SYLLABUS

For

M.Sc. [5 Year Integrated Course]
ELECTRONICS & TELECOMMUNICATION

(w.e.f. 2023-24 session onwards)

B.Sc. ETC [Semester I-VI]

KHALLIKOTE UNITARY UNIVERSITY

BERHAMPUR-(ODISHA)

COURSE STRUCTURE OF U.G. ELECTRONICS

SEMESTER-I

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
101	Basic Electrical Engineering	60	15	25	6
102	Computer Fundamentals	60	15	25	6
103	Physics	60	15	25	6
104	Mathematics-I	80	20		4
105	Communicative English	80	20		4

SEMESTER-II

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
201	Basic Electronics	60	15	25	6
202	Digital Electronics	60	15	25	6
203	Mathematics-II	60	15	25	6
204	Electronic Material Science	80	20		4
205	Design and Fabrication of Printed Circuit Boards	80	20		4

SEMESTER-III

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
301	Electrical Circuit Theory	60	15	25	6
302	Programming in C	60	15	25	6
303	Electronic Device & Circuit-I	60	15	25	6
304	Signals and Systems	80	20		4
305	Principles of Management and Organizational Behavior	80	20		4

SEMESTER-IV

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
401	Analog Communication	60	15	25	6
402	Microprocessor and Peripherals	60	15	25	6
403	Programming in Python	60	15	25	6
404	Electronic Device & Circuit-II	80	20		4
405	Transmission Lines, Antenna and Wave Propagation	80	20		4

SEMESTER-V

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
501	Digital Communication	60	15	25	6
502	Robotics	60	15	25	6
503	Power Electronics	60	15	25*	6
504	Computer Architecture and Operating System	80	20		4
505	Multimedia Techniques	80	20		4

*** 25 marks will be evaluated against Industrial visit/Internship**

SEMESTER-VI

PAPER CODE	TITLE OF THE PAPER	MARKS			CREDIT
		END TERM	MID TERM	PRACTICAL	
601	Measurements System and Transducers	60	15	25	6
602	Communication System	60	15	25	6
603	Consumer Electronics	60	15	25	6
604	Modern Communication System	80	20		4
605	Project (Minor)	80	20		4

EXAMINATION QUESTION PATTERN

1. The duration of end semester examination is 3 hours.
2. The duration of Practical examination is 3 hours.
3. For subjects other than language subjects and **without having practical**, full marks are 100 per paper out of which 20 marks are allotted for Mid-Semester Examination (Internal) and **80 marks** are for End-Semester examination.
   a. The question papers shall be divided into four parts.
   b. Part I will carry 12 **one-mark** questions in the form of fill in the blanks and one word answer. (**12 marks(1X12)**).
   c. Part II will carry 10 **two-mark** questions of which 8 have to be answered. The answer should be within two to three sentences maximum. (**16 marks (2X8)**).
   d. Part III will carry 10 **three-mark** questions of which 8 have to be answered. The answer should be within 75 words maximum. **(24 marks (3X8))**.
   e. Part IV will carry 4 **seven-mark** questions of EITHER-OR format. The EITHER-OR in question can be from same or different units of the paper. The answer should be within 500 words maximum. **(28marks (7X4))**.
4. For subjects other than language subjects and **with practical**, full marks are 100 per paper out of which 15 marks is allotted for Mid- Semester Examination, **60 marks** is for End-Semester Examination and 25 marks is for practical.
   a. The question papers shall be divided into four parts.
   b. Part I will carry 8 **one-mark** questions in the form of fill in the blanks and one word answer. **(08 marks(1X8))**.
   c. Part II will carry 10 **one point five-mark (1.5)** questions of which 8 must be answered. The answer should be within two to three sentences maximum. **(12 marks (1.5X8)).**
   d. Part III will carry 10 **two-mark** questions of which 8 have to be answered. The answer should be within 75 words maximum. **(16 marks (2X8)).**
   e. Part IV will 4 numbers of **six-mark** questions of EITHER-OR format. The EITHER-OR in question can be from same or different units of the paper. The answer should be within 500 words maximum. **(24 marks (6X4)).**
   f. Practical will carry 25 marks out of which 05 will be for records, 05 for viva-voce and 15 for the experiment.

SEMESTER-I

BASIC ELECTRICAL ENGINEERING (101)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE -I

D.C. circuits: - Ideas of electric circuits, power and energy in circuits, series and parallel circuits, Kirchhoff's law and their applications, branch, and loop current method of solving networks, use of crammer's rule.

Capacitance: - Capacitor, types of capacitors, Capacitors in series & parallel, charging & discharging of capacitor.

MODULE -II

A.C. circuit fundamentals: -Alternating quantities, sinusoidal rectangular and triangular wave forms, effective average value and form factor, power and power factor addition and subtraction of AC quantities of same frequencies, phasor and complex representation of sinusoidal quantities, simple parallel and series circuits, series and parallel resonance.

MODULE -III

Analysis of Three Phase circuits: - Introduction & advantages**,** relationship between line & phase voltage & currents in a star & Delta connection, measurement of power & power factor of a balanced three phase load.

MODULE -IV

Transformer: - Introduction**,** Working Principle, construction, Ideal Transformer, E.M.F equation of a Transformer, Voltage transformation Ratio, losses in a Transformer & Efficiency of a Transformer.

D.C Motors & Generators: - Construction, working Principle, basic theory & uses.

Measuring Instruments: Construction, Principles of Operation & basic theory of measurement of following Instruments: DC bridges (Wheatstone), PMMC, Moving Iron, Voltmeter, Ammeter,

Ohmmeter, Galvanometer, DC Potentiometer, electrical resonates frequency meter.

Text Books:

1. Basic Electrical engineering by C.L. Wadhwa. (New age Publisher)
2. Basic Electrical engineering by B.L. Thareja
3. Basic Electrical by prof. B.B. Swain

ELECTRICAL LAB

Full Marks: 25

1. To study about various active and passive components used in electronics circuits.
2. To study about resistance value of different types of resistors by using color code.
3. To study about Breadboard Connection.
4. To study about Series and Parallel connection of Resistor.
5. To study about Analog Multimeter functions.
6. To study about Digital Multimeter Functions.
7. To study about Transformer.
8. To study about Diode forward biased and reverse biased.
9. To study about DC motor.

COMPUTER FUNDAMENTALS (102)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Introduction to Computer: - Characteristics of computer, Evolution & Generations of computer, basic computer organization.

Classification of Computers: Notebook Computers, PCs, Work Stations, Main Frame Systems, Super computers, Clients & Servers.

Processors and memory: CPU, CU, ALU, Registers, Types of Processors

Main Memory: (RAM, ROM, PROM, EPROM, EEPROM, and Cache).

Secondary Storage Devices: Magnetic tape, Magnetic disk, Optical disk, Mass Storage Devices, Storage Hierarchy.

Input/output Devices: Keyboard, Mouse, Scanner, Track ball, Joystick, Light Pen, Monitors, Printers, Plotters, Screen Image Projector.

Special Devices: MotherBoard, Expansion Card, SMPS, UPS, BUS.

MODULE -II

Computer Software: Introduction, Relation between hardware & software, types of software, Local System Architecture Acquiring software, Steps for software development, Purpose of Algorithm, Flow chart and Pseudo code.

MODULE -III

Computer Language:

Machine Language, Assembly Language, High level language, Interpreter & Compiler, OOP Language, characteristics of good programming language, subprograms.

MODULE -IV

Fundamentals of Computer network: Topologies, Protocol, LAN, MAN & WAN.

The Internet: Definition, History, basic Services, WWW, Browsers, Uses.

Multimedia: Multimedia Computer System, Components, Applications.

Books:

1. Computer Fundamentals by : P. K. Sinha.
2. Fundamentals of Computer by : Leon & Leon.
3. Computer Beginners by B. Ram

COMPUTER FUNDAMENTAL LAB

Full Marks: 25

1. Introduction to Windows operating System
2. Ms-Word
3. Ms-Excel
4. Ms-Power point
5. Ms-Access
6. Internet Uses.

PHYSICS (103)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Oscillations and Waves:

Oscillatory systems: simple harmonic oscillations, damped harmonic oscillations, forced vibration resonance, waves as periodic variation quantity in space and time, wave equation, longitudinal and transverse waves, progressive and stationary waves.

Superposition of waves: Two beam super position multiple beam superposition, coherent and incoherent super position.

MODULE -II

Interference:

Two source interference patterns (Young's double slit), Intensity distribution, Transverse section straight fringe, longitudinal sections circular fringe.

Newton's Rings, determination of wave length of light refractive index of liquid.

Michelson interferometer: Construction, working and use.

Diffraction: Huygens' Principle, Fresnel and Fraunhofer diffraction, Zoneplate, Fraunhofer diffraction due to single slit.

Plane transmission grating: Diffraction spectra, determination of wave length of light.

MODULE -III

Polarization:

Polarization of transverse waves, plane circular and elliptically polarized light, polarization by reflection, refraction and scattering.

Double refraction: Nicol Prism, quarter wave plate, half wave plate construction and use.

Production and analysis of circular and elliptically polarized light.

MODULE – IV

Quantum Physics:

The need for quantum physics: Historical overview, Black body radiation, Photoelectric effect, Compton scattering, Pair production.

Matter waves: De- Broglie Hypothesis, Experimental evidence, Bohr model of hydrogen atom, spectral lines.

Features of quantum mechanics: Transition from deterministic to probabilistic, Interpretation, Heisenberg's uncertainty principle, Schrödinger's time dependent and time independent wave equation, Probability density, Superposition principle, Observables and operators, Expectations values, Stationary states,

Books:

Optics- A.K. Ghatak

Geometrical & Physics Optics- P.K. Chakraborty

Concepts of Modern Physics- A.Beiser

E.Merzbacher, Quantum Mechanics, 3rd Edition, John Wiley Ny

A.Bohm, Quantum Mechanics: Foundations & Applications 2nd Edition, Springer Verlag.

PHYSICS LAB/TUTORIAL

Full Marks: 25

1. Determination of Young's Modulus by Searie's Method.
2. Determination of Rigidity Modulus by Static Method.
3. Determination of Surface Tension by Capillary Rise Method.
4. Determination of Acceleration due to Gravity by Bar/ Kater's Pendulum.
5. Determination of Thermal Conductivity by Lees Method.
6. Determination of Wavelength of light by Newton's Rim Apparatus.
7. Determination of Grating Element of a Diffraction Grating.
8. Verification of laws of vibration of string using Sonometer.
9. Determination of wave length of Laser source by diffraction rating method.
10. Study of Hall Effect.
11. Study of Photoemission.

MATHEMATICS-I (104)

Full Marks: 100 (Mid Term-20, End Term-80)
Use of Scientific Calculator may be Permitted

MODULE -I

Vectors Analysis: Vector Concepts, Products of Vectors, Vector functions, Vector Differentiation, Gradient, Divergent and Curl of Vector functions.

Vector Integration: Surface Revolution, Vector Integral Theorem: Green, Gauss and Stokes's Theorem

MODULE-II

Linear Algebra: Notation and Terminology, The solution of Simultaneous Linear equations by Gauss-elimination, Arithmetic of Matrices, Inverse of Matrices, Determinants, Solution of linear equation by Cramer's and matrix inverse methods, Vector Spaces, Linear Dependence, Rank of Matrix, Eigen values and Eigen vectors, Calay-Hamiltonian Theorem.

MODULE -III

Ordinary Differential Equations: Degree and Order**,** Differential equations of first order and first degree and its methods of solutions, Linear differential equations, Homogeneous and Non-Homogeneous Linear differential equations with constant coefficients, Second order linear differential equations with Variable coefficients (Cauchy's Equation), Method of Variation of Parameters.

MODULE -IV

Probability: Axiomatic definition of Probability, laws of Probability, Independent Events, Conditional probability, Generalized Baye's Theorem, Random variables, Discrete and Continuous random variable, Probability Distribution functions, Probability Mass function, Probability Density function, Mathematical Expectation and Moments.

Books:

1. Mathematical Methods by **M.C. Potter and J.Goldberg** (Prentice Hall) - Chapters: 1, 2, 3 (relevant portions)
2. Differential and Integral calculus by **Gorokh Prasad**
3. Engg. Mathematics by **B. S.Grewal**
4. Higher Engg. Mathematics by **V.B.Ramana**
5. Engg Mathematics by **H.K. Dash**
6. Mathematical Physics by **Satya Prakash**

COMMUNICATIVE ENGLISH (105)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Communication in language - its features.

Writing skills - its features - how it differs from other language skills. How to put ideas together, writing paragraphs, identifying the logical development of ideas in piece writing.

MODULE -II

Report writing - How to present facts clearly and logically. Standard formats for writing Preparation of abstract technical documents.

MODULE -III

Reading skills – Reading to get main ideas. Identifying the logical development of ideas in a piece writing, reading to summarize, reading to take and make notes.

MODULE -IV

Speaking – Group discussion based on current topics. Group dynamics Paralinguistic communication - gestures, actions, body language Linguistic tools for better communication.

Audio-visual aids for communication.

Communicative/functional Grammar –Communicative use of structures, collocations.

Books:

1. A Communicative Grammar of English By Geoffrey Leech and Jan Svartvik,Longman

2. A millennium Guide to Writing and Speaking English by J.D. Chand & B.C. Das

3. Oxford Guide to Writing and Speaking, OUP. By John Sealy

SEMESTER-II

BASIC ELECTRONICS (201)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Properties of Semiconductors: Introduction, Types of semiconductors, intrinsic semiconductors, Extrinsic semiconductor, Position of Fermi level, current flow in semiconductor, charge densities in p and n materials; conduction by charge drift; conduction by diffusion of charge.

Junction Diode: The p-n junctions, The unbiased & biased p-n junction, current-voltage characteristics of a p-n junction, rectifier operation, Filters, Half wave & Full wave rectifier with filters, voltage multiplier, Clipping circuits & Clamping circuits, Zener diode.

MODULE -II

Bipolar junction transistor: The junction Transistor, Transistor Amplifier, Configuration of Transistor: CB, CE & CC, Static characteristics of Transistor. Tra0nsistor Biasing, Operating point & load line analysis of transistor amplifier.

Field Effect Transistors: Introduction to FET, Junction field Effect Transistor (JFET), Metal Oxide Semiconductor FET(MOSFET), Types of MOSFET, circuit characteristics of FET; biasing of FET, FET parameters, Comparison between FET & BJT.

MODULE -III

Amplifiers: Basic Concepts of Amplifier, Classification of Amplifiers, Cascading of Amplifiers,

RC-coupled CE-amplifier; frequency response of RC amplifier; gain-bandwidth product; Transformer-coupled Amplifier.

Power Amplifiers: class A power amplifier; push-pull principle; class B push-pull amplifier. Tuned amplifier, Amplifier Characteristics.

MODULE -IV

Feedback circuit & Oscillators:

Introduction to feedback circuits, Principles of negative feedback in amplifiers, gain of negative feedback amplifier, advantages of negative feedback. Introduction to Oscillators, types of Oscillators, Feedback Oscillator concepts, Oscillatory circuits, essentials of transistor oscillators, different types of transistor oscillators: Colpitts, Hartley, Phase shift, Wein – Bridge & Crystal Oscillator.

Books

Applied Electronics by R.S. Sedha

Principles of Electronics by V.K.Meheta

BASIC ELECTRONICS LAB

FULL MARKS: 25

1. To study about different Tools and essential equipment used in electronics circuits.
2. To study about different symbols of different Active and Passive components.
3. To perform the Soldering and De-soldering practices of electronics components on PCB/APB.
4. Plotting of characteristics curve of a P – N Junction Diode.
5. To study about the Half Wave Rectifier by using Crystal Diode.
6. To study about the Full Wave Rectifier by using Crystal Diode.
7. Study the characteristics of Zener Diode.
8. Study of CRO and Function Generator.
9. Study of input and output characteristics of CE, CB & CC transistor.
10. Study the frequency response of RC coupled Amplifier through CRO.
11. Study the frequency response of Tuned Amplifier through CRO.

DIGITAL ELECTRONICS (202)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE -I

NUMBER SYSTEM AND CODES

Number System: Decimal to Binary conversion and vice versa, Decimal to octal conversion and vice versa, Decimal to hexadecimal conversion and vice versa, Octal to Binary conversion and vice versa, **Binary Arithmetic:** Addition, Subtraction, Multiplication and Division, 1's and 2's compliments of Binary. **Codes:** BCD, Excess-3, Gray, Octal, Hexadecimal, Alphanumeric (EBCDIC & ASCII)

Boolean algebra and Logic gates:

Logic gates: AND, OR, NOT, NAND, NOR, EX-NOR gates.

Boolean Algebra: Boolean Operations and Expression, Laws of Boolean Algebra, De Morgan's Theorem, Boolean analysis of Logic Circuits, Simplification using Boolean Algebra, The SOP Form and POS Form, The Karnaugh map (up to 4 variables).

MODULE -II

COMBINATIONAL LOGIC AND FUNCTIONS

Combinational Logic Circuits, Universal Property of NAND and NOR gates, Combinational Logic using NAND and NOR gates, Logic functions, Half and full adder, Half and full subtractor, Parallel Binary Adder, BCD to Decimal and BCD-to-7-Segment Decoder.

Encoder: Decimal to BCD encoder, Multiplexer (4 to 1, 8 to 1), Demultiplexer (1 to 4, 1 to 8)

MODULE -III

FLIP-FLOPS

S-R and clocked S-R Flip-Flop, D-Type Flip-Flop, T-Type Flip-Flop, J-K Flip- Flop, Master Slave Flip-Flop, Flip-Flop Application.

MODULE -IV

SEQUENTIAL LOGIC CIRCUIT

Counters: Asynchronous counter, Synchronous counter.

Shift Register: Basic Functions, Classifications (SISO, SIPO, PISO, PIPO)

Logic Family: TTL, RTL, DTL, ECL, MOS, CMOS.

Books:

Digital Fundamentals by Thomas L. Floyd

Digital Electronics by M. Mano

Digital Electronics by R.P. Jain

DIGITAL ELECTRONICS LAB

FULL MARKS: 25

1. Study & Verify the Logic gates with their truth tables. (7400, 7408, 7432)
2. Study & Verify the Half-Adder circuit with truth table.
3. Study & Verify the Full-Adder circuit with truth table.
4. Study & Verify the Half-Sub tractor circuit with truth table
5. Study & Verify the Full-Sub tractor circuit with truth table
6. Study & Verify the Multiplexer circuit with truth table (74LS373)
7. Study & Verify the De-Multiplexer circuit with truth table
8. Study the various Decoders. (BCD to Decimal & BCD to Seven segment)
9. Study & Verify the Encoder circuit with truth table
10. Study the Various types of Flip-Flops with truth tables. - (7475, 7474)
11. Study of various Synchronous Counters
12. Study of various Asynchronous Counters

MATHEMATICS-II (203)

Full Marks: 75 (Mid Term-15, End Term 60)

Use of Scientific Calculator may be Permitted

MODULE-I

PARTIAL DIFFERENTIATION EQUATIONS:
Order& Degree of PDE, Solution of PDE by direct integration, Solutions of second order linear partial differential equations with constant coefficients, Solution of 2^{nd} order Cauchy's equations, Solutions of one-dimensional wave equation, One-dimensional heat equation, Steady- state solution of Two-dimensional Heat equation.

MODULE -II

Complex Analysis:
Review of complex numbers, formulae of Euler & DeMoivre, analytic functions, Cauchy-Riemann conditions, elementary complex functions and analyticity, Cauchy's Theorem and Cauchy's Integral formulae, Taylor's series, complex power series- representation of an analytical function in terms of a power series, Laurent series, Residue theorem and Formulae.

MODULE -III

Numerical Solution of Linear and Non-Linear Equations: Representation of linear systems, Solution by Gauss- Elimination method, Gauss-Jordan method Jacobi-Iterative Model and Gauss-Seidal Method. Solution of non-linear (polynomial) equations by Bisection, Newton-Raphson, Regula-Falsi and Secant methods.

MODULE -IV

Interpolation: Finite Differences, Newton's Forward, Backward and Divided differences

Numerical Integration: Integration by Trapezoidal rule, Simpson's 1/3 rule, 3/8 rule.

Ordinary differential equations: Solution of Ordinary Differential equation by Picard's method, Euler's methods, Euler's Modified method, Taylor's method, Runge-Kutta methods of order two and four.

Books Prescribed:

1. Introductory Methods of Numerical Analysis by S.S. Shastry
2. Computer Oriented Numerical methods by V. Rajaraman
3. Engg. Mathematics by **B. S.Grewal**
4. Higher Engg. Mathematics by **V.B.Ramana**
5. Engg Mathematics by **H.K. Dash**
6. Mathematical Physics by **Satya Prakash**

NUMERICAL TECHNIQUES LAB/TUTORIAL

FULL MARKS: 25

1. Solution of linear system of equations using Gauss Elimination method.
2. Solution of linear system of equations using Gauss-Seidel method.
3. Program to implement Bisection Method
4. Program to implement Secant Method
5. Program to implement Regula falsi method
6. Program to implement Newton Raphson Method
7. Program to implement Trapezoidal rule
8. Program to implement Simpson's rule
9. Program to implement Runge Kutta Method
10. Program to implement Euler-Cauchy Method
11. Program to implement Gauss-Jordon Method
12. Program to implement Gauss-Seidel Iteration

ELECTRONIC MATERIAL SCIENCE (204)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Crystal Physics: -Crystalline and non-crystalline materials, Bravais lattices, Crystal systems, Symmetry elements, Simple crystal structures, Packing factor for sc, bcc, fcc, hcp structures, Miller Indices, Bragg's law and x-ray diffraction, Reciprocal Lattice, Brief ideas about imperfections in crystals.

MODULE -II

Conducting Materials: Classical free electron theory of metals, Quantum free electron theory of metals, Density of states, Fermi Dirac statistics, Semi-conducting materials, Band theory and energy gaps, Superconductor materials: Principles of superconductivity, zero resistivity, Critical magnetic field and critical current density, Type I & II superconductors, Applications of superconductors

Dielectric Materials: Microscopic displacement of atoms and molecules in an external DC electric field, Polarization and dielectric constant, Dielectric susceptibility, polarization mechanisms, Dielectric breakdown, Ferroelectric materials, Piezo electrics, pyroelectrics and ferroelectrics, Dielectric materials as electrical insulators.

MODULE -III

Magnetic Materials: Different types of magnetic materials and their properties, Domain theory of ferromagnetism, Heisenberg criteria, Hysteresis, Ferrites and their applications, Magnetic recording materials, Metallic glasses.

MODULE -IV

Optical materials: Optical properties of metals, insulators and semiconductors, Phosphorescence and fluorescence, Excitons, traps and color centers and their importance. Liquid crystal as display, LED materials, Working of LED, Thermography and its applications, Photoconductivity and its applications.

Text Books:

1. Material Science for Engineers, James F. Shackelford &Madanapalli K Muralidhara, Pearson Education
2. Materials Science and Engineering, W.D.Callister, Wiley and Sons Inc.

Reference Books :

1. Materials Science by M.S. Vijaya ,G.Rangarajan, Tata MacGraw Hill
2. Materials Science by V. Rajendra, A. Marikani, Tata MacGraw Hill
3. Materias Science for Electrical and Electronic Engineers, I.P.Jones, Oxford University Press
4. Elements of Material Science and Engineering, L.H.VanVlack, Addison Wesley
5. The Science and Engineering of Materials, Donald R. Askeland and Pradeep P Phule, Thomson Learning (India Edition)
6. Materials Science and Engineering, V.Raghavan, Prentice Hall of India Pvt.Ltd.
7. Materials Science and Engineering in SI units, W.F.Smith, J.Hashemi and R.Prakash, Tata MacGraw Hill
8. Engineering Materials, Properties and Selection, Kenneth G. Budinski and Michael K. Budinski, Prentice Hall of India
9. Material Science & Engineering, Vijaya M. S., Rangarajan G, Tata McGraw Hill.
10. Material Science &Enginnering, S.K.Tripathy, A.K.Padhy& A. Panda, Scitech publication.

DESIGN AND FABRICATION OF PRINTED CIRCUIT BOARDS (205)

FULL MARKS: 100 (MID TERM-20, END TERM 80)

Module-1: PCB Fundamentals: PCB Advantages, components of PCB, Electronic components, Microprocessors and Microcontrollers, IC's, Surface Mount Devices (SMD). Classification of PCB - single, double, multilayer, and flexible boards, Manufacturing of PCB,PCB standards.

Module-2: Schematic & Layout Design: Schematic diagram, General, Mechanical and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for library, Tracks, Pads, Vias, power plane, grounding.

Module-3: Technology OF PCB: Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper clad laminates materials of copper clad laminates, properties of laminates (electrical & physical), types of laminates, soldering techniques.

Module-4: PCB Technology: Film master preparation, Image transfer, photo printing, Screen Printing, Plating techniques etching techniques, Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing, and quality controls, PCB technology trends, Environmental concerns in PCB industry.

Suggested Books:

1. Printed circuit Board – Design & Technology by Walter C. Bosshart, Tata McGraw Hill.
2. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, TATA McGraw Hill Publisher

SEMESTER-III

ELECTRICAL CIRCUIT THEORY (301)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorems Reciprocity theorem, Substitution Theorem, Compensation theorem &Tellengen's Theorem, Nodal & Mesh analysis of electric circuits.

MODULE-II

Two port networks: Introduction, network elements, Classification of networks, network configuration, Z-parameters, Y-parameters, Hybrid parameters, ABCD parameters, Relationships between the network parameters. Cascade and Parallel Connections.

MODULE-III

Network Functions & Responses: Concept of complex frequency, driving point and transfer functions for one port and two network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function.

Coupled Circuits: Dot Convention, Coefficient of coupling. Loop Analysis of coupled circuits, single and double tuned coupled circuits.

MODULE-IV

Filters: Low pass, high pass, band pass & band elimination filters. Active filters. Input Power, Power Transfer and Insertion loss.

Network topology: Concept of Network Graph, Relation between Twigs & links, Properties of a tree in a graph, No. of trees in a graph, Tie-set matrix, Cut-set matrix.

Text Book: -

1. Circuit Theory (Analysis & Synthesis) by A.K. Chakrabati
2. Network Analysis by Van Valkenburg

ELECTRICAL CIRCUIT LAB

Full Marks: 25

1. To verify the Kirchoff 's Current Law.
2. To verify the Kirchoff 's Voltage Law.
3. To verify the super position theorem.
4. To verify Thevenin’s theorem
5. To study and verify Norton’s theorem.
6. To study and verify Maximum power transfer theorem.
7. To study and verify Reciprocity theorem.
8. To study and verify Low pass filter.
9. To study and verify High pass filter.
10. To study and verify Band pass filter.

PROGRAMMING IN C (302)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Introduction to C-compiler, Program structure, ASCII characters, Identifiers, Key words, Syntax, I/O statements, Escape Sequence, Application of Keywords, preprocessor, Macro, Assignment Operators, Arithmetic Operators, Logical Operators, Bitwise Operators, Conditional Operators, Special Operators, Conditional statements if, if-else, nested if-else, switch, case, break, continue, go-to, while, do-while, for.

MODULE -II

Function: Introduction to function, function Declaration, need for user defined function, category of function, Pass by Value, Pass by Reference, Storage Class of Variables. recursion, Introduction of Arrays, Declaration of one-dimensional arrays, initializing of one-dimensional arrays, two dimensional arrays, Declaration of two-dimensional arrays, Initializing of two-dimensional arrays,

MODULE -III

Pointer: Understanding Pointers, accessing the address of a variable, declaring pointer variables, initializing pointer variables, accessing a variable through its pointer, chain of pointers, pointer expression, pointers and arrays, Pointers to Function, pointers as function arguments.

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MODULE -IV

Structure: Defining a Structure, declaring structure variables, accessing structure members, arrays of structure, structures with in structures, size of structures, union, defining and opening files, closing files, input/output operations on files, error handling during I/O operations, command line arguments.

Text Books:

1. **Programming in ANSI C by E. Balguruswamy**
2. **Let us C by Yashavant Kanetkar,**
3. **Programming in C P. Radhaganesan**

C PROGRAMMING LAB

FULL MARKS: 25

Programs for

1. Console I/O and standard I/O routines
2. Operators
3. Escape sequences
4. Storage class.3
5. Conditional statements “if”, “if-else” and “nested if-else”
6. Control loop “while”
7. Control loop “do-while”
8. Control loop “for”
9. switch-case concept
10. goto and continue and break concepts
11. One dimensional array
12. Two-dimensional array
13. Array of characters
14. Pointer
15. Pointer string
16. Pointer to array
17. Function concepts
18. Pointer to function
19. structure
20. Pointer to structure
21. File I/O routines
22. Matrix arithmetic

ELECTRONIC DEVICE & CIRCUIT-I (303)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Diodes and Applications: Tunnel diode, Varactor diode, Schottky Diode, PIN Diode, Laser diode and their applications.

Compound Configurations of Transistors: Cascaded systems, Cascode and Darlington connections, Current Source and Current Mirror Circuits, CMOS Circuits.

MODULE -II

Hybrid Parameters: h-parameters of a linear circuit, h-parameters of a transistor, hybrid equivalent circuits for CE, CB and CC configurations, The r_e transistor model, hybrid model, graphical determination of h-parameters.

MODULE -III

Small Signal Analysis: Small Signal Model of BJT and FET, Analysis of JFET C-S and C-D configuration, Analysis of E-MOSFET and D-MOSFET configurations.

Frequency Response of BJT and JFET: General frequency considerations, Bode Plot, cut off frequencies, low and high frequency models, frequency responses of single stage BJT and FET amplifiers with and without feedback, Miller Effect Capacitance, frequency responses of multistage BJT and FET amplifiers with and without feedback.

MODULE -IV

Regulated D.C. Power Supply: Voltage regulators, Voltage Regulation, Zener diode Shunt Regulator, Transistor Shunt Regulator, Transistor Series Regulator, Controlled Transistor Series Regulator

Thyristors: Unijunction Transistor (UJT), Basic construction, Equivalent Circuits, Silicon Controlled Switch (SCS), its operation and application.

Books Recommended:

1. Electronic Circuits by R.S. Sedha
2. Electronic Devices & Circuit Theory by R. L. Boylestad, L. Nashelsky
3. Electronic Devices and Circuits by A. Mottershead

EDC-I LAB/TUTORIAL

FULL MARKS: 25

1. h-parameters of CB configuration.
2. h-parameters of CE configuration.
3. h-parameters of CC configuration.
4. FET characteristics
5. JFET drain & transfer characteristics
6. Common source FET amplifier
7. Frequency response of CE, CC
8. Characteristics of UJT
9. Study of regulated power supply

SIGNALS AND SYSTEMS (304)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Signals and Systems: Continuous and discrete time signals, Transformation of the independent variable, Exponential and sinusoidal signals, Impulse and unit step functions, Continuous-Time and Discrete-Time Systems, Basic System Properties.

MODULE-II

Linear Time -Invariant Systems (LTI): Discrete time LTI systems, the Convolution Sum, Continuous time LTI systems, the Convolution integral. Properties of LTI systems, Commutative, Distributive, Associative. LTI systems with and without memory, Invariability, Causality, Stability, Unit Step response. Differential andDifference equation formulation, Block diagram representation of first order systems.

MODULE-III

Fourier Series Representation of Periodic Signals: Continuous-Time periodic signals, Convergence of the Fourier series, Properties of continuous-Time Fourier series, Discrete-Time periodic signals, Properties of Discrete-Time Fourier series. Frequency-Selective filters, Simple RC high-pass and low-pass filters.

Fourier Transform: Aperiodic signals, Periodic signals, Properties of Continuous-time Fourier transform, Convolution and Multiplication Properties, Properties of Fourier transform and basicFourier transform Pairs.

MODULE-IV

Laplace Transform: Laplace Transform, Inverse Laplace Transform, Properties of the Laplace Transform, Laplace Transform Pairs, Laplace Transform for signals, Laplace Transform Methods in Circuit Analysis, Impulse and Step response of RL, RC and RLC circuits.

Suggested Books:

1. V. Oppenheim, A. S. Wilsky and S. H. Nawab, Signals and Systems, Pearson Education (2007)
2. S. Haykin and B. V. Veen, Signal and Systems, John Wiley & Sons (2004)
3. C. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)
4. H. P. Hsu, Signals and Systems, Tata McGraw Hill (2007)
5. S. T. Karris, Signal and Systems: with MATLAB Computing and Simulink Modelling, OrchardPublications (2008)
6. W. Y. Young, Signals and Systems with MATLAB, Springer (2009)
7. M. Roberts, Fundamentals of Signals and Systems, Tata McGraw Hill (2007)

PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR (305)

Full Marks: 100 (Mid Term-20, End Term-80)

PRINCIPLES OF MANAGEMENT

MODULE – I

Management Concept: Management functions, Managerial Roles, Managerial skills, Levels of management, Characteristics and Importance of management.

Planning: Nature, significance, process and types of planning, Management by Objectives (MBO) and its advantages and disadvantages.

Decision Making: Process, Group Decision Making.

MODULE – II

Organizing: Nature, Significance, Principles of Organizing.

Organization Structure: Formal & In-formal Organizations, Line Organization Structure & Line & Staff Organization Structure, Functional Organization Structure.

Staffing: Importance and Process of Staffing.

Controlling: Concept and Importance, Steps in Controlling.

ORGANIZATIONAL BEHAVIOUR

MODULE –III

Introduction: Meaning & Definition of OB, Importance of OB, Role of OB.

Perception: Meaning, Distortion in person perception, Managerial Application of Perception,

Attitudes: Concept, Types, Factors in Attitude Formation.

MODULE –IV

Motivation: Concept, Theories of Motivation: Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory, Mc GREGOR'S Theory X & Theory Y

Personality: Determinants, Personality Theories – Psychoanalytic Theory.

Learning: Concept & Factors affecting learning.

Leadership: Meaning, Charismatic Leadership Theory, Trait Theory, Situational Theory.

Text Books:

Principles of Management: L. M. Prasad (S.Chand & Co.)

Organisational Behaviour: L.M. Prasad (S.Chand & Co.)

References :

Principles of Management: R. K. Sharma & S. K. Gupta (Kalyani)

Organisational Behaviour: K Aswathappa (HPH)

Organisational Behaviour: Stephen P. Robbins (PHI)

SEMESTER-IV

ANALOG COMMUNICATION (401)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE -I

Spectral Analysis: Review of Fourier series & Transform, Parseval's Theorem, The Sampling Function, The Response of a linear System, Normalized Power in a Fourier expansion. Impulse Response, Power Spectral Density, Effect of Transfer Function on Power Spectral Density, Correlation between waveforms; Auto-and cross correlation. Expansion in Orthogonal Functions, Distinguishability of Signals.

MODULE -II

Amplitude Modulation: Frequency translation, Recovery of baseband Signal, Amplitude Modulation, Spectrum of AM Signal, The Balanced Modulator, The Square law Demodulator, Double Side Band (Suppressed Carrier), Single Side Band (Suppressed Carrier) and Vestigial Side Band, Their Methods of Generation and Demodulation, Carrier Acquisition. Phase-locked Loop (PLL) in Amplitude demodulator.

MODULE -III

Frequency Modulation: Concept of Instantaneous Frequency. Generalized concept of Angle Modulation. Frequency modulation, Frequency Deviation, Spectrum of FM Signal with Sinusoidal Modulation. Bandwidth of FM Signal Narrowband and Wideband FM, Bandwidth required for a Gaussian Modulated WBFM Signal, Generation of FM Signal, FM Demodulator, Phase-locked Loop (PLL) in Frequency demodulator, Pre-emphasis & Deemphasis, Threshold in frequency modulation. Frequency Division Multiplexing.

MODULE -IV

Noise in Communication Systems: Sources and Types of Noise. Frequency Domain Representation of Noise, Spectral Components of Noise, Response of a Narrow band filter to noise. Signal to Noise Ratio (SNR), Effect of a Filter on the Power spectral density of noise. Superposition of Noises, Mixing involving noise, Linear Filtering, Noise Bandwidth.

Noise in AM Systems: The AM Receiver, Super heterodyne Principle, Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB. Figure of Merit.

Noise in FM Systems: Mathematical Representation of the operation of the Limiter, Discriminator; Calculation of output SNR, Comparison of SNR in FM and AM signal, Improvement using pre-emphasis.

Text Books:

1. Modern Digital and Analogue Communication Systems by B.P. Lathi
2. Communication Systems by Siman Haykin, 4th Edition, John Wiley & Sons, Inc.

ANALOG COMMUNICATION LAB

FULL MARKS: 25

1. **Amplitude Modulation**
   i. Generation of DSB-SC with sinusoidal modulating wave, Recording of Modulated waveform with various values of m. Measurement of power in sidebands.
   ii. Generation of DSB-SC.
   iii. Generation of SSB. Generation of VSB signal.
2. **Frequency Modulation**
   i. Generation of Narrow FM using Balanced Modulator.
   ii. Direct method of generating wideband FM signal.
   iii. Study of Pre emphasis & De-emphasis in FM.
3. **Detector circuits**
   i. Envelope Detector
   ii. Product Detector
   iii. FM Discriminator or Balanced Discrimination.
4. **Filters**

   Design and study of Low Pass, high pass, Band pass and Band reject filters (both active and passive - Buffer worth type).
5. **Noise**

   Study on SNR of AM, FM.

MICROPROCESSOR AND PERIPHERALS (402)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Eight-bit Microprocessor (Intel 8085): Microprocessor and Microcomputer Architecture, Pins & Signals, Register Organization, Timing & Control Module, Intel 8085 Instruction, Timing and Execution, Interrupts in 8085, Address decoding for memories and peripherals, Memory mapped IO and IO mapped IO.

Sixteen-bit Microprocessor (Intel 8086): Internal organization of 8086, Signal descriptions, Physical memory organization, Bus Interface Unit (BIU), Execution Unit (EU), Minimum and Maximum modes of 8086 system and their timings.

MODULE-II

Assembly Language Programming with Intel 8085 and 8086: Instruction sets, Memory and I/O Addressing, Assembly language programming, Use of Stack & Subroutines, Addressing modes, Assembler directives and Operators, Data movement instructions, Arithmetic and logic instructions, Program control instructions, and Recursive procedures.

MODULE-III

Basic Peripherals and Their Interfacing: Memory interfacing, Interfacing I/O ports, Programmable Peripheral Interface (8255), Interfacing A/D and D/A converters.

Programmable Peripheral Devices and Their Interfacing: Programmable Interval Timer (8253/8254), Programmable Interrupt Controller (8259), Keyboard/Display Controller (8279), Programmable Communication Interface (8251), DMA Controller (8237/8257).

MODULE-IV

Single Board Computers and Microcontrollers: Single Board Computers (SBC), Microcontrollers, Intel 8051 microcontroller architecture and Intel 8051 based systems, Assembly language programming with Intel 8051, Interfacing of scanned and multiplexed displays, Interfacing of Liquid crystal displays, Interfacing of matrix keyboard, Stepper motor, General Purpose Interface Bus (GPIB, IEEE 1284) architecture and ports.

Books Recommended:

1. Microprocessor Architecture, Programming and Application with Intel 8085 by Ramesh S Gaonkar
2. Microprocessors and Microcomputer based System Design- M. Rafiquzzaman
3. Fundamentals of Microprocessor and Microcontrollers by B. Ram
4. The 8051 Microcontroller by K.J. Ayela

MICROPROCESSOR LAB

FULL MARKS: 25

Programming with 8085 & 8086:

1. Arithmetic programming.
2. Logical programming.
3. Loop & recursive programs.
4. Generate square waves on all lines of 8255 with different frequencies.
5. Traffic Light controller model.
6. Elevator Simulator.
7. Analog to Digital Converter.
8. Digital to Analog Converter (generation of Square, triangular and saw tooth wave).
9. Intel 8253 and its operation.
10. Intel 8279(keyboard & Display interface).
11. Intel 8259 (Programmable Interrupt controller).
12. Intel 8257 (Programmable DMA controller).

PROGRAMMING IN PYTHON (403)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-1:

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

MODULE-2:

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

MODULE-3:

Overview of Programming: Structure of a Python Program, Elements of Python

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

MODULE-4:

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

Text Books

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011

Reference Books

1. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012

Online References:

Python Tutorial/Documentation www.python.or 2015

http://docs.python.org/3/tutorial/index.html

http://interactivepython.org/courselib/static/pythonds

http://www.ibiblio.org/g2swap/byteofpython/read/

PYTHON PROGRAMMING LAB/TUTORIAL

FULL MARKS: 25

Software Lab based on Python Programming:

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsiusand vice versa depending upon users choice.
2. Write a Program to calculate total marks, percentage, and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:

   Grade A: Percentage >=80
   Grade B: Percentage>=70 and <80
   Grade C: Percentage>=60 and <70
   Grade D: Percentage>=40 and <60
   Grade E: Percentage<40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle,square, circle and triangle by accepting suitable input parameters from user.
4. Write a Program to display the first n terms of Fibonacci series.
5. Write a Program to find factorial of the given number.
6. Write a Program to find sum of the following series for n terms: 1 – 2/2! + 3/3!.....n/n!
7. Write a Program to calculate the sum and product of two compatible matrices.

ELECTRONIC DEVICE & CIRCUIT-II (404)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

OPERATIONAL AMPLIFIER (Op-amp): Operational overview, analysis of op-amp equivalent circuits. Differential, Inverting and Non-inverting Open loop OP-AMP configurations, Voltage Series, Voltage Shunt, Current Series and Current Shunt negative feedback configurations, **Op-amp parameters:** Input offset voltage, bias current, offset current, Thermal drift, Effect of variation in power supply voltages, Noise, Common Mode Rejection Ratio (CMMR).

MODULE-II

FREQUENCY RESPONSE OF OP-AMP: Frequency response and compensating networks of OP-Amp, High-Frequency Op-AMP equivalent circuits, Open loop voltage gain, closed loop frequency response Circuit stability, slew rate and its effect. **APPLICATIONS:** AC and DC amplifiers, Peaking, summing, scaling and averaging amplifiers, differential input and differential output amplifiers, voltage to current and current to voltage converters, integrator, differentiator circuits.

MODULE-III

ACTIVE FILTER CIRCUITS (Butterworth): First order low pass, second order low pass, first order high pass, second order high pass, higher order filters, Band pass, Band reject and all pass filters.

MODULE-IV

SPECIAL PURPOSE DEVICES: Circuit configurations and characteristics of MESFET, Gunn Diode, light activated SCR, Shockley diode, Phototransistors, Opto-isolator, Programmable Unijunction Transistor, IGBT. Avalanche Transit Time Devices: IMPATT Diode, TRAPATT Diode, and BARITT Diode. **CONTROLLED RECTIFIERS:** Single phase: circuit configuration and principle of operation of half wave, full wave-controlled rectifiers for RL and RLE Load, effect of source inductance, importance of free-wheeling diode for inductive loads. Input power factor for R& RL load, Average output voltage and currents.

Test Books:

Electronic Devices by Boylstand

Microwave Engineering by M. Kulkarni

Power Electronics by P.S. Bhimra

Op-Amp and linear integrated circuits by R.A. Gayakwad

TRANSMISSION LINES, ANTENNA AND WAVE PROPAGATION (405)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Electromagnetic Wave Propagation: Propagation in Good Conductors, Skin Effect,Reflection of uniform Plane Waves at normal incidence, Plane Wave reflection at Oblique Incidence, Wave propagation in dispersive media, concept of phase velocity and group velocity.

MODULE-II

Transmission Lines: Typical Transmission lines- Co-axial, Two Wire, Microstrip, Coplanar and Slot Lines, Transmission Line Parameters, Transmission Line Equations, Wave propagation in Transmission lines, low loss, lossless line, Distortion less line, Input Impedance, Standing Wave Ratio, Power. and lossy lines, Shorted Line, Open-Circuited Line, Matched Line, Smith Chart, Transmission Line Applications.

MODULE-III

Waveguides and Waveguide Devices: Wave propagation in waveguides, Parallel plate waveguides, TEM, TM and TE modes, rectangular waveguides, circular waveguides, Power transmission and attenuation, rectangular cavity resonators, directional couplers, isolator, circulator.

MODULE-IV

Radiation of electromagnetic waves: Concept of retarded potentials, Antenna Parameters: Radiation Mechanism, Current Distribution on a Thin Wire Antenna, Radiation Pattern, Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance Antenna Radiation Efficiency, Effective Length and Equivalent Areas, Maximum Directivity and Maximum Effective Area, Friis Transmission Equation and Radar Range Equation

Types of Antenna: Hertzian dipole, Half wave dipole, Quarter-wave dipole, Yagi-Uda, microstrip, Parabolic antenna, Helical antenna, Antenna array.

References

1. M. N. O. Sadiku, Principles of Electromagnetics, Oxford University Press (2001)
2. Karl E. Longren, Sava V. Savov, Randy J. Jost., Fundamentals of Electromagneticswith MATLAB, PHI
3. W. H. Hayt and J.A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
4. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education (2001)
5. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)
6. N. Narayan Rao, Elements of Engineering Electromagnetics, Pearson Education (2006)
7. G. S. N. Raju, Antennas and Propagation, Pearson Education (2001)

SEMESTER-V

DIGITAL COMMUNICATION (501)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE -I

Sampling and Reconstruction of Signals: Sampling Theorem, Aliasing, Antialiasing Filters. **Pulse Modulation:** Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Pulse Code Modulation (PCM), Differential PCM (DPCM), Adaptive DPCM (ADPCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM).

MODULE -II

Digital Modulation: Generation, Transmission, Reception, Spectrum and Geometrical Representation in the Signal Space, Phase Shift Keying (PSK), Binary PSK (BPSK), Differential PSK (DPSK), Differentially-Encoded PSK, Quadrature PSK (QPSK), $\pi/4$ QPSK, M-ary PSK, Frequency Shift Keying (FSK), Binary FSK (BFSK), Minimum Shifting Keying (MSK), Amplitude Shift Keying (ASK). **Signal Multiplexing:** Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM).

MODULE -III

Noise In PCM & DM: Transmission Bandwidth and output SNR in case of PCM and DM, Differential PCM, Delta Modulation, Adaptive Delta Modulation, DPCM and ADPCM, Comparison with PCM, Calculation of Quantization Noise Power, Output Signal Power and Thermal Noise Power.

MODULE -IV

Principles of Digital Transmission and Reception: Line Coding, Power Spectral Density of various Line codes, Polar Signaling, ON-OFF Signaling, Bipolar Signaling, Pulse Shaping, Nyquist's Criterion for Zero ISI, Scrambling, Regenerative Repeater. Baseband Signal Receiver, Probability of Error, Optimum Filter, White Noise, The Matched Filter, Coherent Reception, Application to PSK, QPSK, BPSK and BFSK.

Information and Coding: Amount of information, Average information, Entropy; Shannon-Fano Algorithm, Information Capacity Theorem, S/N Tradeoff, Shannon's limit and efficiency of orthogonal signal transmission, Block code, Parity check bit coding, Hamming distance, Probability of error with coding, Hadamard, Hamming, Extended, Cyclic, Golay and BCH codes.

Books Recommended:

1. Modern Digital and Analogue Communication Systems by B.P. Lathi
2. Communication Systems by Siman Haykin
3. Principles of Communication Systems by H. Taub, D. Schilling, G Saha

DIGITAL COMMUNICATION LAB

FULL MARKS: 25

1. Generation of PSK signal.
2. Generation of BPSK signal
3. Generation of DPSK signal
4. Generation QPSK signal.
5. Generation ASK signal.
6. Generation FSK signal.
7. Pulse Modulation with a Delta Modulator
8. Pulse modulation with a Adaptive Delta Modulator.
9. Simulation program in MATLAB for TDM.
10. Simulation program in MATLAB for FDM.
11. Simulation program in MATLAB for Digital Modulation schemes.
12. Simulation program in MATLAB for Demodulation Scheme in presence of noise.

ROBOTICS (502)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE -I

Programming Environments: Integrated Development Environment (IDE) for AVR microcontrollers, free IDEs like AVR Studio, WIN AVR. Installing and configuring for Robot programming, In System Programmer (ISP), loading program on Robot

Actuators: DC Motors, Gearing and Efficiency, Servo Motors, Stepper motors, Motor Control, and its implementations

MODULE -II

Sensors: White line sensors, IR range sensor of different range, Analog IR proximity sensors, Analog directional light intensity sensors, Position encoders, Servo mounted sensor pod/ Camera Pod, Wireless Colour camera, Ultrasound scanner, Gyroscope and Accelerometer, Magnetometer, GPS receiver, Battery voltage sensing, Current Sensing

MODULE -III

LCD interfacing with the robot (2 x 16 Characters LCD)

Other indicators: Indicator LEDs, Buzzer

Timer / Counter operations: PWM generation, Motor velocity control, Servo control,velocity calculation and motor position Control, event scheduling

MODULE -IV

Communication: Wired RS232 (serial) Communication, Wireless ZigBee Communication, USB Communication, Simplex infrared Communication (IR remote to robot)

References

1. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, New Delhi, 2014
2. R.K. Mittal, I.J. Nagrath, ―Robotics & Control‖, Tata McGraw & Hills, 2005.

ROBOTICS LAB

FULL MARKS: 25

1. Interfacing experiment using available hardware like LCD, LED, Buzzer, Motors.
2. Read IR proximity sensor to determine if there is some object nearby and thus Control the motion of robot using IR sensors.
3. Control a robot using LDR and laser.
4. Simple Motion Control (programming the robot to move forward, backward, left and right)
5. Line following Robot (programming the robot to move along a define path, white line or black line)
6. Obstacle Detection (programming the robot for obstacle detection)
7. Control experiment using available hardware or software.
8. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.

POWER ELECTRONICS (503)

Full Marks: 75 (Mid Term-15, End Term-60)

Module-I

Power Devices: Need for semiconductor power devices, Power diodes, Enhancement of reverseblocking capacity, Introduction to family of thyristors.

Silicon Controlled Rectifier (SCR): structure, I-V characteristics, Turn-On and Turn-Off characteristics, ratings, Factors affecting the characteristics/ratings of SCR, Gate-triggering circuits, Control circuits design and Protection circuits, Snubber circuit.

Application of SCR: SCRas a static switch, phase-controlled rectification, single phase half wave, full wave, and bridge rectifiers with inductive & non-inductive loads; AC voltage control using SCR and Triac as a switch.

Module-II

Triac: Basic structure, Equivalent circuit, working and V-I characteristic of Triac, Triac Phase controlled circuit, Application of Triac as an electronic change over of transformer taps

Diac: Structure**,** Operation and V-I characteristics, application of a Diac as Lamp dimmer and heat control

Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics, switching characteristics, device limitations and safe operating area (SOA) etc.

Power MOSFETs: operation modes, switching characteristics, power BJT, second breakdown,saturation, and quasi-saturation state.

Module-III

Power Inverters: Need for commutating circuits and their various types, d.c. link invertors, Parallel capacitor commutated invertors with and without reactive feedback and its analysis, Series Invertor, limitations and its improved versions, bridge invertors.

Choppers: basic chopper circuit, types of choppers (Type A-D), step-down chopper, step-up chopper, operation of d.c. chopper circuits using self-commutation (A & B- type commutating circuit), cathode pulse turn-off chopper (using class D commutation), load sensitive cathode pulse turn-off chopper (Jones Chopper), Morgan's chopper

Module-IV

Electromechanical Machines: DC Motors, Basic understanding of field and armature, Principle of operation, EMF equation, Back EMF, Factors controlling motor speed, Thyristor based speed control of dc motors, AC motor (Induction Motor only), Rotor and stator, torque & speed of induction motor, Thyristor control of ac motors (block diagrams only)

Suggested Books:

1. Power Electronics, P.C. Sen, TMH
2. Power Electronics & Controls, S.K. Dutta
3. Power Electronics, M.D. Singh & K.B. Khanchandani, TMH
4. Power Electronics Circuits, Devices and Applications, 3rd Edition, M.H. Rashid, Pearson Education

INDUSTRIAL VISIT/ INTERNSHIP

FULL MARKS: 25

Course Description: This course enables students to earn credit for qualifying internships/job experiences in their areas of study.

Course Objectives: Each internship position is unique, and the experience depends on the needs of the employer and student qualifications. The following are general course objectives. Students will…. • Gain practical experience in their respective fields of study.

• Expand their professional networks.

• Improve their interpersonal and communications skills.

Once all the requirements have been met, a grade will be issued.

Component Weight Description		
Written log of work activities	10%	Keep a written log of your work activities … nothing formal, just the facts
Midterm Report	15%	Complete a short (1-2 page) written interim summary of your internship experience.
Final Report	65%	At the end of the semester, submit a report.
Final Student Survey	5%	Complete a short survey on your internship experience
Employer Survey	5%	The Internship Coordinator will contact the employer to verify hours and the work performed.

COMPUTER ARCHITECTURE AND OPERATING SYSTEM (504)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Micro Computers, Parallel Computing Models, Multiprocessors, Multicomputer, Multi vector and SIMD Computers. Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures, Performance Matrices and Measures, Parallel Processing Application, Speedup Performance Laws, Scalability Analysis and Approaches

MODULE-II

Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology

Backplane Bus System, Cache Memory Organization, Shared Memory Organization, Sequential and Weak Consistency Models

Linear Pipeline Processors, Non-linear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super-pipeline Design

MODULE-III

Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message Passing Mechanism

Vector Processing Principles, Multi-vector Multiprocessors, SIMD Computer Organizations, The Connection Machine

Principles of multi-Threading, Fine-Grain Multicomputer, Scalable and Multithreaded Architectures, Data Flow Architectures

MODULE-IV

Parallel Programming Models, Parallel Language and Compilers, Code Optimization and Scheduling, Loop Parallelization and Pipelining

Parallel Programming Environment, Synchronization and Multiprocessing Modes, Shared Variable Program Structure, Message Passing Program Development.

Multiprocessor UNIX Design Goals, Master-Slave and Multithreaded UNIX, Multicomputer UNIX Extensions, Mach/OS Kernel Architecture, ODF/I Architecture and Application.

BOOKS:

1. Advance Computer Architecture by Kai Hwang

2. Computer Organization by Hamachar

MULTIMEDIA TECHNIQUES (505)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

A survey of Computer Graphics Applications e.g.: CAD, Presentation Graphics, Art, Entertainment, Education and Training, Visualization, GUI.

Overview of Graphics Systems: Video display Devices, Raster-Scan and Random Scan Systems, Input Devices, Hard copy Devices, Graphics Software.

Output Primitives: - Points and Lines, Breshenham's line Algorithm, Midpoint Circle algorithm, Filled Area Primitives

Attributes of output primitives: Line, Curve, Area fill and character generation, Bundled attributes, antialiasing. Two-Dimensional Geometric Transformation.

MODULE -II

Two-Dimensional Viewing: the viewing Pipeline Viewing coordinate Reference frame, Window-to- view port coordinate Transformation. Line Clipping (Cohen-Sutherland Algorithm) and polygon Clipping (Sutherland-Hodgeman algorithm) Three-dimensional Object Representation Polygon Surface, quadratic Surface, Spline Representation, Bezier Curves and Surfaces B-Spline Curves and surfaces.

MODULE -III

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, Reflections, shear, composite Transformation, Modeling and Coordinate.

Transformation Three-Dimensional Viewing: Viewing Pipeline, viewing coordinates, Projections (Parallel and Prospective) Clipping Visible Surface.

MODULE -IV

Multimedia Systems: Fundamentals of multimedia, media and data streams, sound/audio, image, graphics, video, and animation. Data & File Format standards, Video image and animation–Full motion video storage and retrieval Technologies.

Data compression: Text and image compression algorithm, JPEG, MPEG, MP3, DVI Multimedia Applications, Distributed Multimedia Systems.

Text Books:

1. Computer Graphics: D.Hearn and M.P. Baker (C version) PHI
2. Multimedia Computing Communications and Applications: Ralf Steinmetz And Klara Nahrstedt – Pearson Education.
3. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design," PHI, 2003.

SEMESTER-VI

MEASUREMENTS SYSTEM AND TRANSDUCERS (601)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Measurement standards and meters: - Accuracy and Precision, Significant Figures, Error, Types of error, Statistical error, Probability errors, Limiting errors

International, Primary, Secondary, and Industrial standards, Importance, and application of standards of measurements, Calibration, rationalized MKS units, dimensions of physical quantities

MODULE -II

Transducers: - Definition of transducer, Primary and secondary of transducers, Classification, Principles, Application and advantages of Electric and Electronic transducers, Linear, Nonlinear and Digital potentiometers

Thermocouple, LVDT, Strain gauge, Thermistor, Capacitive transducer, Hall-effect transducer, Opto-electronic transducers, Temperature transducers, Piezo-electric transducers

MODULE -III

Measurement Systems: - Construction, Principles and Working of Galvanometers, Chopper type DC voltmeter, Analog digital Multimeter, Measurement of AC and DC Voltages, Current and Resistance.

MODULE -IV

Bridges and Signal Generators: - DC and AC bridges, Wheatstone bridge, Kelvin Double bridge, Maxwell's Inductance Bridge, Hay's bridge, Capacitance Comparison Bridge

AF and RF Signal Generators, RF Sweep Generator, Function Generator and Pulse Generator

Principles and types of electronic emissions, Construction & operation of CRT, Block diagram of CRO, Focusing and Deflection, Time Base generator, Triggering Circuit, Dual trace CRO, Storage CRO.

Text Books:

1. Electrical and Electronics Measurement & Instrumentation by A.k. Sawney
2. Electronic Measurement Systems by Kalsi

MEASUREMENT LAB

FULL MARKS: 25

1. Sine wave, square wave, and Pulse Measurement.
2. Phase and frequency measurement.
3. Analogue to Digital Conversion.
4. Digital to Analogue Conversion.
5. Capacitive Transducer and its characteristics.
6. Photodiode and its VI-characteristics.
7. Temperature measurement (Thermistors)
8. Strain Gauge transducer and its characteristics.
9. Linear variable differential Transducer (LVDT) and its characteristics.
10. Piezoelectric Transducer and their characteristics.
11. Hall–effect transducer and its characteristics.
12. IC instrumentation Amplifier.

COMMUNICATION SYSTEM (602)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE – I

Radio Transmission system: AM Transmitter, Broadcast transmitter, Master Oscillator, Buffer amplifier, Harmonic Generators, Power amplifier, neutralization, power supply for transmitters, cooling of transmitter tube, Radio telephone transmitters.

Transmission Systems: Single side band AM Transmitter, FM Transmitter, FM Stereo Transmitter, Pre-emphasis circuits, Automatic frequency control, Volume expander, automatic modulation control, volume compressor, peak clipping.

MODULE – II

Radio Reception System: AM broadcast receivers, RF amplifier, frequency changer, IF amplifier, detector, automatic gain control.

Reception Systems: SSB receivers, Diversity reception, Frequency modulated receivers, Stereo FM Receiver, receiver's performance analysis, Selectivity, Sensitivity and Fidelity.

MODULE – III

Television system components: Elements of television system, synthesis of television pictures, composite video signal, television picture and camera tubes, video detector and amplifier circuits, AGC and noise canceling circuits, Sync separation and processing circuits, vertical and horizontal deflection circuits, sound system

Color Television Transmission & Reception System: Television transmitter, Block diagram of monochrome TV receiver, Basics of color television circuits, color signal transmission and reception, Transmission & reception of PAL, NTSC & SECAM system, Merits & Demerits of NTSC, PAL and SECAM systems, High-definition TV, LCD TV, Application of television systems.

MODULE – IV

Telephone instruments and Signals: Telegraphy and instruments, Subscriber loop, standard telephone set, Basic call procedures, call progress tones and signals, cordless telephone, caller ID, electronic telephone.

Public telephone network: Instruments, local loops, trunk circuits and exchanges, local central office telephone exchanges, operator-assisted local exchanges, automated central office switches and exchanges.

Text Books:

1. Principles of communication Engg. by Singh and Chhabra
2. Advanced Communication System by Wayen Tomasi
3. Monochrome & color TV. By R. R. Gulati

COMMUNICATION SYSTEM LAB

FULL MARKS: 25

1. Study of DSB-SC Transmitter [Modulator, RF amplifier]
2. Study of DSB-SC Receiver [Filter, RF amplifier, Demodulator]
3. Study of SSB-SC Transmitter [Modulator, RF amplifier]
4. Study of SSB-SC Receiver [Filter, RF amplifier, Demodulator]
5. Study of Telephone Circuits [DTMF, Telephone Circuit]
6. Study of B/W Television [RF amplifier, Vertical and Horizontal sync separation, Time delay, CRT]
7. Study of Color Television. [RF amplifier, AGC, Vertical and Horizontal sync separation, Time delay, CRT]

CONSUMER ELECTRONICS (603)

Full Marks: 75 (Mid Term-15, End Term-60)

MODULE-I

Audio systems: PA system, Microphone, Amplifier, Loudspeakers. Radio receivers, AM/FM. Audio recording and reproduction, Cassettes, CD and MP3.

MODULE-II

TV and Video systems: Television standards, BW/Colour, CRT/HDTV. Video system, VCR/VCD/DVD players, MP4 players, Set Top box, CATV and Dish TV, LCD, Plasma & LED TV. Projectors: DLP, Home Theatres, Remote Controls

MODULE-III

Landline and Mobile telephony: Basic landline equipment, CLI, Cordless. Intercom/ EPABX system. Mobile phones: GPRS & Bluetooth. GPS Navigation system. Smart Phones

Office Equipment: Scanners, Barcode / Flat bed, Printers, Xerox, Multifunction units (Print, Scan, fax, and copy)

MODULE-IV

Electronic Gadgets and Domestic Appliances: Digital clock, Digital camera, Handi-cam, homesecurity system, CCTV. Air conditioners, Refrigerators, Washing Machine/Dish Washer, Microwave oven, Vacuum cleaners

References

1. R. P. Bali Consumer Electronics Pearson Education (2008)
2. R. G. Gupta Audio and Video systems Tata McGraw Hill (2004)

CONSUMER ELECTRONICS LAB/TUTORIAL

FULL MARKS: 25

1. Study of PA systems for various situations – Public gathering, closed theatre /Auditorium, Conference room, Prepare Bill of Material (Costing)
2. Installation of Audio /Video systems – site preparation, electrical requirements, cables, and connectors
3. Market Survey of Products (at least one from each module)
4. Identification of block and tracing the system. Assembly and Disassembly of system using Toolkit

MODERN COMMUNICATION SYSTEM (604)

Full Marks: 100 (Mid Term-20, End Term-80)

MODULE-I

Optical Communication: Introduction of Optical Fiber, Types of Fiber, Guidance in Optical Fiber, Attenuation and Dispersion in Fiber, Optical Sources and Detectors, Block Diagram of optical communication system, optical power budgeting

MODULE-II

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G and 4G concepts.

MODULE-III

Microwave Radio Communication: Introduction, Advantages & Disadvantages of Microwave radio, Analog Versus Digital Microwave, Frequency Versus Amplitude modulation, Frequency modulated microwave radio system, FM microwave radio repeaters, Diversity, Protection switching arrangements, FM microwave radio station, Microwave repeater station, LOS path characteristics

MODULE-IV

Satellite communication: Introduction, Kepler's Law, satellite orbits, geostationary satellites, up link, down link, cross link, transponders (C- Band), ground station, simplified block diagram of earth station. Satellite access: TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA

References

1. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education, 3rd Edition
2. Martin S. Roden, Analog & Digital Communication Systems, Prentice Hall, EnglewoodCliffs, 3rd Edition
3. Modern digital and analog Communication systems- B. P. Lathi, 4rd Edition 2009 Oxford University press.
4. Thiagarajan Vishwanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India.
5. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2nd Edition,Pearson Education Asia.

PROJECT (MINOR) (605)

Full Marks: 100

Every student will have to do project report in any area of Information Science & Telecommunication detailed in the curriculum under the guidance of regular / guest faculty/ Industry experts. It should be research based to create new knowledge in any area of Information Science & Telecommunication. The student shall submit the project report before the Term – End examination. Marks will be awarded (out of 100) for the project report after viva internally.

Mark Distribution:

1. Project Demo - 40
2. Project Report - 20
3. Presentation / Seminar - 20
4. Viva - 20