets , membership functions

UNIT II: Fuzzy Logic Systems **9**

Introduction , Rules , Fuzzy Inference Engine , Fuzzification and Its Effect on Inference Fuzzifier , Fuzzy inference engine, Defuzzification, Centroid defuzzifier , Center-of-sums defuzzifier

UNIT III: Neural Nets Introduction and Overview **9**

Perceptrons,Least Mean Square Learning Systems , Multilayer Neural Networks Back-Propagation The Practical Application of Back-Propagation Error Rate and Complexity Fit Estimation Improving on Standard Back-Propagation

UNIT IV: Radial Basis Function Networks **9**

Ill-Posed Problems and the Regularization Technique , Stabilizers and Basis Functions, Generalized Radial Basis Function Networks, Moving Centers Learning, Regularization with Nonradial Basis Functions, Orthogonal Least Squares, Optimal Subset Selection by Linear

UNIT V: ANFIS: Adaptive Neuro-Fuzzy Inference Systems **9**

Introduction , ANFIS Architecture , Hybrid Learning Algorithm , Learning Methods that Cross-fertilize ANFIS and RBFN , ANFIS as a Universal Approximator

TOTAL : 45 PERIODS

OUTCOMES:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

TEXT BOOK:

1. Bart Kosko, Neural networks and fuzzy systems: a dynamical systems approach to machine intelligence, Prentice-Hall, Inc., Upper Saddle River, NJ, 1991

REFERENCES:

1. Kin, S. (1999), Neural Networks: A Comprehensive Foundation, 2nd ed.,Upper Saddle River, NJ: Prentice Hall, ISBN 0-13-273350-1.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani (1997)" Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, | Prentice Hall

SEMESTER IV
ELECTIVE - I

19152E44FP DIGITAL AUDIO ENGINEERING L T P C
4 0 0 4

AIM

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

OBJECTIVES:

- To understand the concept of fundamentals of digital audio.
- To understand the concept of audio in digital TV broadcasting.
- To understand the various codes of digital coding.
- To understand the concept of digital audio tape recorder.
- To analyze the concept internet audio in digital audio engineering.

UNIT I FUNDAMENTALS OF DIGITAL AUDIO 9

Discrete time sampling - sampling theorem - Nyquist frequency – aliasing – prevention – quantization – signal to error ratio – distortion – other architectures – dithers – types of dither.

UNIT II RECORDING AND TRANSMISSION PRINCIPLES 9

PCM – record processing – recording oriented codes – transmission oriented codes – audio in digital TV broadcasting – DAB.

UNIT III DIGITAL CODING & COMPRESSION 9

Block & convolutional codes – cyclic codes – Reed Solomon codes – interleaving – compression principles – lossless & perceptive coding – subband codes – transform coding – compression formats – MPEG audio – Dolby AC 3 – ATRAC.

UNIT IV DIGITAL AUDIO TECHNIQUES 9

Digital audio tape recorder – cassettes – modes – track format – digital audio editing – editing with random access media & recording media – editor structure – digital audio in optical disks – CD, MD, DVD, playing optical disk – Minidisk.

UNIT V APPLICATIONS OF DIGITAL AUDIO 9

Internet audio – MP3 – SDMI – audio MPEG 4 – PC – MIDI – sound cards**.**

TOTAL: 45 PERIODS

OUTCOMES:

- To study RF components 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.

TEXT BOOKS:

1. John Watkinson, “An Introduction to Digital Audio”, Focal Press, Second edition. 2013.
2. Ken C Pohlmann, “Principles of Digital audio”, McGraw Hill, Sixth edition, 2010.

REFERENCES:

1. Then Ballin, “ Handbook for sound Engineers Taylor & Francis”, Fifth edition, 2015.
2. John Watkinson, “The art of Digital Audio” Focal Press, Third edition, 2013.

SEMESTER V

19152H51P OPTICAL COMMUNICATION AND NETWORKS L T P C

4 0 0 4

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 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 kinds of losses, signal distortion in optical waveguides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wavelength.
- 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 splicing and connectors, noise effects on system performance, operational principles WDM and solutions.

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations –fiber types Mode theory of Circular Waveguides- Overview of Modes- Key model concepts- Linearly Polarized Modes –Single Mode Fibers-

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Waveguides-Information Capacity determination –Group Delay-Material Dispersion, Waveguide Dispersion, Signal distortion in SM fibers -Mode Coupling

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

Direct and indirect Band gap materials-LED structures –Quantum efficiency Modulation of a LED, lasers Diodes-Modes and Threshold condition Fiber amplifiers- Power Fibre –to- Fibre joints, Fibre splicing.

UNIT IV FIBER OPTICAL RECEIVERS 9

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error –

UNIT V DIGITAL TRANSMISSION SYSTEM 9

Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solitons-. Basic on concepts of SONET/SDH Network. .

TOTAL : 45 PERIODS

OUTCOMES:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kinds of losses, signal distortion in optical waveguides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wavelength.
- 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 splicing and connectors, noise effects on system performance, operational principles WDM and solutions.

TEXT BOOK

1. Gerd Keiser, “Optical Fiber Communication” McGraw –Hill International, Singapore, 3rd ed., 2000

REFERENCES

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

SEMESTER V

19152H52P MICROWAVE ENGINEERING L T P C
4 0 0 4

AIM

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

OBJECTIVES

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

Unit – I: Introduction **9**

Radio Spectrum – Microwave Frequency and its characteristics – Transmission media for microwave signals – Waveguides – Scattering Parameters for microwave network (two ports)

Unit – II: Passive Microwave Devices **9**

Isolators, Attenuators, Directional Couplers – Waveguide Tees – E- plane, H-Plane and Magic Tee –- Matched Terminators – S – parameters for all the components

Unit – III: Microwave Sources **9**

Klystron Oscillator – Magnetron Oscillator– TWTA Amplifier – Power output and efficiency equations for all the devices

Unit – IV: Semiconductor Microwave Devices **9**

PIN Diode – Varactor Diode (Manley – Rowe Power Relation) – Tunnel Diode – Gunn Diode – Applications of all the diodes –

Unit – V Microwave Measurements **9**

Power Measurements – Frequency Measurements – VSWR Measurements (High and Low VSWR) – Attenuation Measurements – Insertion Loss Measurements

TOTAL : 45 PERIODS

OUTCOMES:

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

- To study Microwave sources and amplifiers.

TEXT BOOK

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

REFERENCE:

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

SEMESTER V

19152H53P VLSI DESIGN L T P C

4 0 0 4

AIM

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

OBJECTIVES

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

UNIT I CMOS TECHNOLOGY 9

An overview of Silicon semiconductor technology, Basic CMOS technology : nwell, P well, Twin tub and SOI Process. Interconnects, circuit elements: Resistors, capacitors, Electrically alterable ROMs, bipolar transistors, Latch up and prevention.

UNIT II MOS TRANSISTOR THEORY 9

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

UNIT III SPECIFICATION USING VERILOG HDL 9

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

UNIT IV CMOS CHIP DESIGN 9

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

UNIT V CMOS TESTING 9

Need for testing, Design strategies for test, Chip level and system level test techniques.

TOTAL : 45 PERIODS

OUTCOMES:

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.

- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

TEXT BOOKS

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

REFERENCES

1. M.J.S.Smith : Application Specific integrated circuits, Pearson Education, 1997.
2. Wayne Wolf, Modern VLSI Design, Pearson Education 2003.
3. Bob Zeidmin ; Introduction to verilog, Prentice Hall, 1999
4. J . Bhaskar : Verilog HDL Primer, BSP, 2002.

19152L55P OPTICAL COMMUNICATION AND MICROWAVE LAB

L T P C

0 0 3 2

OBJECTIVE:

The student should be made to:

- Understand the working principle of optical sources, detector, fibers and microwave components
- Develop understanding of simple optical communication link.
- Learn about the characteristics and measurements in optical fiber
- Know about the behavior of microwave components.
- Practice microwave measurement procedures

Part I: Experiments pertaining to Fiber optics

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

Part II: Experiments pertaining to Microwave

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

TOTAL 45 PERIODS

OUTCOMES:

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

- Analyze the performance of a simple optical link.
- Test microwave and optical components.
- Analyse the mode characteristics of fiber
- Analyse the radiation pattern of the antenna.

ELECTIVE- II

19152E54BP OPTO ELECTRONIC DEVICES L T P C
4 0 0 4

AIM

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

OBJECTIVE

- 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 devices.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction – Photoluminescence – Cathodoluminescence – Electro luminescence – Injection luminescence – Injection luminescence – LED – Plasma display – Liquid Crystal Display (LCD) – 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

OUTCOMES:

- 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.

TEXTBOOK

1. Wilson J and Haukes J., "Opto Electronics – An Introduction", PHI Pvt. Ltd., 1995.

REFERENCES

1. Bhattacharya, "Semiconductor Opto Electronic Devices", PHI Pvt Ltd., 1995.
2. Jasprit Singh, "Opto Electronics – As Introduction to Materials and Devices", TMH International Edition, 1998.

SEMESTER V
ELECTIVE- II

19152E54CP RADAR AND NAVIGATIONAL AIDS L T P C
4 0 0 4

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 cancellers – Staggered pulse repetition frequencies – Doppler filter banks – Digital MTI processing – Moving target detector – Limitations to MTI performance – MTI from a moving platform (AMIT) – Pulse Doppler radar – Other Doppler radar topics – Tracking with radar – Mono pulse 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

Detection of signals in noise – Introduction – Matched – Filter receiver – Detection – Detectors – Automatic detector – Integrators – Constant – False – Alarm rate receivers – The radar operator – Signal management – Propagation radar waves – Atmospheric – 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 – Super heterodyne receiver – Duplexers and receiver protectors – Radar displays.

UNIT IV RADIO DIRECTION AND RANGES 9

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 omnidirectional range (Vor) – Vor receiving equipment – Range and accuracy of Vor – Recent developments – Hyperbolic systems of navigation (loran and decca) **–** 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 SATELLITE NAVIGATION SYSTEM 9

DME and TACAN – Distance measuring equipment – Operation of DME – TACAN – TACAN equipment – Aids to approach and landing – Instrument landing system – Ground controlled approach system – Microwave Landing System (MLS) – Doppler navigation – The Doppler effect – Beam configurations – Doppler frequency equations – Track stabilization – Doppler spectrum – Components of the Doppler navigation system – Doppler range equation – Accuracy of Doppler navigation systems –Inertial navigation – Principles of operation – Navigation over the earth – Components of an inertial navigation system – Earth coordinate mechanization – Strapped – Down systems – Accuracy of inertial navigation systems – Satellite navigation system – The transit systemNavstar Global Positioning System (GPS)

TOTAL: 45 PERIODS

OUTCOMES:

- 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.

TEXTBOOK

1. Merrill I. Skolnik , “Introduction to Radar Systems”, 3rd Edition, TMH, 2003

REFERENCES

1. Peyton Z. Peebles, “Radar Principles”, John wiley, 2004
2. Toomay J.C, “Principles of Radar”, 2nd Edition, PHI, 2004

SEMESTER V

ELECTIVE- II

19152E54DP DIGITAL IMAGE PROCESSING L T P C

4 0 0 4

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 visual perception – Image sampling, Quantization – Basic relationship between pixels-monochrome vision model- color space model-convolution.

UNIT – II IMAGE TRANSFORM 9

Basic geometric transforms-Introduction to Fourier transform and DFT – properties of 2d Fourier transform – FFT- Separable image transforms – Walsh – Hadamard- Discrete cosine and Haar Transforms

UNIT-III:IMAGE ENHANCEMENT AND RESTORATION TECHNIQUES 9

Spatial domain methods- Basic gray level transformation-Histogram equalization-Spatial filtering-Laplacian filtering- Frequency Domain filters- homomorphic filtering-Model of image degradation/Restoration process- Noise models.

UNIT IV:IMAGE COMPRESSION 9

Lossless compression-: Variable length coding- LZW coding- -Predictive coding-DPCM. Lossy compression- Transform coding-– Image compression standards-JPEG,MPEG.

UNIT – V:IMAGE SEGMENTATION & REPRESENTATION 9

Edge detection – Thresholding- region based segmentation- Boundary representation – chair codes- Boundary segments – boundary descriptors-: simple descriptors-Fourier descriptors-Regional descriptors- Texture.

TOTAL : 45 PERIODS

OUTCOMES:

- 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.

TEXT BOOK:

1. Rafeel C. Gonzalez,Richard E woods 2nd edition – Digital Image processing – Pearson education 2003.

REFERENCE BOOKS:

1. William K.Pratt, Digital Image processing, John Wiley (2001)

2. Image processing Analysis and Machine Vision - Millman Sonka ,Vaclav hlavac,Roger Boyle,Broos/Colic,Thompson Learnfy(1999)
3. A.K.Jain PHI,(1995) – Fundamentals of Digital Image processing

SEMESTER V

ELECTIVE- II

19152E54EP ENGINEERING ACOUSTICS L T P C

4 0 0 4

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 loudspeakers and microphones.

UNIT I: INTRODUCTION 9

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

UNIT II: RADIATION AND RECEPTION OF ACOUSTIC WAVES 9

Radiation from 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: PIPE 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 loudspeaker, receivers – Condenser – Microphone – Moving coil electrodynamics microphone Piezoelectric microphone – Calibration of receivers.

TOTAL: 45 PERIODS

OUTCOMES:

- 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 environment inclusive of reverberation and noise.
- To give a detailed study on loudspeakers and microphones.

TEXT BOOK

1. Lawerence E. Kinsler, Austin R. Frey, Alan B. Coppens and James V. Sanders, "Fundamentals of Acoustics", 4th Edition, Wiley, 2000.

REFERENCE

1.Berarek L., “Acoustics”, TMH, 2002.

SEMESTER V

ELECTIVE- II

19152E54FP SOFTWARE ENGINEERING L T P C

4 0 0 4

AIM:

To understand fundamental concepts of requirements engineering and Analysis Modeling.

OBJECTIVES:

The student should be made:

- To understand the phases in a software project.
- To understand the various software design methodologies.
- To learn various testing and maintenance measures.

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III SOFTWARE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV TESTING AND MAINTENANCE 9

Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT V PROJECT MANAGEMENT 9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection – Risk Management-Risk Identification-RMMM Plan-CASE TOOLS.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Identify the key activities in managing a software project.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.
- Manage project schedule, estimate project cost and effort required.

TEXT BOOKS:

1. Roger S. Pressman, “Software Engineering – A Practitioner‟s Approach”, Seventh Edition, McGraw-Hill International Edition, 2010.
2. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning PrivateLimited, 2009.
2. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010.
3. Kelkar S.A., “Software Engineering”, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, “Software Engineering”, Tata McGraw-Hill Publishing Company Limited,2007.
5. http://nptel.ac.in/.

SEMESTER VI

19152H61P MOBILE AND WIRELESS COMMUNICATION L T P C

4 0 0 4

AIM

To introduce the concepts of wireless / mobile communication using cellular environments. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in 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 environments. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measure and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides ideas about analog and digital modulation techniques used in wireless communication. It also deals with the different types of equalization techniques and diversity concepts.
- It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques are presented. This unit also describes the time, frequency code division multiple access techniques as well as more recent multiple access techniques such as space division multiple access.
- It deals with second generation and third generation wireless networks and worldwide wireless standards.

UNIT I: PRINCIPLES OF WIRELESS COMMUNICATION 10

Digital modulation techniques – Linear modulation techniques – Spread spectrum modulation – Performance of modulation – Multiple access techniques – TDMA – FDMA – CDMA – SDMA – Overview of cellular networks – Cellular concept – Handoff
strategies – Path loss – Fading and Doppler effect.

UNIT II: WIRELESS PROTOCOLS 11

Issues and challenges of wireless networks – Location management – Resource management – Routing – Power management – Security – Wireless media access techniques – ALOHA – CSMA – Wireless LAN – MAN – IEEE 802.11 (a–b–e–f–g–h–i) – Bluetooth. Wireless routing protocols – Mobile IP – IPv4 – IPv6 – Wireless TCP.
Protocols for 3G & 4G cellular networks – IMT – 2000 – UMTS – CDMA2000 – Mobility management and handover technologies – All-IP based cellular network

UNIT III: TYPES OF WIRELESS NETWORKS 9

Mobile networks – Ad-hoc networks – Ad-hoc routing – Sensor networks – Peer-Peer networks – Mobile routing protocols – DSR – AODV – Reactive routing – Location aided routing – Mobility models – Entity based – Group mobility – Random way – Point mobility model.

UNIT IV: ISSUES AND CHALLENGES 9

Issues and challenges of mobile networks – Security issues – Authentication in mobile applications – Privacy issues – Power management – Energy awareness computing. Mobile IP and Ad-hoc networks – VoIP applications.

UNIT V: SIMULATION 6

Study of various network simulators (GloMoSim – NS2 – Opnet) – Designing and evaluating the performance of various transport and routing protocols of mobile and wireless networks using network simulator (any one).

TOTAL: 45 PERIODS

OUTCOMES:

- 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 environments. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measure and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multipath channel.
- It provides ideas about analog and digital modulation techniques used in wireless communication. It also deals with the different types of equalization techniques and diversity concepts.
- It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques are presented. This unit also describes the time, frequency code division multiple access techniques as well as more recent multiple access techniques such as space division multiple access.
- It deals with second generation and third generation wireless networks and worldwide wireless standards.

REFERENCES

1. Theodore S. Rappaport, “Wireless Communications, Principles and Practice”, Prentice Hall, 1996.
2. Stallings W., “Wireless Communications & Networks”, Prentice Hall, 2001.
3. Schiller J., “Mobile Communications”, Addison Wesley, 2000.
4. Lee W. C. Y., “Mobile Communications Engineering: Theory and Applications”, 2nd Edition, TMH, 1997.
5. Pahlavan K. and Krishnamurthy P., “Principles of Wireless Networks”, Prentice Hall, 2002.
6. Black U. D., “Mobile and Wireless Networks”, PHI, 1996.
7. Charles E. Perkins, “Ad – Hoc Networking”, Addison – Wesley, December 2000
8. IEEE Journals and Proceedings

SEMESTER VI

19152H62P MEDICAL ELECTRONICS **L T P C**

4 0 0 4

AIM

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

OBJECTIVE

- 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 biopotentials – Bio-potential electrodes – Biological amplifiers – ECG – EEG – EMG – PCG – EOG – Lead systems and recording methods – Typical waveforms and signal characteristics.

UNIT II BIO– CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

PH – PO2 – PCO2 – PHCO3 – Electrophoresis – Colorimeter – Photometer – Auto Analyzer – Blood flow meter – Cardiac output – Respiratory measurement – Blood pressure – Temperature – Pulse – Blood cell counters.

UNIT III ASSIST DEVICES AND BIO– TELEMETRY 9

Cardiac pacemakers – DC defibrillator – Telemetry principles – Frequency selection – Bio-telemetry – Radio – Pill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS 9

Ionising radiation – Diagnostic X-ray equipment – Use of radioisotope in diagnosis – Radiation therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermo graph – Endoscopy unit – Laser in medicine – Diathermy units – Electrical safety in medical equipment.

TOTAL: 45 PERIODS

OUTCOMES:

- 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

TEXTBOOK

1. Leislie Cromwell, “Biomedical Instrumentation and Measurement”, PHI, 2002.

REFERENCES

1. Khandpur R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, 1997.
2. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, 1997.

SEMESTER VI

19152H63P MICROCONTROLLER AND EMBEDDED SYSTEMS L T P C
4 0 0 4

AIM:

To make students familiar with microcontroller, programming and its applications.

OBJECTIVE:

- To study 8051 architecture
- To write assembly language programming
- To study the embedded architecture and real time applications.

UNIT I 8051 MICROCONTROLLER 9

8051 Microcontroller hardware- I/O pins, ports and circuits- External memory –Counters and Timers-Serial Data I/O- Interrupts-

UNIT II 8051 PROGRAMMING AND APPLICATIONS 9

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

UNIT III INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC)

UNIT IV DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O Devices - Device I/O Types– Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices -Communication Devices - UART and HDLC - Parallel Port Devices - Timer and Counting Devices - '12C', 'CAN' - I/O Serial high speed buses- ISA,

UNIT V EMBEDDED ARCHITECTURE 9

Embedded computers, characteristics of embedded, computing applications- challenges in embedded computing systems design, embedded design process, requirements and specifications, architectural design

TOTAL : 45 PERIODS

OUTCOMES:

- To study 8051 architecture
- To write assembly language programming
- To study the embedded architecture and real time applications

TEXT BOOKS

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

3. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003

REFERENCES

1. Douglas V.Hall, "Microprocessors and Interfacing: Programming and Hardware", TMH, Third edition
2. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", PHI 2003
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, "The 8051 microcontroller and embedded systems", Pearson education, 2004.
4. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
5. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
6. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001

SEMESTER VI

19152L65P VLSI AND EMBEDDED SYSTEMS LAB **L T P C**

0 0 3 2

OBJECTIVE:

- To learn Hardware Descriptive Language (Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- Learn the working of ARM processor
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

PART –I: VLSI LAB

1. Study of Simulation using tools using Digital Logic Circuits.
2. Study of Synthesis tools using Digital Logic Circuits.
3. Study of development tools for FPGA using Verilog and Schematic Entry.
4. Design and Simulation of 8bit Signed Multiplier.
5. Place and Root and back annotation for FPGA.

PART-II: EMBEDDED LAB

1. Programming using Arithmetic, instruction of 8051microcontroller.
2. Programming and verifying Timer operations in 8051 microcontroller.
3. ARM-7 based On board LED testing
4. ARM 7 Based ADC testing
5. ARM 7 based DAC testing

TOTAL 45 PERIODS

SEMESTER VI
ELECTIVE -III

19160E64AP **PRINCIPLES OF MANAGEMENT** **L T P C**
(Common to all Branches) **4-0-0-4**

AIM:

To study the functions and principles of management

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 - Nature of Management **9**

Definitions, meaning, scope, administration and management - Science and art Mgmt as a profession, University of management Hierarchy (Top, middle and supervisory, Levels), Principles of Management

UNIT II - Development of Management Thought **9**

Taylor and Scientific Management, Principles of Scientific Management Contributions of fayol,Barnard and social system theory, Contributions of Herbert Simon, Contributions of Peter Drucker, Contributions of behavioral scientists ,Contribution of system scientists

UNIT III - Planning and organizing **9**

Definition and features of planning, Nature of planning, Importance of planning
Types of planning, Steps in planning. Management by objectives, Strategies and policies, Definition of organization, Importance of organization, Principles of organization, Span of management

UNIT IV - Direction and Coordination **9**

Meaning, definition, principles of direction, Techniques of direction - Meaning of supervision, Functions of supervisor, Meaning of coordination Element and features of coordination, Importance of coordination Cooperation and coordination systems approach Steps for effective coordination Meaning and causes of conflicts, Management of conflicts

UNIT V – Controlling **9**

Definition, Meaning .elements, steps in establishing control procedure Control Techniques, Requirements of good control systems Budget –meaning, definitions, types Zero based budgeting, responsibility accounting, budgetary control, Report –meaning types PERT and CPM Management by Exception

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Prasad L.M ., Principles and practice of Management ,New Delhi Sultan Chand and sons ,1998

REFERENCES:

1. saxena ,s.c principles and practice of management Agra : sahitya bhawan 1998
2. Koontz Harold and others ,Management New York :McGraw Hill 1980
3. stoner james and others ,Management ,New Delhi :PHI ,1997
4. Dale Yoder : Personnel Management and industrial Relations ,New Delhi
5. PHI 1974

SEMESTER VI
ELECTIVE -III

19152E64BP SATELLITE COMMUNICATION L T P C
4 0 0 4

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 : ELEMENTS OF ORBITAL MECHANICS 9

Equation of motion – Orbital elements – Orbital perturbation – Tracking and orbit determination – orbit control.

Satellite Launch systems: Fundamentals of Rocket propulsion – Multistage rockets – Huffman transfer orbit circularization

UNIT II: ELEMENTS OF COMMUNICATION SATELLITE DESIGN 9

Space environment – Spacecraft configuration – Spacecraft subsystems – Payload – Reliability consideration – Spacecraft integration – Testing facilities – Spacecraft operations.

UNIT – III : SATELLITE COMMUNICATION SYSTEMS 9

Types of systems – FSS,BSS- Noise interference ,inter modulation –CDMA- Packet satellite networks – The INSAT system - The INTELSAT/INMARSAT system.

UNIT – IV:EARTH STATION DESIGN 9

Earth station configuration option – Site selection – Antenna systems – Tracking systems – Receiver subsystems – Low noise amplifiers – Down converters – Transmitter subsystems – Up converters- High power amplifiers - Terminal equipment .

UNIT - V: PERFORMANCE MEASUREMENTS 9

Spacecraft checkout – Ground station measurements –System coordination and control .Elements of Frequency coordination and management : The ITU/IFRB requirements – Satellite system characterization – Ground system characteristics .

TOTAL : 45 PERIODS

OUTCOMES:

- 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.

TEXT BOOK:

1. B.N.AGARWAL :Design of Geosynchronous spacecraft, Prentice Hall

REFERENCES:

1. R.F.FILIPOWASKY and E.K.MUCHIDORF: Space communication Systems ,Mcgraw Hill
2. DENNIS RODDY – Satellite communication
3. K.MIYA :Satellite communication technology – Lattice and company

SEMESTER VI
ELECTIVE -III

19152E64CP	**ROBOTICS**	**L T P C**
		4 0 0 4

AIM:

Robots are slowly and steadily replacing human beings in many fields. The aim of this course is to introduce the students into this area so that they could use the same when they enter the industry.

OBJECTIVES:

- The course has been so designed to give the students an overall view of the mechanical components and mathematics associated with the same.
- Actuators and sensors necessary for the functioning of the robot

UNIT I: ROBOT ORGANIZATION 9

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

UNIT II: ROBOT HARDWARE 9

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

UNIT III: ROBOT AND ARTIFICIAL INTELLIGENCE 9

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

UNIT IV: ROBOTIC VISION SYSTEMS 9

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

UNIT V: ROBOT CONTROL AND APPLICATION 9

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

TOTAL: 45 PERIODS

OUTCOMES:

- The course has been so designed to give the students an overall view of the mechanical components and mathematics associated with the same.
- Actuators and sensors necessary for the functioning of the robot.

REFERENCES

1. Koren, “Robotics for Engineers”, TMH International Company, 1995.

2. Vokopravotic, “Introduction to Robotics”, Springer, 1988.
3. Rathmill K., “Robot Technology and Application”, Springer, 1985.
4. Charniak and Mc Darmott, “Introduction to Artificial Intelligence”, TMH, 1986.
5. Fu K.S, Gonzally R.C, Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, TMH Book Company, 1997.
6. Barry Leatham and Jones, “Elements of Industrial Robotics”, Pittman Publishing, 1987.
7. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, “Industrial Robotic Technology Programming and Applications”, TMH Book Company, 1986.
8. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloguing Publication, 1990.

SEMESTER VI
ELECTIVE -III

19152E64DP **REMOTE SENSING** **L T P C**
4 0 0 4

AIM:
To understand the basics for REMOTE SENSING

OBJECTIVES:

- Introduce the principles of remote sensing and fundamental knowledge on the physics of remote sensing, aerial photographic techniques, photogrammetry, multispectral, hyperspectral and thermal imaging, and RADAR and LIDAR image analysis.
- The newest technology in the field will also be discussed.
- The course will be taught with an emphasis on the geographical applications of remote sensing; however, in certain instances other disciplines will be introduced as well.

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 Repetitivity – Electromagnetic 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 Material – 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

OUTCOMES:

On completion of the course the students will have knowledge on

- Principles of Remote Sensing and GIS
- Analysis of RS and GIS data and interpreting the data for modeling applications

TEXT BOOK:

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).

REFERENCE BOOKS:

1. Jensen, J.R., Remote Sensing of the environment, Prentice Hall, 2000.
2. Kang-Tsung Chang, "Introduction to Geographic 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, "Priciples of GIS for land resource assessment", Oxford
5. Mischael Hord, "Remote Sensing and Methods and Applications" , John Wiley & Sons, New York, 1986.
6. Signal, "Remote Sensing", Tata McGraw-Hill, NewDelhi, 1990.
7. Floyd F. Sabins, Remote Sensing, "Priciples and interpretation", W H Freeman and Company 1996.

SEMESTER VI
ELECTIVE -III

19150E64FP **TRANSDUCER ENGINEERING** **L T P C**
4 0 0 4

AIM:

To understand the behavior of transducers under static and dynamic conditions and hence to model the transducer.

OBJECTIVES:

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas.

- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on a variety of transducers and get introduced to MEMS and Smart transducers.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

Units and standards – Static calibration – Classification of errors, Limiting error and probable error – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics: - Accuracy, precision, resolution, sensitivity, linearity, span and range. Dynamic characteristics: Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezo-resistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Inductive transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT V OTHER TRANSDUCERS 9

Piezoelectric transducer – Hall Effect transducer – Magneto elastic sensor – Digital transducers – Fiber optic sensors – Thick & Thin Film sensors (Bio sensor & Chemical Sensor) – Environmental Monitoring sensors (Water Quality & Air pollution) – Introduction to MEMS – Introduction to Smart transducers and its interface standard (IEEE 1451).

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course the students will be able to

- to model and analyze transducers

TEXT BOOKS:

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003.

REFERENCES:
1. Bela G.Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol. 1, ISA/CRC Press, 2003.
2. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
3. John P. Bentley, Principles of Measurement Systems, III Edition, Pearson Education, 2000.
3. W.Bolton, Engineering Science, Elsevier Newnes, Fifth edition, 2006.
4. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
5. Ian Sinclair, Sensors and Transducers, 3rd Edition, Elsevier, 2012.

SEMESTER VII

19160S71P TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

AIM:

To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.

OBJECTIVE

1. To understand the statistical approach for quality control.
2. To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION 9

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

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams,

Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

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

\

UNIT V QUALITY SYSTEMS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK

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

REFERENCES

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

SEMESTER VII

19152H72P WIRELESS NETWORKS L T P C

4 0 0 4

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: PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES 9

Wired transmission techniques: Design of wireless modems – Power efficiency – Out of band radiation – Applied wireless transmission techniques – Short distance baseband transmission – VWB pulse transmission – Broad modems for higher speeds – Diversity and smart receiving techniques – Random access for data oriented networks – Integration of voice and data traffic.

UNIT II: WIRELESS NETWORK PLANNING AND OPERATION 9

Wireless networks topologies – Cellular topology – Cell fundamentals signal to interference ratio calculation – Capacity expansion techniques – Cell splitting – Use of directional antennas for cell sectoring – Micro cell method – Overload cells – Channels allocation techniques and capacity expansion FCA – Channel borrowing techniques – DCA – Mobility management – Radio resources and power management securities in wireless networks.

UNIT III: WIRELESS WAN 9

Mechanism to support a mobile environment – Communication in the infrastructure – IS-95 CDMA forward channel – IS-95 CDMA reverse channel – Pallert and frame formats in IS-95, IMT-2000 – Forward channel in W-CDMA and CDMA-2000 – Reverse channels in W-CDMA and CDMA-2000 – GPRS and higher data rates – Short Messaging Service in GPRS mobile application protocols.

UNIT IV: WIRELESS LAN 9

Historical overviews of the LAN industry – Evolution of the WLAN industry – Wireless Home Networking – IEEE 802.11 – The PHY layer – MAC layer – Wireless ATM – HYPER LAN – HYPER LAN – 2.

UNIT V: WPAN AND GEOLOCATION SYSTEMS 9

IEEE 802.15 WPAN – Home RF – Bluetooth – Interface between bluetooth and 802.11 – Wireless geolocation technologies for wireless geolocation – Geolocation standards for E.911 service.

TOTAL: 45 PERIODS

OUTCOMES:

- 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.

TEXT BOOK

1. Kaveh Pahlavan, Prashant Krishnamoorthy, “Principles of Wireless Networks, – A United Approach”, Pearson Education, 2002.

REFERENCES

1. Jochen Schiller, “Mobile Communications”, 2nd Edition, Pearson Education, 2003.
2. Wang X. and Poor H.V., “Wireless Communication Systems”, Pearson Education, 2004.
3. Mallick M., “Mobile and Wireless Design Essentials”, Wiley Publishing Inc. 2003.
4. Nicopolitidis P, Obaidat M.S, Papadimitriou G.I, Pomportsis A.S., “Wireless Networks”, John Wiley and Sons, 2003.

SEMESTER VII

19152H73P TELECOMMUNICATION SWITCHING AND NETWORKS

L	T	P	C
4	0	0	4

AIM:

- 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 a digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in the 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 EVOLUTION OF TELECOMMUNICATION SWITCHING AND CIRCUITS 9

Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange,– Basic Telecommunication equipment – Telephone handset, , Echo suppressors and cancelers, PCM coders, Modems and Relays.

UNIT II ELECTRONIC SWITCHING 9

Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Space switching,– Digital switching system hardware configuration,

UNIT III TELECOMMUNICATION SIGNALLING AND TRAFFIC 9

Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, , Grade of service, Modeling switching systems, Blocking models and Delay systems.

UNIT IV INTEGRATED DIGITAL NETWORKS 9

Subscriber loop characteristics, Local access wireline and wireless PCM / TDM carrier standards transmission line codes, Synchronous, Asynchronous, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN) –

UNITV DATA NETWORKS 9

Data transmission in PSTN – Connection oriented and Connection less protocols – packet switching – ISO-OSI architecture-Satellite based data networks –LAN, WAN – standards – TCP / IP – Internet –

TOTAL : 45 PERIODS

OUTCOMES:

- 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 a digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in the 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.
- To understand WPAN and geo-location systems.

TEXT BOOKS:

1. Viswanathan. T, “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.
2. Behrouz Forouzan, “Introduction to Data Communication and Networking”, McGraw-Hill, 1998.

REFERENCES

1. L.S.Lawton, “Integrated Digital Networks, Galgotta Publication Pvt., Ltd., New Delhi,1996.
2. Syed R. Ali, “Digital Switching Systems”, McGraw-Hill Inc., New York, 1998.

SEMESTER VII
ELECTIVE – IV

19152E74AP 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 converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

UNIT I POWER SEMICONDUCTOR DEVICES 9

Power transistors, Thyristors, Power TRIAC, MOSFET, IGBT, GTO characteristics, rating, Protection circuits,.

UNIT II POWER SUPPLIES 9

Single Phase and Three Phase Controlled rectifiers, Design of Trigger circuits, Switching mode regulators – Boost, Buck, Buck-Boost and Cuk regulators, AC voltage regulator.

UNIT III INVERTERS 9

Voltage and current source inverters, Resonant, Series inverter, PWM inverter.

UNIT IV CHOPPERS 9

Type A, B, C and D choppers, Pulse width modulation - Gating requirements.

UNIT V MOTOR CONTROL & Applications 9

Single Phase DC series motor drives, Induction and Synchronous motor drives, Switched reluctance motor Drive, SMPS and UPS

TOTAL: 45 PERIODS

OUTCOMES:

- 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 converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

TEXT BOOK:

1. M.D.Singh, K.B. Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998.

REFERENCES:

1. Ned Mohan, Tore M.Undeland, William P.Robbins, “Power Electronics, Converters, Applications and Design”, John Wiley & Sons, 1994.
2. Muhamed H.Roshid, “Power Electronics Circuits, Devices and Application”, Prentice Hall of India, 1995.
3. B.K.Bose, “Modern Power Electronics”, Jaico Publishing House, 1999.
4. Sen, Power Electronics”, Tata McGraw-Hill, 1987

SEMESTER VII
ELECTIVE – IV

19152E74BP	**ADVANCED MICROPROCESSORS**	**L T P C**
		3 0 0 3

AIM:

To learn the architecture and programming of advanced Intel family microprocessors and microcontrollers.

OBJECTIVES

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

UNIT I ADVANCED MICROPROCESSOR ARCHITECTURE 9

Internal microprocessor architecture – Real mode memory addressing – Protected mode memory addressing – Memory paging – Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions – Arithmetic and logic instructions.

UNIT II MODULAR PROGRAMMING AND ITS CONCEPTS 9

Modular programming – Using keyboard and video display – Data conversions – Disk files – Interrupt hooks – Using assembly languages with C/ C++

UNIT III PENTIUM PROCESSORS 9

Introduction to pentium microprocessor – Special pentium registers – Pentium memory management – New pentium instructions – Pentium processor – Special pentium pro features – Pentium IV processor

UNIT IV 16– BIT MICRO CONTROLLER 9

8096/8097 architecture – CPU registers – RALU – Internal program and data memory timers – High speed input and output – Serial interface – I/O ports – Interrupts – A/D converter – Watchdog timer – Power down feature – Instruction set – External memory interfacing – External I/O interfacing.

UNIT V RISC PROCESSORS AND ARM 9

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

TOTAL: 45 PERIODS

OUTCOMES:

- To introduce the concepts in the internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of the Pentium family of processors.

- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

TEXT BOOKS

1. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing", PHI Private Limited, 2003.
2. John Peatman, "Design with Microcontroller", TMH Publishing Co Ltd, 2003.
3. Alan Clements, "The Principles of Computer Hardware", 3rd Edition, Oxford University Press, 2003.

REFERENCES

1. Rajkamal, "The Concepts and Feature of Micro Controllers 68HC11, 8051 and8096", S Chand Publishers, 2000.

SEMESTER VII

ELECTIVE – IV

19152E74CP 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 conversion.

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

OUTCOMES:

- 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

TEXT BOOKS

1. Prasad Kodali V., “Engineering Electromagnetic Compatibility”, S. Chand and Co, 2000.
2. Clayton R. Paul, “Introduction to Electromagnetic Compatibility” , Wiley and sons ,1992.

REFERENCES

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

SEMESTER VII
ELECTIVE – IV

19152E74DP SOLID STATE ELECTRONIC DRIVES L T PC
3 0 0 3

AIM

To have fundamental knowledge about the structure of devices, VI characteristics of devices like PN Junction diode, Zener diode, MOSFET, BJT and Opto electronic.

OBJECTIVES:

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.

- To study behavior of semiconductor junction under different biasing conditions. Fabrication of different semiconductor devices, Varactor diode, Zener diode, Schottky diode, BJT, MOSFET, etc.
- To study the VI Characteristics of devices and their limitations in factors like current, power frequency.
- To learn photoelectric effect and fabrication of opto electronic devices.

UNIT I: CRYSTAL PROPERTIES AND GROWTH SEMICONDUCTORS 9

Semiconductor materials – periodic Structures – Crystal Lattices – Cubic lattices – Planes and Directions – Diamond lattice – Bulk Crystal Growth – Starting Material – Growth of Single Crystal Ingots – Wafers – Doping – Epitaxial Growth – Lattice Matching in Epitaxial Growth – Vapor – Phase Epitaxy – Atoms and Electronics – Introduction to Physical Models – Experimental Observations – Photoelectric Effect – Atomic spectra – Bohr model – Quantum Mechanics – Probability and Uncertainty Principle – Schrodinger Wave Equation – Potential Well Equation – Potential well Problem – Tunneling.

UNIT II: ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators – Direct and Indirect Semiconductors – Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors – Electrons and Holes – Electrons and holes in Quantum Wells – Carrier Concentrations –Fermi Level – Electron and Hole Concentrations at Equilibrium – Temperature Dependence of Carrier Concentrations – Compensation and Space Charge Neutrality – Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility – Drift and Resistance – Effects of Temperature and Doping on Mobility – High Field effects – Hall Effect – invariance of Fermi level at equilibrium – Fabrication of p-n junctions, Metal semiconductor junctions.

UNIT III: METAL OXIDE SEMICONDUCTOR FET 9

GaAS MESFET – High Electron Mobility Transistor – Short channel Effects – Metal Insulator Semiconductor FET – Basic Operation and Fabrication – Effects of Real Surfaces – Threshold Voltage – MOS capacitance Measurements – Current – Voltage Characteristics of MOS Gate Oxides – MOS Field Effect Transistor – Output Characteristics – Transfer characteristics - Short Channel MOSFET V-I characteristics – Control of Threshold Voltage – Substrate Bias Effects - Subthreshold characteristics – Equivalent Circuit for MOSFET –MOSFET Scaling and Hot Electron Effects – Drain – Induced Barrier Lowering – short channel and Narrow width Effect – Gate Induced Drain Leakage.

UNIT IV: OPTO ELECTRON DEVICES 9

Photodiodes – Current and Voltage in illuminated Junction – Solar Cells – Photo detectors – Noise and Bandwidth of Photo detectors – Light Emitting Diodes – Light Emitting Material – Fiber Optic Communication Multilayer Heterojunctions for LEDS – Lasers – Semiconductor lasers – Population Inversion at a Junction Emission Spectra for p-n junction – Basic Semiconductor laser – Materials for Semiconductor laser.

UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9

Tunnel Diode, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode – transferred – electron mechanism, formation and drift of space charge domains, p-n-p-n diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

TOTAL: 45 PERIODS

OUTCOMES:

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.

TEXT BOOKS

1.Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5th Edition, PHI, 2003.

REFERENCES

1. Donald A. Neaman, Semiconductor Physics and Devices, 3rd Edition, TMH, 2002.
2. Yannis Tsividis, Operation & Mode line of MOS Transistor, 2nd Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & aamitava Das Gupta, Semiconductor Devices Modeling a Technology, PHI, 2004.
4. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

SEMESTER VII

ELECTIVE – IV

19152E74FP SPACE TIME WIRELESS COMMUNICATION L T P C

3 0 0 3

AIM:

To understand the concept of multiple antenna propagation.To understand the concept of capacity of frequency flat deterministic MIMO channel.

OBJECTIVES:

- To understand the concept of multiple antenna propagation.
- To understand the concept of capacity of frequency flat deterministic MIMO channel.
- To understand the concept of transmitter and receiver diversity technique.
- To design the coding for frequency flat channels.
- To analyze the concept of micro multi user detection.

UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION 9

Wireless channel – Scattering model in macrocells – Channel as a ST random field – Scattering functions, Polarization and field diverse channels – Antenna array topology – Degenerate channels – reciprocity and its implications – Channel definitions – Physical scattering model – Extended channel model – Channel measurements – sampled signal model – ST multiuser and ST interference channels – ST channel estimation.

UNIT II CAPACITY OF MULTIPLE ANTENNA CHANNELS 9

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter – Channel known to the transmitter – capacity of random MIMO channels – Influence of ricean fading – fading correlation – XPD and degeneracy on MIMO capacity – Capacity of frequency selective MIMO channels.

UNIT III SPATIAL DIVERSITY 9

Diversity gain – Receive antenna diversity – Transmit antenna diversity – Diversity order and channel variability – Diversity performance in extended channels – Combined space and path diversity – Indirect transmit diversity – Diversity of a space-time – frequency selective fading channel.

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS 9

Coding and interleaving architecture – ST coding for frequency flat channels – ST coding for frequency selective channels – Receivers–SISO–SIMO–MIMO–Iterative MIMO receivers – Exploiting channel knowledge at the transmitter: linear pre-filtering – optimal pre-filtering for maximum rate – optimal pre-filtering for error rate minimization – selection at the transmitter – Exploiting imperfect channel knowledge

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 9

SISO-OFDM modulation, MIMO-OFDM modulation – Signaling and receivers for MIMO–OFDM – SISO–SS modulation – MIMO-SS modulation – Signaling and receivers for MIMO – S.MIMO – MAC – MIMO – BC – Outage performance for MIMO-MU – MIMO - MU with OFDM – CDMA and multiple antennas.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students would be able to

- Design and analyze the channel characterization.
- Analyze the capacity of random MIMO channel.
- Design and analyze the order diversity and channel variability.
- Analyze the multiple antenna coding and receivers.
- Analyze the MIMO multi user detection

TEXT BOOKS:

1. Sergio Verdu, “Multi User Detection” , Cambridge University Press, 2011.
2. Paulraj, Rohit Nabar, Dhananjay Gore, “Introduction to Space Time Wireless Communication Systems”, Cambridge University Press , 2008.

REFERENCES:

1. Don Tarrieri, “Principles of Spread Spectrum Communication systems” ,Springer, Third edition, 2015.