DIBRUGARH UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIBRUGARH UNIVERSITY

CURRICULUM FOR B.TECH DEGREE (SEMESTERS III TO VIII)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING.

SEMESTER - 3

Course Code	Course Name	L-T-P	Credits	Remarks
MA-201	Linear Algebra & Complex Analysis	3-1-0	4	Basic Science
EC-201	Network Theory	3-1-0	4	Basic Engineering
EC-202	Solid State Devices	3-1-0	4	Basic Science
EC-203	Electronic Circuits	3-1-0	4	Core Engineering.
EC-204	Logic Circuit Design	3-1-0	4	Core Engineering.
HU-201	Business Economics	3-0-0	3	Humanities
EC-213	Electronic Devices & Circuits Lab.	0-0-3	1	Core Engineering.
EC-214	Logic Circuit Design Lab.	0-0-3	1	Core Engineering.

Total Credits = 25(Basic science = 8, Core = 10, HU = 3, Basic Engineering= 4)

SEMESTER - 4

Course Code	Course Name	L-T-P	Credits	Remarks
MA-202	Probability, Random Processes and Numerical Methods	3-1-0	4	Basic Science
EC-205	Signals & Systems	3-1-0	4	Core Engineering.
EC-206	Analog Integrated Circuits	4-0-0	4	Core Engineering.
EC-207	Applied Electro-Magnetic Theory	3-1-0	4	Basic Science
EC-208	Analog Communication Engineering	3-1-0	4	Core Engineering.
HU-202	Fundamentals of Accountancy	3-0-0	3	Humanities
EC-216	Analog Integrated Circuits Lab.	0-0-3	1	Core Engineering.
EC-219	Electronic Design AutomationLab.	0-0-3	1	Core Engineering.

Total Credits = 25(Basic science = 8, Core = 14, HU = 3)

SEMESTER – 5

Course Code	Course Name	L-T-P	Credits	Remarks
EC-301	Digital Signal Processing	3-0-0	3	Core Engineering.
EC-302	Antenna and wave propagation	4-0-0	4	Core Engineering.
EC-303	Microprocessors & Microcontrollers	3-0-0	3	Core Engineering.
EC-304	Digital Communication	3-1-0	4	Core Engineering.
HU-301	Principles of Management	3-0-0	3	Humanities
EC-501	Elective-1	3-1-0	4	Dept. Elective
EC-311	Digital Signal Processing Lab.	0-0-3	1	Core Engineering.
EC-314	Communication Engineering Lab (Analog& Digital)	0-0-3	1	Core Engineering.

Total Credits = 23(Core = 16, HU = 3, Elective = 4,)

SEMESTER – 6

Course Code	Course Name	L-T-P	Credits	Remarks
EC-305	Power Electronics & Instrumentation	3-0-0	3	Basic Engineering
EC-306	Computer organization and architecture	3-0-0	3	Core Engineering.
EC-307	Embedded Systems	3-0-0	3	Core Engineering.
EC-308	Control systems	3-1-0	4	Basic Engineering
EC-502	Elective-2	3-1-0	4	Dept. Elective
EC-601	Open Elective-1	3-1-0	4	Open Elective
EC-315	Power Electronics & Instrumentation Lab.	0-0-3	1	Basic Engineering
EC-317	Microcontroller& Embedded Systems Lab.	0-0-3	1	Core Engineering.

Total Credits = 23(Core = 7, Basic Engineering =8, Elective = 4, Open elective = 4)

SEMESTER – 7

Course Code	Course Name	L-T-P	Credits	Remarks
EC-401	Microwave Engineering	3-0-0	3	Core Engineering.
EC-402	Optical Communication	3-0-0	3	Core Engineering.
EC-403	Advanced Digital Signal Processing	3-0-0	3	Core Engineering
EC-404	Object Oriented Programming	3-1-0	4	Basic Engineering
EC-503	Elective-3	3-1-0	4	Dept. Elective
EC-602	Open Elective-2	3-1-0	4	Open Elective
EC-415	Seminar & Project Preliminary	0-1-9	10	Core Engineering.
EC-411	Communication Systems Lab(Optical & Microwave)	0-0-3	1	Core Engineering.

Total Credits = 32(Core = 20, Basic Engineering =4, Elective = 4, Open elective = 4)

SEMESTER – 8

Course Code	Course Name	L-T-P	Credits	Remarks
EC-405	Advanced Communication Systems	3-0-0	3	Core Engineering.
EC-504	Elective 4	3-1-0	4	Dept. Elective
EC-505	Elective 5	3-1-0	4	Dept. Elective
EC-603	Open Elective-3	3-1-0	4	Open Elective
EC-604	Open Elective-4	3-1-0	4	Open Elective
EC-416	Project		10	Core Engineering.

Total Credits = 29(Core = 13, Elective = 8, Open elective = 8)

Note: - EC-50X are Core Electives
EC-60X are Open Elective

Elective Course:-

1. Digital System Design
2. Biomedical Engineering
3. Soft Computing
4. Information Theory & Coding
5. Electrical Machine

6. Modelling& Simulation of Communication Systems
7. Computer Vision
8. Digital Image Processing
9. VLSI
10. Speech and Audio Processing
11. Pattern Recognition
12. Opto-Electronic Devices
13. Antenna and RADAR Engineering
14. Mixed Signal Circuit Design
15. Low Power VLSI Design
16. Secure Communication
17. Nano Electronics.
18. Cryptography and network security.
19. Integrated Optics & Photonic Systems
20. Computer Communication.

Open Elective Course:-

1. Optimization Techniques
2. Real Time Operating Systems
3. Robotics
4. Microwave Devices and Circuits
5. MEMS
6. Satellite Communication
7. IC Technology
8. Advanced Control system
9. Artificial Intelligence.
10. Reverse Engineering.
11. Yoga and Sports science.
12. Cyber Security.
13. Material Science.
14. Microelectronics
15. Human Values and professional ethics.
16. Operation research
17. Big data analytics
18. Electric Vehicles
19. Renewable Energy
20. Information and communication technology(ICT)
21. Internet of Things (IOT)
22. Software Engineering.

Total Credits =210 (Including 1st year of 53 credits).

Core Engineering= 80
Humanities= 09
Basic Science=16
Basic Engineering=16
Departmental Electives= 20
Open Electives=16.

SEMESTER – 3

Linear Algebra & ComplexAnalysis

Module 1:

Limit, continuity and derivative of complex functions. Analytic Functions, Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation Harmonic functions, Harmonic Conjugate.

Module 2:

Geometry of Analytic functions Conformal Mapping, Circles and straight lines, extended complex plane, fixed points Special linear fractional Transformations, Cross Ratio, Cross Ratio property-Mapping of disks and half planes

Module 3:

Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof) Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof). Application of derivative of Analytical Functions Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof) Laurent's series (without proof).

Module 4:

Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem. Evaluation of Real Integrals.

Module 5:

Linear systems of Equations, Coefficient Matrix, Augmented Matrix Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it. Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space Solution of linear systems, Fundamental theorem of non-homogeneous linear systems (Without proof)-Homogeneous linear systems (Theory only)

Module 6:

Determination of Eigen values and Eigen vectors-Eigen space Symmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof). Basis of Eigen vectors- Similar matrices Diagonalization of a matrix-Quadratic forms- Principal axis theorem(without proof).

Text Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

References:

1. Murray R Spiegel, Seymour Lipschutz, John J. Schiller&Dennis Spellman - Complex Variables, 2ed (Schaum's Outline Series), McGraw Hill
2. S. Ponnusamy- Foundations Of Complex Analysis, Narosa Book Distributors
3. Seymour Lipschutz&Marc Lipson - Linear algebra, 5ed (Schaum's Outline Series), McGraw Hill
4. Michael Artin- Algebra, Pearson.

5. Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications- Jones &Bartlet Publishers
6. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
7. Lipschutz, Linear Algebra,3e (Schaums Series) McGraw Hill Education India 2005
8. Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

Network Theory

UNIT- I

DC Circuit Analysis: Sources-Transformation and manipulation, Network theorems -Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem and Tellegen's theorem – Application to DC circuit analysis.

UNIT- II

AC Circuit Analysis: Series circuits - RC, RL and RLC circuits and Parallel circuits –RLC circuits - Sinusoidal steady state response - Mesh and Nodal analysis - Analysis of circuits using Superposition, Thevenin's, Norton's and Maximum power transfer theorems. Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency – Bandwidth - Q factor - Selectivity.

UNIT- III

Transient Analysis: Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by DC and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidal excitation.

UNIT- IV

Magnetically Coupled Circuits: Self-inductance - Mutual inductance - Dot rule -Coefficient of coupling - Analysis of multiwinding coupled circuits - Series, Parallel connection of coupled inductors - Single tuned and double tuned coupled circuits.

UNIT –V

Network Topology: Network terminology - Graph of a network - Incidence and reduced incidence matrices – Trees –Cutsets - Fundamental cutsets - Cutset matrix – Tiesets – Link currents and Tieset schedules -Twig voltages and Cutset schedules, Duality and dual networks.

Text Book:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering CircuitAnalysis", McGraw Hill Science Engineering, Seventh Edition, 2006
2. Joseph Edminister and MahmoodNahvi, "Electric Circuits", Schaum's Outline Series,Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.
3. David A. Bell, "Electric Circuits", Sixth Edition, PHI Learning, New Delhi, 2003

Solid State Devices

UNIT - I

CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS: Semiconductor materials- Periodic Structures- Crystal Lattices- Cubic lattices -Planes and Directions-The Diamond lattice- Bulk Crystal Growth-Starting Materials-Growth of Single Crystal lngots-Wafers-Doping- Epitaxial Growth -Lattice Matching in Epitaxial Growth -Vapor -Phase Epitaxy-Atoms and Electrons-Introduction to Physical Models-Experimental Observations-The Photoelectric Effect-Atomic spectra-The Bohr model- Quantum Mechanics -Probability and the Uncertainty Principle-The Schrodinger Wave Equation -Potential Well Equation -Potential well Problem-Tunneling.

UNIT - II

ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS: Bonding Forces and Energy bands in Solids-Bonding Forces in Solids-Energy Bands-Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors -Variation of Energy Bands with Alloy Composition-Charge Carriers in Semiconductors-Electrons and Holes-Effective Mass-Intrinsic Material-Extrinsic Material - Electrons and Holes in Quantum Wells-Carrier Concentrations-The 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-The Hall Effect -invariance of the Fermi level at equilibrium -Excess Carrier in Semiconductors-Optical Absorption- Luminescence-Photoluminescence-Electro luminescence-Carrier Lifetime and Photoconductivity - Direct Recombination of Electrons and Holes - Indirect Recombination ; Trapping -Steady State Carrier Generation ; Quasi-Fermi Levels-Photoconductive Devices-Diffusion of Carriers-Diffusion of Processes-Diffusion and Drift of Carrier; Built-in Fields-Diffusion and Recombination; The Continuity Equation -Steady state Carrier Injection; Diffusion Length-The Haynes- Shockley Experiment -Gradients in the Quasi-Fermi levels.

UNIT - III

JUNCTIONS: Fabrication of P-N Junctions-Thermal Oxidation-Diffusion -Rapid Thermal Processing-Ion Implantation-Chemical Vapor Deposition Photolithography-Etching -Metallization-Equilibrium Conditions-The Contact Potential-Equilibrium Fermi Levels -Space Charge at a Junction-Forward -and Reverse -Biased Junctions; -Steady state conditions-Qualitative Description Of current flow at a junction-Carrier Injection-Reverse Bias-Reverse -Bias Breakdown-Zener Breakdown -Avalanche Breakdown-Rectifiers-The Breakdown Diode-Transient and AC Conditions -Time variation of stored charge-Reverse Recovery Transient -Switching Diodes -Capacitance of P-N Junctions-The Varactor Diode-Deviations from the Simple Theory-Effects of contact Potential on carrier injection-Recombination and Generation in the Transition Region-Ohmic Losses -Graded Junctions-Metal -Semiconductor Junctions-Schottky Barriers-Rectifying contacts-Ohmic Contacts-Typical Schottky Barriers-Hetrojunctions.

UNIT –IV

THE METAL -SEMICONDUCTOR-FET: The GaAS MESFET-The High Electron Mobility Transistor -Short channel Effects-The Metal Insulator Semiconductor FET-Basic Operation and Fabrication -THE ideal MOS Capacitor-Effects of Real Surfaces-Threshold Voltage -MOS capacitance Measurements- current -Voltage Characteristics of MOS Gate Oxides -The MOS Field -Effect Transistor -Output characteristics-Transfer characteristics- Mobility Models-Short channel MOSFET I-V characteristics -Control of Threshold Voltage -Substrate Bias Effects-Sub threshold characteristics -Equivalent Circuit for the MOSFET-MOSFET Scaling and Hot Electron Effects-Drain -Induced Barrier Lowering -short channel and Narrow Width Effect-Gate -Induced Drain Leakage-BJT Fabrication -Minority carrier distribution and Terminal currents-Solution of the Diffusion Equation in the Base Region-Evaluation of the Terminal currents -Current Transfer Ratio-Generalized Biasing -The coupled -Diode Model-Charge control analysis-Switching -cut off -saturation-The switching cycle-Specifications for switching Transistors-other Important Effects-Drift in the base Narrowing -Avalanche Breakdown -Injection level; Thermal Effects-Base Resistance and Emitter Crowding - Gummel -Poon Model-Kirk Effect-Frequency Limitations of Transistors-Capacitance and Charging Times-Transit Time Effects-Webster Effect-High -Frequency Transistors -Heterojunction Bipolar Transistors.

UNIT - V

OPTOELCTRONIC DEVICES: Photodiodes-Current and Voltage in illuminated Junction-Solar Cells-Photo detectors-Noise and Bandwidth of Photo detectors-Light-Emitting Diodes-Light Emitting Materials-Fiber Optic Communications Multilayer Heterojunctions for LEDs- Lasers-Semiconductor lasers-Population Inversion at a Junction Emission Spectra for p-n junction-The Basic Semiconductor lasers-Materials for Semiconductor lasers-Integrated Circuits -Background -Advantages of Integration -Types of Integrated circuits-Monolithic and Hybrid Circuits-Evolution of Integrated Circuits-Monolithic Device Elements CMOS Process Integration -Silicon -on -Insulator (SOI)-Integration of other Circuit Elements -Charge Transfer Devices -Dynamic Effects in MOS capacitors -The basic CCD-Improvements on the Basic Structure -Applications of CCDs-Ultra Large -Scale Integration (ULSI) -Logic devices -Semiconductor Memories-Testing, bonding , and Packaging-Testing -Wire Bonding -Flip-flop Techniques-Packaging

TEXT BOOK

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

REFERENCES

1. YannisTsividis: Operation & Mode line of The MOS Transistor (2nd Edition) Oxford University Press, 1999
2. Nandita Das Gupta &Aamitava Das Gupta- Semiconductor Devices Modeling a Technology, PHI, 2004.

Electronic Circuits

UNIT-I

Semiconductor Diodes: Introduction-semiconductor materials, P-N junction and its V-I Characteristics, P-Njunction as a rectifier, switching characteristics of Diode. Diode applications-Diode as a circuit element, the load-line concept, half-wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

UNIT-II

Bipolar junction transistors: Bipolar junction transistor: operation, characteristics, Ebers-moll model of transistor,hybrid model, h-parameters (CE, CB, and CC configurations), analysis of a transistor amplifier circuits using h-parameters, emitter follower, Miller's Theorem, frequency response of R-C coupled amplifier. Transistor Biasing: Operating point, bias stability, collector to base bias, self-bias, emitter bias, bias compensation, thermistor &sensistor compensation, frequency response of BJT.

UNIT-III

Field- effect transistors: Introduction, Construction and characteristics of JFET–Relation between pinch offvoltage and drain current – JFET as voltage variable resistor – MOSFET – Depletion and enhancement types, CMOS – Its construction and characteristics, biasing of FET, frequency response of FET.

UNIT -IV

Special Diodes and Photonic Devices: Construction, Principle of operation, application and characteristics ofSchottky barrier diode, Varactor diode, Tunnel diode, PIN diode. LED, LCD, Seven segment display, Photoconductivity - Photodiode, APD, Phototransistor, Solar cells- Concept of DLP.

UNIT- V

Power Devices: SCR, Two transistor model- operation and characteristics, Phase control using SCR, SCS and lightactivated SCR, Schottky diode, DIAC, TRIAC and their applications. Characteristics and equivalent circuit of UJT – intrinsic standoff ratio –UJT relaxation oscillator, triggering circuit for SCR – programmable UJT.

TEXT BOOK :

1. Electronic Devices & circuits. - David A. Bell, PHI
2. Electronic Devices -Floyd, PHI

REFERENCE:

3. Semiconductor Devices - Jasprit Singh, John Wiley
4. Electronic Devises & Circuits Theory - Boylestad&Nashalsky. Pearson Education
5. Electronic Device & Circuit - Millman-Halkias, Tata McGraw Hill.
6. Electronic Design: From Concept to Reality - - Roden,. Carpenter, Wiesrman (SPD).
7. Introduction to Electronic Circuit Design – - Spencer &Ghausi, Pearson Education
8. Electronics Lab Primer- K.K. Sarma, Global Publishing;
9. Electronic Device and Circuits- Ramesh Babu, Scitech Publication, 2010.

Logic Circuit Design

UNIT-I

Number System and codes : Decimal, Binary, Octal, Hexa-decimal number system, Conversion of numbers from a number system to another, complement method of subtraction, 9's and 10's compliment method, l's and 2's complement method, Floating point numbers. Weighted and Non-weighted code, Self complementing course, cyclic course, 8421 BCD code, Gray code, Binary to Gray conversion, Gray to Binary conversion, Parity bit and its importance in error detecting.

Unit-II

Logic Gates and Boolean Algebra : AND, OR, NOR, NOT, NAND, X-OR, Inhibit circuits, Axioms and laws of Boolean algebra, D'morgans theorem, Duality, Reduction of boolean expression, converting AND/OR/INVERT logic to NAND/NOR logic

Unit-III

Simplification of Boolean expressions : Expansion of a Boolean expression to SOP and POS form, Minimization of POS and SOP expressions for 2 to 6 variables, Don't care conditions, Combinational logic, Quine- Mcclusky methods. Combinational Logic : The Half-adder, The Full-adder, The Half-subtractor, The Full-Subtractor, Parallel Binary Adders, The Look-Ahead Carry Adder, IC Parallel Adders, Two's Complement Addition And Subtraction Using Parallel Adders, Serial Adders, BCD adder, Binary Multipliers, Code converters, Parity bit Generators/Checkers, Comparators, IC comparators, Decoders, BCD to 7- Segment Decoders, Encoders, Priority Encoders, Multiplexers, Applications of Multiplexer, Demultiplexers

Unit-IV

Sequential Logic :S-R Flip-flop, JK Flip-flop, D Flip-flop, T Flip-flop, Edge —Triggered Flip-flop, Master-slave Flip-flop, Applications of Flip-flops. Serial-in Serial-out Shift register, Serial-in Parallel-out Shift register, Parallel-in Serial-out Shift register, Parallel-in Parallel-out Shift register, Bidirectional shift register, Universal shift register, Dynamic shift register, Applications of shift registers. Asynchronous counter, Design of Asynchronous counter, Decoding of Ripple counters, Synchronous counters, Design of Synchronous counter.Logic Families: Digital IC specification terminology, Logic families, TTL, Open collector gate, TTL subfamilies, IIL, ECL, MOS, CMOS, Dynamic MOS Logic.

Unit-V

Memories: Memory types and terminology, Read Only memory, Semiconductor RAMs, Non-volatile RAMs, Sequential memories, Programmable logic Devices, Magnetic memories, Optical Disk memory, Charge coupled devices.

Suggested Readings

1. M. Morris Mano, Digital Logic and Computer Design, Pearson Education,2009
2. A. Anand Kumar, Fundamentals of Digital Circuits, 2nd Ed., PHI
3. B. Somanathan Nair, Digital Electronics and Logic Design, 1st Ed., PHI.
4. R.P. Jain, Modern Digital Electronics, 4th Ed., TMH.

Business Economics

Unit 1

Business Economics:Basicconcepts,tools and analysis;The scope and methods of economics;scarcity and choices;Questions of What,how and for whom to produce and how to distribute output;The basic competitive model

Unit 2

Supplyand demand: Individual demand and supply schedules and the derivation of market demand and supply;shifts in demand and supply curves;the concept of elasticity and its application,consumer and producer surplus.

Unit 3

Households-The consumption decision:preferences and their representation with indifference curves;budget constraints;a consumer's optimum choice;income and substitution effects.

Unit 4

Market-Firms,Perfect and Imperfect market structure, behavior of profit maximizing firms and the production process,government policies towards competition, breakeven analysis

Unit 5

Production and Cost-Technology,Isoquants,production with one and more variable inputs;returns to scale;short run and long run costs;cost curves in the short run and long run

Books Recommended:

1. Hal R.varian,IntermediateMicroeconomics:A modern approach,W.W.Norton and company/Affiliated East-west press(India), The workbook by Varian and Bergstrom may be used for problems.
2. C.snyder and W.Nicholson, Fundamentals of Microeconomics, Cengage Learning (India)
3. B.DouglasBernheim and Micheal D. Whinston, Microeconomics, Tata McGraw-Hill(India)

SEMESTER – 4

Probability, Random Processes and Numerical Methods

UNIT-I

Discrete random variables and Discrete Probability Distribution. Discrete Random Variables, Probability distribution function, Cumulative distribution function. Mean and Variance of Discrete Probability Distribution. Binomial Distribution-Mean and variance.Poisson Approximation to the Binomial Distribution.Poisson distribution-Mean and variance.Continuous Random variables and Continuous Probability Distribution.
Continuous Random Variable, Probability density function, Cumulative density function, Mean and variance.Normal Distribution, Mean and variance (without proof).Uniform Distribution.Mean and variance.Exponential Distribution, Mean and variance.

UNIT-II

Fourier transforms. Laplace Transforms.Fourier Integrals.Fourier integral theorem (without proof). Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform. Laplace Transforms, linearity, first shifting Theorem. Transform of derivative and Integral, Inverse Laplace transform, Solution of ordinary differential equation using Laplace transform. Unit step function, second shifting theorem.Convolution Theorem (without proof).Differentiation and Integration of transforms.

UNIT-III

Numerical methods-solution of Algebraic and transcendental Equations, Interpolation.Solution Of equations by Iteration, Newton- Raphson Method.Interpolation of Unequal intervals-Lagrange's Interpolation formula.Interpolation of Equal intervals-Newton's forward difference formula, Newton's backward difference formula.Numerical solution of system of Equations.Solution to linear System- Gauss Elimination, Gauss Seidal Iteration Method.Numeric Integration-Trapezoidal Rule, Simpson's 1/3 Rule. Numerical solution of first order ODE-Euler method, Runge-Kutta Method (fourth order).

Text Books:

1. Miller and Freund's "Probability and statistics for Engineers"-Pearson-Eighth Edition.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2015.

References:

1. V. Sundarapandian, "Probability, Statistics and Queuing theory", PHI Learning, 2009.
2. C. Ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics"-Sixth Edition.
3. Jay L. Devore, "Probability and Statistics for Engineering and Science"-Eight Edition.
4. Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers"-Sixth Edition-McGraw Hill.

Signals & Systems

UNIT- I

Representation / Classification of Signals and Systems: Continuous time signals –Discrete time signals – Representation of signals – Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Operation on the signals – Classification of continuous time and discrete time signals – Periodic, Aperiodic, Deterministic, Random, Even, Odd, Energy and Power Signals – Continuous time and discrete time systems – Classification of systems – Properties of systems.

UNIT- II

Continuous Time Signal Representation / Analysis: Fourier series analysis – Representation of periodic signals in trigonometric and exponential forms – Fourier transform analysis of aperiodic signals – Spectral analysis of periodic and aperiodic signals– Parseval's theorem for periodic and aperiodic signals – Laplace transform in signal analysis.

UNIT- III

Continuous Time Systems: LTI continuous time systems – Differential equation – Block diagram representation and reduction techniques – impulse response – Convolution integral – Properties of LTI continuous time systems – Frequency response of continuous time LTI systems – Analysis of LTI systems using Fourier and Laplace transform techniques – State variable representation of LTI systems.

UNIT- IV

Discrete Time Signal Representation / Analysis: Discrete time Fourier series – Discrete time Fourier transform – Spectrum of discrete time periodic and aperiodic signals – Parseval relations – Z transform – Properties and application to discrete time signal analysis – Inverse Z transform.

UNIT- V

Discrete Time Systems: LTI discrete time systems – Difference equation – Block diagram representation and reduction techniques – impulse response – Convolution Sum –Properties of discrete time LTI systems – Frequency response – Analysis of LTI systems using Fourier and Z transform techniques – State variable representation of discrete time LTI systems.

Text Book:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Second Edition, John Wiley and Sons, 2002.

R**eference Books:**

1. AllanV.Oppenheim, Allan S.Willsky and S.HamidNawab, "Signals and Systems", Second Edition, PHI Learning, New Delhi, 2007.
2. Douglas K. Lindner, "Signals and Systems", McGraw-Hill International Edition, 1999.

Analog Integrated Circuits

UNIT I:

Amplifiers: Introduction & classification, Class A, Class B, Complementary Symmetry Push Pull amplifier, Class C, distortion in amplifiers. Tuned Amplifiers: Introduction & classification, Capacitance Coupled tuned amplifier **Power**, Stagger tuned amplifier, Neutralization. Oscillators: Introduction and classification, General form of LC oscillator, e.g. Hartley oscillator, Colpitts oscillator, RC phase shift oscillator, Wein Bridge oscillator, Crystal oscillator.

UNIT II:

Differential amplifier: Dual input balanced output and unbalanced output Operational amplifier (Opamp): Introduction, Internal block schematic of Opamp, Integrated Circuits (IC), Opamp parameters, Ideal Opamp equivalent circuits, transfer curve, open loop Opamp configurations, open loop gain- input and output impedance, frequency response, frequency compensation, Slew rate & its effect, Typical datasheet 741.

UNIT III:

Feedback configurations: Voltage Series, Voltage Shunt, Current Series, Current Shunt.Opamp amplifier: Inverting, Non Inverting, Differential amplifier with one and three Opamp, Instrumental amplifier and its application Practical Opamp: Input bias current, offset compensating networks CMRR, SVRR, finite gain bandwidth & its effect in Opamp circuits performance, Open loop and Closed loop configuration.

UNIT- IV:

Opamp applications: Adder - Subtractor, Log - Antilog amplifier, Integrator - Differentiator, Comparator – Zero crossing detector, Schmitt trigger and its application, Astable and Monostablemultivibrator, Triangular and Saw

tooth wave generator, Sample and Hold circuit, Precision rectifiers, Voltage regulators (block diagram and typical low voltage regulator circuit), 78XX, 79XX, 317.

UNIT- V:

Active Filters: Transfer functions – LPF, HPF, BPF, BRF& Notch Filter. Approximation methods – Butterworth, Chebyshev Filter. Filter orders Ist and IInd. Quality factor – Design, Gyrator, Negative Impedance Converter – Filter using simulated Inductance- Universal active filters – All Pass filters, Switched Capacitive Filters. Specialized ICs: 555 Timer architecture and applications (Monostable and Astablemultivibrator) linear time base generator, PLL-architecture and applications, VCO architecture and applications.A/D and D/A Converter: DAC (Weighted-R, R-2R Networks), ADCs (Dual slope, counter type, successive approximation and flash type).

Suggested Readings

1. Ramakant A. Gayakwad, Op-amps and Linear Integrated Circuits, 4thEdition,PHI.
2. Jacob Millman, Christos C Halkias and SatyabrataJit, Millman's Electronic Devices and Circuits, 2nd Edition,Tata McGraw Hill, New Delhi.
3. S. Salivahanan, V.S.K. Bhaaskaran, Linear Integrated Circuits, Tata McGraw Hill.
4. K.Lal Kishore, Operational Amplifiers & Linear Integrated Circuits, Pearson Education.
5. R.F. Coughlin, Op-amps and Linear Integrated Circuits, 6th ed., Pearson Education.

Applied Electromagnetic Theory

Unit-I

Electric Field: Introduction - Orthogonal co-ordinate systems – Divergence theorem, Stoke's theorem. Coulomb's law - Electric field intensity, electric fields due to point charge, line charge, surface charge and volume charge distributions – Electric flux density -Gauss's law and its applications - Electric potential – Potential gradient, Poisson and Laplace equations - Dipole and dipole moment. Capacitors - Capacitance of system conductors – Electric potential energy associated with different charge distribution –
Energy density.

Unit-II

Magnetic Field: Concepts – Vector magnetic potential – Force on a current element, Biotsavart'slaw and applications – Magnetic flux density and magnetic field intensity – Force between current carrying conductors – Torque on closed conductors, Ampere's law and modified Ampere's law, Helmholtz's theorem.

Unit-III

Electromagnetic Induction: Faraday's law of electromagnetic induction– Inductance of solenoids, toroids, transmission lines and cables – Mutual inductance – Inductors in series and parallel circuits – Energy stored in magnetic fields and energy density – Force and torque on closed circuits .Boundary conditions at the surface of dielectric, conductor and magnetic.

Unit-IV

EM Waves and Wave Equations: Maxwell's equation in point and integral form–Poynting's theorem – Energy in electromagnetic field, Electromagnetic wave equation,wave equation for free space and conducting medium.

Unit-V

Electromagnetic Waves: Uniform plane wave - Characteristics impedance or intrinsic impedance – Wave propagation in a lossless medium, conducting medium, good dielectric, good conductor – phase velocity and group velocity – Depth of penetration – Polarization, linear polarization, circular polarization and elliptical polarization - Reflection and refraction of plane waves – Surface waves.

Text Books:

1. David K. Cheng, "Field and Wave Electromagnetics", Second Edition, Pearson Education, Asia, 2008.
2. Edward C.Jordan and Keith G.Balaman, "Electromagnetic waves and radiating systems", Second Edition, PHI Learning, 2007.

Reference Books:

1. K.A.Gangadhar, "Field Theory", Khanna Publishers, 2006.
2. William H. Hayt, "Engineeering Electromagnetics", McGraw Hill, Fifth Edition, 2008.

Analog Communication Engineering

UNIT-I

Noise and Amplitude Modulation: General communication systems-external and internal noise-Noise figure and noise temperature-AWGN-Need for modulation-Amplitude modulation-Frequency spectrum-Power relation-Different types of AM modulators-SSB and VSB generation-AM transmitters-Block diagram-Functions of each block-High level transmitter.

UNIT-II

Angle Modulation: Principle of frequency and phase modulation-Relation between FM and PM waves-Bandwidth of FM-Narrow band and wideband FM-Generation of FM wave- Direct and Indirect methods-FM transmitters-Block diagram-Function of each block.

UNIT-III

Detection and Receivers: Detection-Diode detectors-Synchronous detection-FM detectors-Slope detectors-Phase discriminators-Ratio detectors. Receivers- different typessuper heterodyne receivers- Block diagram-choice of IF and oscillator frequencies- Tracking-Alignment-AVC, AFC-Communication receivers- AM and FM – Receiver characteristics.

UNIT-IV

Pulse Modulation Systems and RADAR: Sampling theorem-Generation and detection of PAM, PWM and PPM-Conversion of PWM to PPM- TDM and FDM. Basic principles of RADAR system- Range equation- Pulse radar system- MIT radar- CW Radar- FM CW Radar.

UNIT-V

Television: Introduction of Television-Television systems and standards-Black and white transmission-black and white reception-color transmission and reception-Introduction to modern TV cameras, LCD and plasma displays

Text Book:

1. George Kennedy and Bernard Davis, "Electronic Communication Systems", TataMcGraw Hill, Fourth Edition, 2008.
2. Simon Haykin, "communication systems",wiley,2006

Reference Books:

1. Roddy and Coolen, "Communication Systems", PHI learning, 2001.
2. Wayne Tomasi, "Electronic Communication Systems- Fundamentals TheoryAdvanced", Fourth Edition, Pearson Education, 2001.
3. A.M. Dhake, "Television and Video Engineering", McGraw Hill Publications, 2008.

Fundamentals of Accountancy

SEMESTER – 5

Digital Signal Processing

Module -I

Discrete-Time Signals: Signal classifications, frequency domain representation, time domain representation, representation of sequences by Fourier transform, properties of Fourier transform, discrete time random signals, and energy and power theorems. **Discrete-Time Systems:** Classification, properties, time invariant system, finite impulse Response (FIR) system, infinite impulse response (IIR) system. **Sampling of Time Signals:** Sampling theorem, application, and frequency domain representation of sampling, reconstruction of band limited signal from its samples. Discrete time processing of continuous time signals, changing the sampling rate using discrete time processing.

Module -II

Z-Transform: Introduction, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform. **The Discrete Fourier Transform** –Frequency Domain Sampling, Properties of DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals using DFT. Computation of DFT - FFT Algorithms (Radix 2 only), Efficient computation of DFT of Two Real Sequences and a 2N-Point Real Sequence, Linear Filtering and Correlation using DFT. Introduction to DCT and properties.

Module -III

Design of FIR Filters- Symmetric and Antisymmetric FIR Filters, FIR Filters using Window method and Frequency Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters. Design of IIR Digital Filters from Analog Filters- IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Frequency Transformations in the Analog and Digital Domain. Filter structures: FIR Systems- Direct Form, Cascade Form and Lattice Structure. IIR Systems- Direct Form, Transposed Form, Cascade Form and Parallel Form.

Module -IV

Analysis of finite word length effects- Quantization noise, round off errors, input and output quantization error, limit cycles in IIR filters, round off errors in FFT algorithm. Multi-rate Digital Signal Processing- Decimation and Interpolation (Time domain and Frequency Domain Interpretation), Sampling Rate Conversion, Multistage Implementation of Sampling-Rate Conversion.

Text Books

1. A.V. Oppenheim & Ronald W Schafer: Discrete Time Signal Processing, 2/e, PHI.
2. Sanjith K Mitra : Digital Signal Processing, 2/e, Tata McGraw Hill.

Reference:

1. John G Proakis, Dimitris G Monolakis-Digital Signal Processing, 4/e, PHI.
2. Vinay K. Ingle and John Proakis, Digital Signal Processing A MATLAB based Approach, Books-cole publishing company,2000

Antenna & Wave Propagation

UNIT I:

Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

UNIT II:

Aperture and Reflector Antennas- Huygens' principle, radiation from rectangular and circular apertures, design considerations, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.

UNIT III:

Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas. Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.Antenna Arrays- Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays

UNIT IV:

Different modes of Radio Wave propagation: ground wave propagation, sky wave propagation, space wave propagation. Ionospheric structure and its effect on wave propagation. Virtual height, maximum usable frequency and skip distance concepts& calculation

Texts books:

1. *G.S.N. Raju , "Antenna and wave propagation" pearson publication 2006*
2. A.K. Gautam"Antenna and wave propagation"s.k. kataria&sons fifth edition
3. A.R Harish, M. Sachidananda "antennas and wave propagation" oxford university press 2007

Microprocessors & Microcontrollers

UNIT-I

Introduction to Microcomputer based system. History Evolution of Microprocessor and microcontrollers and their advantages and disadvantages.

UNIT-II

Architecture of 8085 Microprocessor.Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation. Instruction set of 8085 Microprocessor. Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT-III

Assembly language programming: Addition, Multiplication, Block Transfer, Ascending order, Descending order, Finding largest & smallest number, Look-up table etc. Interrupts of 8085 processor: classification of interrupts, Programming using interrupts, Serial and parallel data transfer – Basic concept of serial I/O, DMA, Asynchronous and synchronous serial transmission using SID and SOD pins of 8085 Microprocessor.

UNIT-IV

8051 architecture: 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts.

UNIT-V

Assembly language Programming using 8051 Moving data: External data moves, code memory read only data moves, PUSH and POP opcodes, data exchanges. Logical operations: Byte-level, bit-level, rotate and swap operations. Arithmetic operations: Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic. Jump and call instructions: Jump and call program range, jumps, calls and subroutines, interrupts and returns.

UNIT-VI

The 8086 microprocessor: Architecture, Pin details, memory segmentation, addressing modes, Familiarization of basic Instructions, Interrupts. Assembly language programming: Addition, Multiplication, Block Transfer, Ascending order, Descending order, Finding largest & smallest number etc.

UNIT-VII

Support IC chips: 8255, 8253 and 8251: Block Diagram, Pin Details, Modes of operation, control word(s) format. Interfacing of support IC chips with 8085, 8086 and 8051.Memory interfacing with 8085, 8086 & 8051.ADC / DAC interfacing with 8085, 8086 & 8051.

Text Books:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar (Penram International) (strongly recommended) 14. The 8051 microcontroller – K. Ayala (Thomson)
2. Microprocessors & interfacing – D. V. Hall (Tata McGraw-hill)
3. Ray &Bhurchandi, Advanced Microprocessors & Peripherals, TMH
4. The 8051 microcontroller and Embedded systems –Mazidi, Mazidi and McKinley (PEARSON)

Reference Books:

1. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)
2. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press).
3. 8086 Microprocessor –K Ayala (Cengage learning) Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI).

Digital Communication

Module – I

Pulse Modulation, Sampling process, Aliasing, Reconstruction, PAM, Quantization, PCM, Noise in PCM system, Prediction-Error Filtering for redundancy reduction, Delta modulation, Delta-Sigma modulation, DPCM, ADPCM, ADM, Processing Gain. Performance comparison of various pulse modulation schemes, Line codes.

Module – II

Base band Pulse Transmission Matched filter, properties, Error rate due to noise, ISI Nyquist criterion for distortion less transmission, Ideal solution, Raised cosine spectrum, Correlative level coding Duobinary coding, preceding, Modified duobinary coding, Generalized Partial response signaling, Base band M-ary PAM transmission, eye pattern, optimum linear receiver. Adaptive Equalization, LMS algorithm, Equalizers.

Module – III

Signaling Over AWGN Channel: Signal space Analysis, Geometric representation of signals, Gram Schmidt orthogonization procedure. Conversion of the continuous AWGN channel into a vector channel, Optimum receivers using Coherent Detection, probability of error. Error probability for BPSK, QPSK and FSK, M-ary Quadrature Amplitude Modulation (QAM),Detection of signals with unknown phase, Non coherent orthogonal modulation, Differential phase shift keying, Comparison of digital modulation schemes.

Module – IV

Spread spectrum communication Pseudo noise sequences, Properties of PN sequences. Generation of PN Sequences, Spread spectrum Communication, Anti jam Characteristics, Frequency Hop spread spectrum with MFSK, Slow and Fast frequency hoping. Multiple Access Techniques, multipath channels, classification, Coherence time, Coherence bandwidth, Statistical characterization of multi path channels, Binary signaling over a Rayleigh fading channel, Diversity techniques Diversity in time, frequency and space. TDMA and CDMA RAKE receive.

Text Books

1. SymonHaykin, Digital Communication Systems, Wiley India, 2013.
2. SymonHaykin, Communication Systems, 4/e Wiley India, 2012.

Reference

1. Won Y Yang et al., Matlab/Simulink for Digital Communication, 2/e SP Surya Page Turners, 2012.
2. Sklar, Ray, Digital Communication, Fundamental and Applications, 2/e Pearson, 2011
3. Bruce Carlson, "Principles of Digital Communication", Tata McGraw Hill, 2008.
4. Taub and Schilling, "Principles of Communication systems", Tata McGraw Hill, India, 2008.
5. William Stallings, "Cryptography and Network Security - Principles and Practices", PHI Learning, Third Edition, 2008.
6. Proakis. JG, "Digital Communications", McGraw Hill Publications, 2008.

Principles of Management

Unit-1:

Overview of management: Definition-Management-Role of managers-Evolution of management thought-Organisation and the environmental factors-Trends and challenges of Management in Global Scenario

Unit-2:

Planning: Nature and purpose of planning-planning process-types of plans-objectives-managing by objective(MBO) strategies-types of strategies-decision making-decision making process

Unit-3:

Organising: Nature and purpose of organising-organising structure-formal and informal groups/organisation-line and staff authority-departmentation-span of control-centralisation and decentralisation-delegation of authority.

Unit-4:

Staffing: Selection and Recruitment-career development-career stages—training-performance appraisal.

Unit-5:

Directing: Creativity and innovation-motivation and satisfaction-motivation theories-leadership styles-leadership theories-communication-barriers to effective communication.

Unit-6:

Controlling: Process of controlling-types of control-managing productivity-cost control-purchase control=maintenance control-quality control.

Textbooks/ References:

1.StephenP.Robbins and Mary Coulter,'Management', Prentice Hall of India.8th edition
2.HaroldKootnz,HeinzWeihrich and Mark V Cannice,;Management- A global

SEMESTER – 6
Power Electronics & Instrumentation

Unit-1:

Power Semiconductor Switches: Rectifier diodes, fast recovery diodes, Schottky barrier diode, Power BJT, Power MOSFET, SCR, TRIAC, IGBT and GTO. Ratings, Static and Dynamic Characteristics, Trigger, driver and switching-aid circuits and cooling. SCR turn –on and turn - off methods, Triggering circuits, SCR Commutation circuits, SCR Series and Parallel operation, Snubber Circuit.

Unit-2:

Rectifiers Single phase and three phase controlled Rectifiers with inductive loads, RL load Effect of source inductance- performance parameters.

Unit-3:

Single phase and three phase inverters – PWM techniques, Sinusoidal PWM, modified Sinusoidal PWM , multiple PWM Voltage and harmonic Control ,Series resonant inverter-Current Sources Inverter.

Unit-4:

Step down and step up Chopper, AC voltage controller, Buck, Boost and Buck-Boost converter, Cycloconverter, DC and Induction motor drives.

Instrumentation:

Unit-1:

Electromechanical indicating instruments: ac/dc current and voltage meters, ohmmeter; loading effect. Measurement of power and energy; Instrument transformers.Measurement of resistance, inductance, capacitance.Ac/dc bridges.

Unit-2:

Measurement of non-electrical quantities: transducers classification; measurement of displacement, strain, pressure, flow, temperature, force, level and humidity. Signal conditioning; Instrumentation amplifier, isolation amplifier, and other special purpose amplifiers. Electromagnetic compatibility; shielding and grounding. Signal recovery, data transmission and telemetry. Data acquisition and conversion.

Unit-3:

Modern electronic test equipment: oscilloscope, DMM, frequency counter, wave/ network/ harmonic distortion/ spectrum analyzers, logic probe and logic analyzer. Data acquisition system; PC based instrumentation. Basics of programmable logic controller.

Books/References:

1. P.C. Sen, Power Electronics
2. M.H. Rashid, Power Electronics, PHI/ Pearson Education
3. C.W. Lander, Power Electronics, McGraw Hill
4. A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Pearson Education, 2008.
5. M. M. S. Anand, Electronic Instruments and Instrumentation Technology, PHI, 2006.

Computer Organization and Architecture

UNIT-I

Computer Organization & Architecture, Basic functional Unit, Computer component structure [Eg. Structure of IAS Computer, IBM Machine configuration], Harvard & Von Neumann architecture, BUS architecture, ALU designs [combinational ALU & sequential ALU], Instruction set: Instruction format & types.

UNIT-II

Memory Organization: Memory system overview, Cache memory organizations, Techniques for reducing cache misses; Hierarchical memory technology: Inclusion, Coherence and locality properties; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT-III

CPU Organization: Fundamentals, Processor-memory communication [Clock cycles and Timing Diagram], Instruction cycle, RISC & CISC based architecture.

UNIT-IV

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards, Flynn's classification –SISD, SIMD, MISD, MIMD architectures, Pipeline optimization techniques.

UNIT-V

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures, Array and Vector processors.

UNIT-VI

Overview of HDL: VHDL basics programming concept, Structural, dataflow, behavioral & mixed style modeling techniques.

Text Books:

1. William Stallings —"Computer Organization & Architecture Designing for performance", 8/e Pearson.
2. Mano M.M—"Computer System Architecture", 3/e,Pearson

Reference Books

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky —"Computer Organization", 5/e, MGH
2. Kai Hwang &NareshJotwani-- " Advanced Computer Architecture Parallelism, Scalability,Programmability",2/e, MGH
3. Pedroni---"Circuit Design And Simulation With VHDL", 2/e, PHI

Embedded Systems

Unit – I

Introduction to Embedded Processors: Introduction to Embedded Computing, Issues and Challenges in Embedded system Design, Trends: SC, custom designed chips, configurable designed chips, configurable processors and multi-core processors. Embedded processor architecture: General concepts, instruction sets, Levels in architecture, Functional description-hardware/software trade-off Introduction to RISC
architecture, Pipelining, Instruction issue and execution, Instruction formats, Addressing modes, Data alignment and byte ordering, Introduction to VLIW and DSP processors.

Unit – II

Devices and Buses for Devices Network: I/O Devices:- Types and Examples of I/O devices, Synchronous, Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication

Devices:- SPI, UART, Parallel Port Devices - Timer and Counting Devices – Serial Communication using: 'I2C', 'USB', 'CAN'- Advanced I/O Serial high speed buses: ISA, PCI, PCI-X, cPCI and advanced buses.

Unit – III

Programming Concepts and Embedded Programming in C, C++ : Programming in assembly language (ALP) vs High Level Language - C Program Elements:- Macros and functions, Use of Date Types, Structure, Pointers, Function Calls - Concepts of Embedded Programming in C++:- Objected Oriented Programming, Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory needs.

Unit – IV

Real Time Operating Systems: Definitions of process, tasks and threads – Inter Process Communication:- Shared data problem, Use of Semaphore(s), Priority Inversion Problem and Deadlock Situations, Message Queues, Mailboxes, Pipes, Virtual (Logical) Sockets, Remote Procedure Calls (RPCs) - Operating System Services:- Goals, Structures, Kernel, Process Management, Memory Management, Device Management - Real Time Operating System - RTOS Task scheduling models:- Co-operative Round Robin Scheduling, Cyclic Scheduling with Time Slicing.

Unit – V

System Design Techniques: Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design. Design Examples:- Telephone PBX- System Architecture, Ink jet printer - Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

Textbooks:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003
2. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001.

References:

1. Steve Heath, Embedded Systems Design, Second Edition, Elsevier India Pvt. Ltd.,2007.
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
3. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware/Software Introduction, John Wiley, 2002.

Control Systems

UNIT-I

System Modelling: Introduction to control system-Basic elements in control system –Open and closed loop control systems – Differential equation representation of physical systems– Transfer function –Mathematical modeling of electrical and mechanical systems (Translational and Rotational) –Analogous system- Block diagram representation of systems- Block diagram reduction techniques – Signal flow graph-control system components-synchros-tachometer-dc and ac servomotors-stepper motors.

UNIT-II

Time Domain Analysis: Standard test signals- First order system - step, ramp and impulse response analysis-Second order system – step response analysis- steady state error –generalized error co-efficients –Effect of adding a zero to system- Principle of PI, PD and PID compensation-stability analysis – Routh Hurwitz criterion – Root locus method

UNIT-III

Frequency Domain Analysis: Frequency response –Frequency domain specifications –Correlation between time domain and frequency domain specifications-Bode plot –Stability analysis using Bode plot- transfer function from bode plot-Polar plot – Nyquist stability criterion, Relative stability gain margin and phase margin.

UNIT-IV

Root Locus Technique: Root locus concept, development of root loci for various systems, stability considerations.

Unit – V

State Space Analysis of Control Systems: State Space Representation, Solution to Homogeneous State Equation, State Transition Matrix, Time Invariant State Equations, linear time varying systems, Controllability and Observability, Decomposition of Transfer Function.

UNIT-VI

Compensation: Necessity of compensation, compensation networks, application of lag and lead compensation, basic modes of feedback control, proportional, integral and derivative controllers, illustrative examples.

Text Book:

1. J.Nagrath, M. Gopal, "Control Systems Engineering", Fifth Edition, New Age International, New Delhi, 2007.
2. . Katsuhiko Ogata, "Discrete Time Control Systems", Second Edition, PHI Learning New Delhi, 2006.

Reference Books:

1. Benjamin C.Kuo, "Automatic Control Systems", Seventh Edition, PHI Learning New Delhi, 1997.
2. Kannan M. Moudgalya, "Digital Control," Wiley-India, 2009.
3. R.Anandanatarajan, P. Ramesh Babu, "Control Systems Engineering", Second edition,
4. Control System – S. Ghosh, Pearson Education
5. Control System Engineering- Bhattacharjya- Pearson Education;

SEMESTER – 7

Microwave Engineering

UNIT – I

Microwave Active Devices: Gunn diode and its mode – PIN modulator - IMPATT and TRAPATT diodes - Bipolar transistor – FET – Transferred electron oscillators – Avalanche diode oscillators – Parametric amplifiers - Two cavity klystron amplifier – Power and efficiency considerations – Reflex Klystron oscillators – Modes and efficiency considerations – Magnetrons – TWT.

UNIT – II

S Parameters: Scattering parameters, properties of S matrix, Conversion of ABCD and matrix, S matrix representation of Waveguide corners, bends, twists, Directional couplers, Circulators, Isolators, Attenuators, Wave guide Tee, Hybrid Tee, Hybrid rings (rat-race) and Terminator.

UNIT – III

An introduction to RADAR: radar block diagram, determination of co-ordinates in radar, target resolution, application of radar, radar frequencies and different types of radar, simple form of radar equation, minimum detectable signal, system loss, propagation effect on EM waves in atmospheric conditions, Doppler effect, continuous and frequency modulated radar.

UNIT4

MTI, pulse Doppler radar and tracking radar: MTI block diagram, AMTI, non-coherent MTI, block diagram of tracking radar, radar servo tracking system, sequential lobbing, conical scanning, mono pulse tracking

UNIT5

Radar display units and radar antennas: A-scope, B-scope, C-scope, PPI scope, parameters of radar antennas, different types of radar antenna (parabola, phase array, cassergain antenna, lens, horn, slot)

Texts books:

1. G.S.N. Raju , "Antenna and wave propagation" pearson publication 2006
2. Merrill L. Skolnik, "Introduction to Radar Systems" 3rd edition, McGraw Hill 2001
3. John K Kraus,Ronald J. Marhefka, Ahmed S. Khan, "Antenna and wave propagation "4th Edition McGraw Hill publication,2006

Optical Communication

UNIT- I

Introduction to communication systems: Principles, components; Different forms of communications in brief, advantages of optical fibre communication, spectral characteristics.

UNIT- II

Optical Fibre wave guide: Structure, Single and Multimode operation; Attenuation, Material and wave guide dispersion.

UNIT- III

Optical Sources: Light Emitting Diode; principle, structures, power and efficiency, coupling to fibres. Laser diodes; principle, double heterostructure, gain and index guiding, distributed lasers.Quantum Well Lasers; Modes and narrow line width lasers. Modulation; Bandwidth for modulation, Optical transmitters: components.

UNIT- IV

Optical Detectors: Device types, optical detection principles, efficiency, responsively, bandwidth. Preamplifiers; noise sources, signal to noise ratio.

UNIT- V

Point-to-point link and Wavelength Division Multiplexing: Building blocks; Multiplexing; Intensity Modulation/Direct Detection system; Principle of Regeneration; WDM link, Optical amplifiers; EDFA, SOA, Raman amplifier, Fabry-Perot filters. Dispersion compensation and management, Link analysis and Bit-Error-Rate calculation.

UNIT- VI

Optical Network:LAN, MAN, WAN; Topologies: bus, star, ring; Ethernet; FDDI; Telecom networking:SDH/SONET. Different forms of access networks: [4] Telephony; ISDN; Cable TV; Broadcast and Switched Networks; HFC networks; FTTC and FTTHnetworks; All optical networks.

TEXT BOOK:

1. Optical Networks – A practical perspective : Rajiv Ramaswami, K. N. Sivarajan, Galen H. Sasaki (Morgan-Kaufman)

REFERENCE BOOKS:

1. Optical FibreCommunication : John M. Senior (Pearson) .
2. Optical FibreCommunication :Gerd Kaiser (TMH) .
3. Optical Communication Systems : John Gawar (PHI)

Advanced Digital Signal Processing

Course Contents

Review of random process, problem formulation and objective of signal detection and signal parameter estimation; Hypothesis testing: Neyman-Pearson, minimax, and Bayesian detection criteria; Randomized decision; Compound hypothesis testing; Locally and universally most powerful tests, generalized likelihood-ratio test; Chernoff bound, asymptotic relative efficiency; Sequential detection; Nonparametric detection, sign test, rank test. Parameter estimation: sufficient statistics, minimum statistics, complete statistics; Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, Bhattacharya bound; Linear models; Best linear unbiased estimation; Maximum likelihood estimation, invariance principle; Estimation efficiency; Least squares, weighted least squares; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

Texts / References:

1. H. V. Poor, An Introduction to Signal Detection and Estimation, 2nd edition, Springer, 1994.
2. S. M. Kay, Fundamentals of Statistical Signal Processing: Detection Theory, Prentice Hall PTR, 1998.
3. S. M. Kay, Fundamentals of Statistical Signal Processing: Estimation Theory, Prentice Hall PTR, 1993.
4. H. L. Van Trees, Detection, Estimation and Modulation Theory, Part I, John Wiley, 1968.
5. D. L. Melsa and J. L. Cohn, Detection and Estimation Theory, McGraw Hill, 1978.
6. L. L. Scharf, Statistical Signal Processing: Detection, Estimation, and Time Series Analysis, Addison-Wesley, 1990.
7. V. K. Rohatgi and A. K. M. E. Saleh, An Introduction to Probability and Statistics, 2nd edition, Wiley, 2000.

Object Oriented Programming

Unit – I

Object oriented design: Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Unit – II

Object oriented concepts: Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism.

Unit – III

Basic concepts of object oriented programming using Java
Implementation of Object oriented concepts using Java. Class & Object properties: Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) &StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader& Scanner classes.

Unit – IV

Reusability properties– Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.
Exception handling & Multithreading [6L] – Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Unit – V

Applet Programming (using swing)– Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.

Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – McGraw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

SEMESTER – 8

Advanced Communication Systems

UnitI

Basics: Introduction to spread spectrum modulation, Direct sequence (DS) spread spectrum, Spread spectrum with code division multiple access (CDMA), Ranging, Frequency hopping (FH) spread spectrum, PN sequence generation, Acquisition and tracking of FH signal and DS signals.

UnitII

Satellite communication: Introduction to satellite communication, Frequency allocation active/passive synchronous ,Non synchronous systems, Orbits satellite attitude, Transmission path, Path loss, noise consideration link analysis, Satellite systems effective isotropic radiated power, Multiple access methods, Earth stations, Tracking and servo system, Updown converters, Example of satellite systems.

Unit III

Digital switching systems: Introduction to electronics and digital exchanges, Hierarchy of switching offices, Common control push button dialing systems, Switching matrix multiple stage switching time division multiplexing time slot interchanging (TSI), Comparison of TSI with space switching, Space array for digital signals, Combined space and time switching. Principles of FAX.

Unit IV

Mobile communication: Introduction to cellular mobile communication element of the cellular systems, Cell design, hand off techniques, Frequency Management.

Unit V

Local access networks: Improvement in convention cables: XDSL, ADSL, Wireless local loop, Fiber in local loop, radio Trunking. ISDN: Architecture, Services and Protocols, ATM networks

TEXT BOOKS:

1. Radio Callins, Microwave communication.
2. Gagldardi, Satellite communication.
3. ThyggajanVishwanathan, Digital switching systems.
4. Lee, Cellular and mobile communication
5. Karmile Fresher, Wireless digital communication.

Elective Courses

Electrical Machine

Unit-1

D.C. Machines:

Constructional features and principles of operation of shunt, series and compound generators and motors including EMF equation and armature reaction, performance characteristics of generators and motors, starting speed control and braking of motors. Two quadrant and four quadrant operation of motors, choice of de motors for different application.Losses and efficiency.

Unit – II

Transformers :

construction , principle of operation, EMF equation, phasor diagram, leakage reactance, equivalent circuits, voltage regulation, losses and efficiency, open circuit and short circuit tests, all day efficiency, autotransformers , Instrument transformers, three phase transformers.

Unit-III

Induction motors :

Construction, types of induction motor, principle of operation, equivalent circuit, torque equation, slip – torque curves, losses and efficiency, condition for maximum torque, no load and blocked rotor tests, methods of starting and speed control.

Unit – IV

Synchronous Machines:

Construction, classification, working principle, armature winding and winding factors, e.m.f. equation, armature reaction, synchronous reactance and impedance, phasor diagram, open-circuit and short –circuit tests, voltage regulation by synchronous impendence method. Synchronous motor-Principle of operation, V-curve, Vector diagram, starting methods

Unit – V

Special Machines:

Stepper motor, Shaded pole motor, Universal motor, Repulsion type motor, Hysteresis motor.

Textbooks/ References:

1. P.S. BHIMRA, Electrical Machinery
2. Hughes Edward, Electrical Technology, Addison Weslelonginan ltd.
3. Nagrath I.J.& Kothari D.P.Electrical Machines. TMH
4. Cotton H., Advanced Electrical Teclitiolog , Wheeler & Co.
5. Fitzerald, Kingsicy, Kusko – Dunias – Electrical Machines. TMLA.
6. Kosow L.L, Electrical Machines and Transformers. PHI

VLSI

Unit-I

Introduction: Introduction to VLSI and VLSI fabrication- Introduction to power reduction techniques-Dynamic Power Reduction-Static Power Reduction- CMOS inverter– propagation delays – power dissipation - Stick Diagram. MOS layers - design rules and layout- choice of layers.

Unit-II

VLSI Logic Circuits, Design Process and Layout: Pass transistor and transmission gatesinverter-
NAND gates and NOR Gates for n MOS, CMOS and Bi CMOS – parity generator– multiplexers- code converters – PLA – Clocked sequential circuits- Memories and Registers.

Unit-III

Arithmetic Circuits: One bit adder- multibit adder –Ripple carry-Carry Skip Adder-Carry Look Ahead Adder-design of signed parallel adder-comparison of different schemes in terms of delay - multipliers – Design of serial, parallel and pipelined multipliers- different schemes and their comparison. 2's complement array multiplication-Booth encoding- Wallace Tree multiplier.

Unit-IV

Programmable ASIC's and FPGAs: Actel, Altera and Xilinx FPGA devices.

Unit-V

Introduction to Verilog: Basics of Verilog, operators, Data Types, Continuous assignments, Sequential and parallel statement groups. Timing control (level and edge sensitive) and delays, tasks and functions, control statements, Blocking &nonblocking assignments, If-else and case statements, For-while-repeat and forever loops, Rise, fall, min, max delays, Behavioral and synthesizable coding styles for modeling combinational logic, Behavioral& synthesizable coding styles for modeling sequential logic, Parameters
and Defines for design reuse.Verilog and logic synthesis.

Text books:

1. Neil H.E. Weste and K.Eshraghian, "Principles of CMOS VLSI design," Addison Wesley Publishing Company,1985.
2. Neil He Weste,David Harris and Ayan Banerjee, "Principles of CMOS VLSI design-A circuits and Systems Perspective," Dorling Kindersley (india) Pvt Ltd, 2006.
3. Sebastian Smith, "Application Specific Integrated Circuits", Pearson Education,2001
4. J. Bhasker "A Verilog HDL Primer," Star Galaxy Press,1997.
5. Wayne wolf, "Modern VLSI Design: System on Chip Design," Prentice Hall of India, 2005.

Reference books:

1. E.D.Fabricious, "Introduction to VLSI design", McGraw Hill, 1990.
2. Thomas, D .E .,Philip.R. Moorby "The Verilog Hardware Description Language", 2nd ed.,Kluwer Academic Publishers,2002.

Digital Image Processing

UNIT I

DIGITAL IMAGE FUNDAMENTALS:

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements ofvisual p erception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals, RGB,HSI models, Ima ge sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2Dtransforms -
DFT, DCT, KLT, SVD.

UNIT II

IMAGE ENHANCEMENT :

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, DirectionalSmoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering,Color image enhan cement.

UNIT III

IMAGE RESTORATION :

Image Restoration degradation model, Unconstrained restoration Lagrange multiplier and Constrainedrestoration, I nverse filtering removal of blur caused by uniform linear motion, Wiener filtering, Geometrictransformations-spatial transformations.

UNIT IV

IMAGE SEGMENTATION

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

UNIT-V

IMAGE COMPRESSION:

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmeticcoding, VectorQuantizati on, Transform coding, JPEG standard, MPEG.

TEXTBOOK

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

REFERENCES

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.

2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB',Pearson Educ ation, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice HallProfessional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002

5. Milan Sonka et aI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, VikasPublis hing House, 2nd edition, 1999,

Information Theory & Coding

UNIT- I

Introduction to Information Theory: Measure of information- Entropy of symbols -Continuous and discrete cases,Conditional entropies- Basic relationship among different entropies- Mutual information and Trans information, Redundancy and Efficiency

UNIT- II

Channel Classification and Capacity: Continuous and discrete communication channels-Discrete memory lesschannels-Channel representations- noiseless channel, lossless channel, deterministic, Binary Symmetric channel, Binary Erasure channel and their capacities - Continuous and discrete channels with noise- Shannon Hartley theorem and its implications.

UNIT- III

Detection of Signals and Channels with Noise: Hypothesis testing-Baye's criterion-Minimum error probabilitycriterion, Neymanpearson criterion, Min-max criterion-Maximum likelihood detector- Wiener filter.

UNIT- IV

Source Coding: Purpose of encoding- Uniquely decipherable codes-Code efficiency and redundancy, Shannon'sfirst and second fundamental theorem, Shannon's encoding algorithm, Shannon Fano code, Huffman code

UNIT- V

Error Correcting Codes: Linear block codes, cyclic codes- Hamming, Block codes, BCH and RS codes,Convolutional codes- Viterbi algorithm, Concatenated codes, Trellis code modulation, Turbo codes- coding, decoding and performance, LDPC codes- construction and decoding

TEXT BOOK:

1. Das, S.K.Mullick and P.K.Chatterjee, "Principles of Digital Communication", Wiley Eastern Limited, 1986.

REFERENCE BOOKS:

1. K.SamShanmugam, "Digital and Analog Communication Systems", John Wiley and Sons, 1985.
2. Simon Haykin, "Communication Systems", John Wiley and Sons, Fourth Edition.
A.J.Viterbi and J.K.Omura, "Principles of Digital Communication and Coding", McGraw Hill.

Speech and Audio Processing

Module – I

Nature of Speech Signal: Speech production mechanism, Classification of speech sounds, Nature of speech signal. Speech Signal Processing: Review of DSP, Digital models for speech signals, significance of short time analysis.

Module – II

Time Domain Methods: Time-domain parameters of speech, methods for extracting the parameters, zero crossings, autocorrelation function, pitch estimation. Digital representation of Speech Waveform: Sampling speech signals, Review of statistical model for speech, Instantaneous quantization, Adaptive quantization, DPCM with adaptive quantization and with adaptive prediction, PCM to ADPCM conversion.

Module – III

Frequency Domain Methods: Short time Fourier analysis, Filter back analysis, Spectro graphic analysis, Formant extraction, Pitch extraction, Analysis – synthesis system.

Module – IV

Linear Predictive coding of Speech: Formulation of Linear Prediction problem in time domain, solution of normal equations, interpretation of linear prediction in auto correlation and spectral domains. Homomorphic Speech Analysis :Cepstral analysis of speech, formant and pitch estimation. Speech recognition, Speech synthesis and speaker verification.

References:-

1. Rabiner L. R. and R. W. Schafer, Digital Processing of Speech Signals, Prentice Hall, 1978.
2. Flanagan J. L., Speech Analysis Synthesis and Perception, (2/e), Berlin,1983.
3. Witten I. H., Principles of Computer Speech, Academic Press, 1982.

Nano electronics

UNIT I - BASICS AND SCALE OF NANOTECHNOLOGY (9 hours)

Introduction – Scientific revolutions –Time and length scale in structures – Definition of a Nano system – Dimensionality and size dependent phenomena – Surface to volume ratio -Fraction of surface atoms – Surface energy and surface stress- surface defects-Properties at Nano scale (optical, mechanical, electronic, and magnetic).

UNIT II - DIFFERENT CLASSES OF NANOMATERIALS (9 hours)

Classification based on dimensionality-Quantum Dots, Wells and Wires- Carbon- based Nano materials (Bucky balls, nanotubes, graphene)– Metal based Nano materials (Nano gold, Nano silver and metal oxides) -Nano composites- Nano polymers – Nano glasses –Nano ceramics -Biological nanomaterials.

UNIT III - SYNTHESIS OF NANOMATERIALS (9 hours)

Chemical Methods: Metal Nano crystals by Reduction - Solvothermal Synthesis- Photochemical Synthesis - Sonochemical Routes- Chemical Vapor Deposition (CVD) – Metal Oxide - Chemical Vapor Deposition (MOCVD).Physical Methods: Ball Milling – Electrodeposition - Spray Pyrolysis - Flame Pyrolysis - DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

UNIT IV – FABRICATION AND CHARACTERIZATION OF NANOSTRUCTURES (9 hours)

Nanofabrication: Photolithography and its limitation-Electron-beam lithography (EBL)- Nano imprint – Soft lithography patterning. Characterization: Field Emission Scanning Electron Microscopy (FESEM) – Environmental Scanning Electron Microscopy (ESEM) High Resolution Transmission Electron Microscope (HRTEM) –Scanning Tunnelling Microscope (STM)-Surface enhanced Raman spectroscopy (SERS)- X-ray Photoelectron Spectroscopy (XPS) - Auger electron spectroscopy (AES) – Rutherford backscattering spectroscopy (RBS).

UNIT V – APPLICATIONS (9 hours)

Solar energy conversion and catalysis - Molecular electronics and printed electronics -Nano electronics -Polymers with a special architecture - Liquid crystalline systems - Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices -Nanomaterials for data storage - Photonics, Plasmonics- Chemical and biosensors -Nanomedicine and Nano biotechnology – Nano toxicology challenges.

TEXT BOOKS

1. Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002.

REFERENCES

1. Nabok A., "Organic and Inorganic Nanostructures", Artech House, 2005.
2. Dupas C., Houdy P., Lahmani M., "Nanoscience: Nanotechnologies and Nanophysics", Springer-Verlag Berlin Heidelberg, 2007.

Integrated Optics & Photonic Systems

UNIT- I

OPTICAL AMPLIFIERS: Concepts – principles of optical amplification – optical amplifiers: general considerations – semiconductor optical amplifier – applications – advantages and drawbacks, EDFAs – optical fiber amplifiers – coherent sources for IO – MQW – photonic switching principles.

UNIT-II

OPTICAL WAVEGUIDES AND INTEGRATED CIRCUITS: Applications of coupled mode theory – theory of gratings in waveguide structures – guided wave control – electro optic, acousto-optic, magneto optic, thermo optic and nonlinear optical effects – fabrication of optical waveguides in glass, Lithium Niobate substrates. Micro

fabrication techniques in optical integrated circuits – guided wave excitation and waveguide evaluation – passive waveguide devices – functional optical waveguide devices, directional couplers, optical switch phase and amplitude modulators, filters etc, Y junction, power splitters, arrayed waveguide devices, fabrication and integrated optical waveguides and devices, waveguide characterization.

UNIT III

PHOTONIC MATERIALS GROWTH & FABRICATION: Types of photonic materials – growth methods – nucleation – homogeneous – heterogeneous – LEC technique – epitaxy - growth of photonic materials by LPE, VPE, MBE, MOCVD, Plasma CVD, photochemical deposition. Interfaces and junctions - interface quality, interdiffusion and doping. Quantum wells and bandgap engineering (examples of structures).Post-growth processing (patterning by photolithography, contacting, annealing).

UNIT-IV

Photonic crystals and its application: Introduction to Photonic Crystals, Photonic Crystal LatticeBasic concept,Types of crystal, structure of crystal, , Unit Cell, Lattice Vectors, Reciprocal Lattice, Reciprocal Lattice Vectors and Brillouin Zone, Band Structure Computation, Photonic Crystal Optical Fibers, Photonic Crystal Waveguides,application.

REFERENCE BOOKS:

1. H. Nishihara, M. Haruna and T. Suhara, "Optical integrated circuits", McGraw Hill Book Co., Tokyo (1989).
2. Robert G. Hunsperger, "Integrated optics: Theory and technology", Springer (2010).
3. Theodor Tamir (Ed.), "Guided-wave optoelectronics", Springer-Verlag (2012).
4. D.K. Mynbaev and L.L. Scheiner, "Fiber-optic communications technology", Pearson Education, New Delhi (2001).
5. G. Keiser, "Optical fiber communications", McGraw Hill.,New Delhi., (1983).
6. P.Bhattacharya, "Semiconductor optoelectronic devices"., Prentice-Hall India., New Delhi, (1998).
7. A.Ghatak and K.Thyagarajan, " Optical electronics", Cambridge Univ. Press, New Delhi, \ (2002).
8. B.E.A. Saleh and M.C. Teich., "Fundamentals of photonics", John Wiley., New York (1991).

CRYPTOGRAPHY AND NETWORK SECURITY

UNIT I

INTRODUCTION & NUMBER THEORY:

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields-Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY:

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III

HASH FUNCTIONS AND DIGITAL SIGNATURES:

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC – Digital signature and authentication protocols – DSS – EI Gamal – Schnorr.

UNIT IV

SECURITY PRACTICE & SYSTEM SECURITY :

Authentication applications – Kerberos – X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce

Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT V

E-MAIL, IP & WEB SECURITY :

E-mail Security: Security Services for E-mail-attacks possible through E-mail – establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. **IPSecurity:**Overview of IPSec – IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security*"*, Prentice Hall of India, 2002.

REFERENCES:

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
3. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.
6. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Douglas R Simson "Cryptography – Theory and practice", First Edition, CRC Press, 1995.

Computer Communication

Unit- I

Network Models: Data communications- Networks- LAN, MAN and WAN- Internet, Intranet and Extranets- Protocols and standards- The OSI/ISO reference model- Layers in the OSI model-TCP/IP protocol suite- IP addressing- Broadband ISDN- ATM protocol reference model-ATM layers- SONET/SDH architecture- FDDI-DQDB- Structure of circuit and packet switches.

Unit- II

Data Link Control: Types of errors- Error detection and correction- Checksum- Framing- Flow control-Error control- Stop and wait protocol- Go-back N- Selective repeat protocols- HDLC-Random access protocols-Controlled access- Wired LANs- Ethernet- Fast Ethernet- Gigabit Ethernet- IEEE standards, IEEE 802.3, 802.4, 802.5 and 802.6- Wireless LANs- IEEE 802.11 and Bluetooth.

Unit- III

Network Routing Algorithms: Logical addressing- IPv4 addresses- IPv6- Internet protocol- Transition from IPv4 to IPv6- Mapping logical to physical address- Mapping physical to logical address- ICMP-Direct Vs indirect delivery-Forwarding- Unicast and Multicast routing protocols- Routers and gateways.

Unit- IV

Congestion and Traffic Management: Queuing analysis- Queuing models- Single server and multi server queues-Congestion control in data networks and internets- Effects of congestion- Congestion and control- Traffic management- Congestion control in packet networks- TCP flow control- TCP congestion control- Requirements for ATM traffic and congestion control- Performance of TCP over ATM.

Unit- V

Network Security: Security issue- threats and responses- Preservation measures-Firewalls, Protection form spam, Home networks security, Intrusion detection systems, intrusion prevention systems- Legal implications- Next generation virus defence- wireless network security- Radiation- Wireless security features- WEP,WPA,TKIP-Defensive strategies-Network auditing and intrusion detection- Network administration.

Text Books:

1. Behrouz. A. Forouzan, “Data Communication and Networking”, Fourth Edition, Tata McGraw-hill, New Delhi, 2006.
2. Houston. H. Carr and Charles. A. Snyder, “Data Communications and Network security”, Tata McGraw-hill, New Delhi, 2007.

Reference Books:

1. William Stallings, “High Speed Networks and Internets”, Second Edition, Pearson Education Asia, New Delhi, 2002.
2. Andrew .S. Tanenbaum, “Computer Networks”, Fourth Edition PHI Learning Private Ltd, New Delhi, 2008.
3. Rainer Handel et al, “ATM Networks”, Addison Wesley, New Delhi, 2008.

Peterson. L and Davie. B, “Computer Networks”, Morgan Kauffmann, 2008