

# **SYLLABUS**

**For**

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

**B.Sc. ETC [Semester I-VI]**

**KHALLIKOTE AUTONOMOUS COLLEGE**  
**BERHAMPUR-(ODISHA)**

**SEMESTER: I**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem. End	Internal	
101	Mathematics-I	80	20	06
102	Physics	80	20	06
103	Basic Electrical Engineering	80	20	06
104	Computer Fundamentals	80	20	06
105	Physics lab	40	10	03
106	Computer lab	40	10	03

**SEMESTER: II**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem.End	Internal	
201	Mathematics-II	80	20	06
202	Communicative English	80	20	06
203	Basic Electronics	80	20	06
204	Digital Electronics	80	20	06
205	Basic Electronics Lab.	40	10	03
206	Digital Electronics Lab.	40	10	03

**SEMESTER:III**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem.End	Internal	
301	Mathematics - III	80	20	06
302	Electronic Material Science	80	20	06
303	Analog Communication	80	20	06
304	Electrical Circuit Theory	80	20	06
305	Analog Communication Lab.	40	10	03
306	Electrical Circuit Lab.	40	10	03

**SEMESTER: IV**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem.End	Internal	
401	Computer Oriented Numerical Methods	80	20	06
402	Electronic Devices & Circuits-I	80	20	06
403	Microprocessor & Peripherals	80	20	06
404	Digital Communication	80	20	06
405	Microprocessor Lab.	40	10	03
406	Communication Lab-I	40	10	03

**SEMESTER: V**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem.End	Internal	
501	Principles of Management and Organizational Behavior	80	20	06
502	Communication Systems	80	20	06
503	Electronic Devices & Circuits-II	80	20	06
504	Programming in C	80	20	06
505	Communication Lab-II	40	10	03
506	'C' Prog. Lab	40	10	03

**SEMESTER: VI**

<b>Paper Code</b>	<b>Title of the Paper</b>	<b>Marks</b>		<b>Credit</b>
		Sem. End	Internal	
601	Computer Architecture & Operating System	80	20	06
602	Multimedia Techniques	80	20	06
603	Measurements Systems & Transducers	80	20	06
604	Multimedia Lab.	40	10	03
605	Measurement Lab.	40	10	03
606	Project (Minor)	100	---	06

## SEMESTER- I

**MATHEMATICS – 1[ETC- 101]**  
**Full Marks: 100(Internal-20, End Term 80)**  
**Use of Scientific Calculator may be Permitted**

### MODULE -I

**Differential Calculus:** Asymptotes of Algebraic and Polar curves, Parallel Asymptotes, Curvature: Curvature of Cartesian, Pedal, Polar, Parametric equations, Center and Chord of curvature. **Integral Calculus:** Area under the Curves, Rectification, Volume of the Curves. **Vectors Analysis:** Vector Concepts, Products of Vectors, Vector functions, Vector Differentiation, Gradient, Divergent and Curl of Vector functions.

### MODULE -II

**Vector Integration:** Surface Revolution, Vector Integral Theorem: Green, Gauss and Stokes Theorems.

**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, Cayley-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**

## PHYSICS (ETC 102)

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

### 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, 3<sup>rd</sup> Edition, John Wiley Ny

A.Bohm, Quantum Mechanics: Foundations & Applications 2<sup>nd</sup> Edition, Springer Verlag.

## **BASIC ELECTRICAL ENGINEERING (ETC - 103)**

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

### **MODULE -I**

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

**Capacitance:** - Capacitor, types of capacitor, 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 & Gnerators:** - 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, Ameter,

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

## **COMPUTER FUNDAMENTALS (ETC – 104)**

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

### **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

## **PHYSICS (ETC - 105)**

### **Full Marks: 50 (Internal-10, End Term 40)**

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. Plotting of characteristics curve of a P – N Junction Diode.
9. Plotting of Characteristics curve of BJT.
10. Verification of laws of vibration of string using Sonometer.
11. Determination of wave length of Laser source by diffraction rating method.
12. Study of Hall Effect.
13. Study of Photoemission.

## **COMPUTER – LAB (ETC - 106)**

### **Full Marks: 50 (Internal-10, End Term 40)**

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



## **SEMESTER: II**

### **MATHEMATICS-II (ETC - 201)**

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

#### **MODULE -I**

##### **Fourier Series and Fourier Transformations:**

Fourier Theorems, Computation of Fourier coefficients, Fourier Series of Change of interval, Even & Odd Functions, Half-Range Fourier Series, Integral Transformation, Fourier Integral and Transformation, Fourier & Inverse Transform, Properties of Fourier Transform (linearity, scaling, shifting, modulation and differentiation), Convolution and its Fourier transform.

#### **MODULE -II**

##### **Laplace Transforms:**

The Laplace Transform (L.T.) of Algebraic, Periodic and Hyperbolic functions. Linearity, Scaling and Shifting Properties of L.T. Derivatives and Integrals, of L.T's, , Inverse Laplace Transforms, Convolution Theorem, Application of L.T to Solutions of differential equation, Special Techniques.

#### **MODULE -III**

##### **Complex Analysis:**

Review of complex numbers, formulae of Euler & De-Moivre, 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 -IV**

##### **Special functions:**

Properties of Power series to solutions for Ordinary Differential Equation, Gamma function, Bessel's equation, **Integral Equations:** Conversion of Linear Differential Equation to an Integral Equation, Solution of an Integral Equations, Integral Equation of Convolution Type.

#### **Books:**

1. Mathematical Methods by **M.C. Potter and J. Goldberg**
2. Advanced Engineering Mathematics - by **E. Kreysjig.**
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 (ETC - 202)**

**Full Marks: 100 (Internal-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

**MODULE-I**

**Properties of Semiconductors:** Introduction, Types of semiconductor, 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. Transistor 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 ckt, 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 ckts, essentials of transistor oscillators, different types of transistor oscillators: Colpitts, Hartley, Phase shift, Wein – Bridge & Crystal Oscillator.

**Communication systems:**

Introduction to communication systems, Radio Communication, Radio Transmitter, Radio Receiver, Satellite Communication, Cellular Telephone Network, Analog Communication, Digital Communication, comparison between Analog and Digital communication.

**Books**

Applied Electronics by R.S. Sedha

Principles of Electronics by V.K.Meheta

## **DIGITAL ELECTRONICS (ETC – 204)**

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

### **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 complements of Binary. **Codes:** BCD, Excess-3, Gray, Octal, Hexadecimal

#### **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

## **BASIC ELECTRONICS -LAB (ETC - 205)**

**Full Marks: 50 (Internal-10, End Term 40)**

1. Study of passive Components (Resistors, Inductors, Capacitors)
2. Study of passive Components (Diode, Transistor, Zener diode)
3. Study the characteristics of PN junction diode.
4. Study of Half wave & Full wave Rectifiers.
5. Study the characteristics of Zener diode.
6. Study the different characteristics of Multimeter (Voltage, current & resistance).
7. Study of input & output characteristics of CB, & CE transistor applications.
8. Study of CRO & Function Generator
9. Study the frequency response of RC coupled Amplifier through CRO.
10. Study the frequency response of Tuned Amplifier through CRO.

## **DIGITAL ELECTRONICS-LAB (ETC - 206)**

**Full Marks: 50 (Internal-10, End Term 40)**

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

## **SEMESTER: III**

### **MATHEMATICS-III (ETC- 301)**

**Full Marks: 100(Internal-20, End Term 80**

**(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<sup>nd</sup> order Cauchy's equations, Solutions of one-dimensional wave equation, One-dimensional heat equation, Steady-state solution of Two-dimensional Heat equation.

#### **MODULE –II**

##### **PROBABILITY DISTRIBUTIONS:**

Random variable and Distribution Functions, Moments, Moment Generating function, Binomial, Poisson, Geometric, Exponential, Gamma and Weibull distributions of Random Variables, Chebychev's inequality. **2-DIMENSIONAL RANDOM VARIABLES:** Marginal and Conditional distributions of Random Variables

#### **MODULE III**

**EXACT SAMPLING DISTRIBUTIONS:** MGFs & Constants of Normal distribution,  $\chi^2$ , t, F, Z-distributions and its Test of Significance.

**RANDOM PROCESSES:** Markov Chain and Markov processes, Binomial, Poisson, Sine-wave Process.

**CORRELATION:** Karl Pearson Coefficient of correlation, Covariance, Rank of correlation.

**REGRESSION:** Regression Lines, Coefficients and their properties, Second degree Regression curves.

#### **MODULE -IV**

**OPERATION RESEARCH:** Concept and Application of Operation Research, **Linear Programming Problem:** Introduction, Formulation and Matrix Form of LPP, Procedure of LPP by Graphical Method, Simplex Method, Artificial Variable Technique as Charne's Big M method, **Goal Programming:** Concept, Programming Model, Model Formulation, Goal Programming Algorithm.

**Text Books:** Kapur V.K. and Gupta S.C., "Mathematical statistics ", S. Chand & Company Ltd, New Delhi, (1997). O'Flynn M., "Probability, Random variables and random processes ", Harper and Row Publishers, New York, (1982)

. S. Kalavathy , Operation Research , Vikash Publishing House Pvt. Ltd

E.Kreyszig, Advanced Engineering Mathematics, 8<sup>th</sup> Edition, Wiley Eastern

##### **References:**

B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.

Higher Engg. Mathematics by V.B.Ramana

## **ELECTRONIC MATERIAL SCIENCE (ETC - 302)**

**Full Marks: 100 (Internal-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.

**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, Preemphasis & 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.



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

**MODULE-I**

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

**MODULE-II**

**Two port network:** 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

**Full Marks: 50 (Internal-10, End Term 40)**

**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 .

**ELECTRICAL CIRCUIT LAB (ETC - 306)**

**Full Marks: 50 (Internal-10, End Term 40)**

Electric Circuit Lab

- 1. Verification of Kirchoff 's Laws
- 2. Verification of Network Theorem.
- 3. Resonance Circuits
- 4. Study of Transients
- 5. Coupled Circuits.
- 6. Study of Bridge Circuits.
- 7. Power Measurements in 3-phase circuits.
- 8. OC and SC tests on Transformers.

## **SEMESTER: IV**

### **COMPUTER ORIENTED NUMERICAL METHODS (ETC - 401)**

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

**(Use of Scientific Calculator May be Permitted)**

#### **MODULE -I**

**Algebraic Equations of Linear Systems:** Representation of linear systems, Solution by Gauss-Elimination method, Gauss-Jordan method, Checking zero pivoted elements, Solution of Ill-Conditioned systems, Jacobi-Iterative Model and Gauss-Seidal Method.

**Algebraic and Transcendental equations:** Solution of non-linear (polynomial) equations by Bisection, Newton-Raphson, Regula-Falsi and Secant methods, Least square method of linear parameters.

#### **MODULE -II**

**Interpolation:** Errors and approximations in numerical methods. Lagrange's interpolation, Finite differences, Newton's forward, backward, divided difference interpolation and relevant symbolic operators.

**Numerical Differentiation:** Differentiations based on finite differences up to Second order.

#### **MODULE -III**

**Numerical Integration:** Integration by Trapezoidal rule, Simpson's 1/3 rule, 3/8 rule and Gaussian rules.

**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, Adam-Bash forth's Predictor-Corrector method.

#### **MODULE-IV**

**Discrete Mathematical Structures:** Proposition and Logic Operation, Conditional Statements, Mathematical Induction, Product of Sets and Partitions, Relation and Digraphs, Matrix Relation, Properties of Relation, Equivalence Relation, Trees, Labeled Trees, Minimal Spanning Trees.

#### **Books Prescribed:**

1. Introductory Methods of Numerical Analysis by S.S. Shastry
2. Computer Oriented Numerical methods by V. Rajaraman
3. Discrete Mathematical Structures by Bernard Kolman, Robert C. Busby, Sharon Ross, PHI Learning Pvt. Ltd, New Delhi ( Chapters- 2, 4 and 7)

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

**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**

**Thyristors:** Types of thyristors, Silicon Controlled Rectifier(SCR), SCR biasing, operation and equivalent circuits, Turning ON and Turning OFF a SCR, V-I characteristics of SCR , V-I characteristics & applications of Diac and Triac, Differences between SCR, Diac and Triac, Unijunction Transistor (UJT), Basic construction, Equivalent Circuits, Silicon Controlled Switch(SCS), its operation and application.

**Regulated D.C. Power Supply:** Regulated power supply, Voltage regulators, Zener follower Regulator, Transistor follower regulator

**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

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

**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

**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 Simon Haykin
3. Principles of Communication Systems by H. Taub, D. Schilling, G Saha

## **MICROPROCESSOR LAB (ETC - 405)**

**Full Marks: 50 (Internal-10, End Term 40)**

### **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).

## **COMMUNICATION LAB-I (ETC - 406)**

**Full Marks: 50 (Internal-10, End Term 40)**

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.

## SEMESTER:V

### **PRINCIPLES OF MANAGEMENT & ORGANIZATIONAL BEHAVIOR (ETC - 501)**

**Full Marks: 100 (Internal-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)



## COMMUNICATION SYSTEM (ETC - 502)

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

### **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

**Full Marks: 100 (Internal-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

**PROGRAMMING IN 'C' (ETC - 504)**  
**Full Marks: 100 (Internal-20, End Term 80)**

**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, goto, while, do-while, for.

**MODULE -II**

Function, Pass by Value, Pass by Reference, Array, Pointer, Pointer to Array, Pointer to Function, Storage Class of Variables.

Structure, Structure Array, Structure to Function, Pointer to structure, File handling.

**MODULE -III**

Searching: Selection Search, Binary Search,

Sorting Techniques, Insertion sort, Selection sort, Bubble sort, Merge sort, Heap sort, Quick sort.

**MODULE -IV**

Linked List, Stack, Queue, Prefix, Infix, Postfix Expressions and Conversion, Tree [Binary, BST-tree, AVL-tree].

**Text Books:**

1. **Programming in ANSI C by E. Balguruswamy**
2. **Data Structure using C by Radha ganeshan**
3. **Data Structures by Seymour Lipschutz**

## **COMMUNICATION LAB-II (ETC - 505)**

### **Full Marks: 50 (Internal-10, End Term 40)**

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]

## **'C' PROGRAMMING LAB (ETC - 506)**

### **Full Marks: 50 (Internal-10, End Term 40)**

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. union
20. structure
21. Pointer to structure
22. File I/O routines
23. Matrix arithmetic
24. Searching techniques
25. Sorting techniques
26. Tree traversal
27. Stack and queue operations
28. Shortest path algorithms

## **SEMESTER : VI**

### **COMPUTER ARCHITECTURE & OPERATING SYSTEM (ETC - 601)**

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

#### **MODULE-I**

Micro Computers, Parallel Computing Models, Multiprocessors, Multicomputers, Multi vector and SIMD Computers and Development Tracks, 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, Three Generations of Multicomputers, Message Passing Mechanism,

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

Latency Hiding Techniques, Principles of Multi Threading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Data Flow Architectures

#### **MODULE-IV**

Parallel Programming Models, Parallel Language and Compilers, Dependence Analysis of Data Array, Code Optimization and Scheduling, Loop Parallelization and Pipelining

Parallel Programming Environment, Synchronization and Multiprocessing Modes, Shared Variable Program Structure, Message Passing Program Development, Mapping Programs onto Multicomputers

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

**BOOKS: 1. Advance Computer Architecture by Kai Hwang**

**2. Computer Organization by Hamachar**

## GRAPHICS AND MULTIMEDIA SYSTEMS (ETC – 602)

**Full Marks: 100 (Internal-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, Bresenham'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 . Prabat K Andleigh and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003.

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

**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

## **MULTIMEDIA LAB (ETC – 604)**

**Full Marks: 50 (Internal-10, End Term 40)**

1. Adobe Photoshop
2. Sound Forge
3. Adobe Premier
4. Macromedia Director
5. 3D- MAX
6. FLASH

## **MEASUREMENT LAB (ETC – 605)**

**Full Marks: 50 (Internal-10, End Term 40)**

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.

## **PROJECT (MINOR) (ETC – 606)**

**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



# **SYLLABUS**

**For**

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

**M.Sc. ETC [Semester VII TO X]**

**KHALLIKOTE AUTONOMOUS COLLEGE**  
**BERHAMPUR-760 001**

**SEMESTER: VII**

Paper Code	Title of the Paper	Marks		Credit
		Sem.End	Internal	
701	Electromagnetic Waves & Antenna Theory	80	20	04
702	Pulse & Digital Circuits	80	20	04
703	Optical Fiber & Satellite Communication	80	20	04
704	RDBMS with SQL Server	80	20	04
705	Linear ICs & Applications	80	20	04
706	Advanced Communication Lab	40	10	02
707	RDBMS Lab.	40	10	02

**SEMESTER: VIII**

Paper Code	Title of the Paper	Marks		Credit
		Sem.End	Internal	
801	Software Engineering	80	20	04
802	Data Communication & Networking	80	20	04
803	Control System.	80	20	04
804	Microwave Tech. & Radar.	80	20	04
805	OOP's with Java Programming	80	20	04
806	Data communication Lab	40	10	02
807	OOP's Lab	40	10	02

**SEMESTER: IX**

Paper Code	Title of the Paper	Marks		Credit
		Sem.End	Internal	
901	Internet & Web Technology	80	20	04
902	Digital Signal Processing	80	20	04
903	Advanced Microprocessor & Microcontroller	80	20	04
904	Digital Image & Speech Processing	80	20	04
905	VLSI Design	80	20	04
906	DSP Matlab	40	10	02
907	Web Development Lab	40	10	02

**SEMESTER: X**

Paper Code	Title of the Paper	Marks		Credit
		Sem.End	Internal	
1001	Broadband communication	80	20	04
1002	Wireless Mobile Comm.	80	20	04
1003	Embedded System	80	20	04
1004	Soft Computing	80	20	04
1005	Project (Major)	200		08

**SEMESTER – VII**  
**ELECTROMAGNETIC WAVES & ANTENNA THEORY (ETC – 701)**  
**Full Marks: 100 (Internal-20, End Term 80)**

**MODULE-I**

**Electrostatics:** Potential gradient, electric dipole, equipotential surfaces, energy stored in an electrostatic field, Gauss'law, boundary conditions, capacitors and capacitances, Poisson's and Laplace's equations, method of images.

**Electromagnetism:** Biot-Savart law, Ampere's circuit law, torque exerted on a current carrying loop by a magnetic field, magnetic vector potential, magnetic field intensity and Ampere's circuit law, boundary conditions, magnetic materials, energy in magnetic field, magnetic circuits.

**MODULE -II**

Maxwell's equations from Ampere's and Gauss's laws, Maxwell's equations in differential and integral forms, equation of continuity, concept of displacement current, electromagnetic boundary conditions, Poynting's theorem, time-harmonic EM fields, application to transformer.

**MODULE -III**

**Plane wave propagation:** Helmholtz wave equation, plane wave solution, plane wave propagation in lossless and lossy dielectric medium and conducting medium, plane wave in good conductor, surface resistance, depth of penetration, polarization of EM wave - linear, circular and elliptical polarization, normal and oblique incidence of linearly polarized wave at the plane boundary of a perfect conductor, dielectric – dielectric interface, reflection and transmission co-efficient for parallel and perpendicular polarizations, Brewster angle.

**MODULE - IV**

**Antennas:** Physical concept of radiation from an antenna, wave equations in terms of potential functions, the concept of retarded vector potential, Hertzian dipole, near zone fields, radiation fields, radiation resistance, directive gain and directivity, magnetic dipole, short dipole antenna, half wave dipole antenna, monopole antenna, pattern multiplication antenna arrays, linear antenna arrays, antenna types (horn, helical, yagi, log periodic, disc).

**Text Books:**

1. Electromagnetic Field Theory, Fundamental by B. S. Guru & Huseyn
2. Electromagnetic fields & Antenna Theory by J.D.Krauss
3. Electromagnetic waves and Radiating Systems E. C. Jordan & K. G. Balmin, 2nd Edition. PHI Pvt.Ltd.
4. Electromagnetic fields by W.H.Hayt Jr.
5. Electromagnetic Theory by Saddique.

## **PULSE & DIGITAL CIRCUITS (ETC – 702)**

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

### **MODULE-I**

**Multivibrators using negative resistance devices:** Stable states, fixed biased and self-biased transistor, commutating capacitors, symmetrical/unsymmetrical triggering, emitter coupled multivibrators, Gate width collector coupled multivibrators, waveforms triggering.

### **MODULE-II**

#### **Time base generator:**

**Voltage time base generator:** Exponential sweep circuit, fixed amplitude sweep, basic principles of Miller and Bootstrap time base generator.

Current time base generator: Simple current sweep, linearity correction, coil capacitance, effect of omission of impulse component.

### **MODULE- III**

**Pulse transformers:** Pulse transformer models and equivalent circuits, transformer impedances, rise time response, pulse response of the transformer, triggered transistor blocking oscillator with base and emitter timing.

### **MODULE- IV**

**Sampling gates:** Operating principle, unidirectional diode gate, bidirectional gate using diodes and transistors, reduction of pedestal in gate circuits, balance condition in bidirectional gates, signal input resistance, four-diode gate, six diode gate.

**Synchronisation and frequency division:** Pulse synchronisation, Frequency division in sweep circuits, synchronisation with symmetrical signals, frequency division with sweep circuits, stability of a relaxation divider.

#### **Text Book:**

1. Pulse , Digital and switching Waveforms - Jacob Millman and Herbert, Taub (TMH Publication).
2. Pulse and Digital Circuits by A. Anand Kumar, PHI
3. OP-Amp & Linear Integrated circuit by Ramakanta A. Gayakward.

## **OPTICAL FIBER & SATELLITE COMMUNICATION (ETC – 703)**

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

### **MODULE-I**

Int. to optical communication, principles of light transmission, optical fiber modes and configuration, Optical sources: L.E.D's, LASER Diodes, Power Launching & Coupling, Population Inversion, Fiber splicing, optical connector, photo detector: PIN, Avalanche, Modulation Techniques: Misalignment, Fiber to Fiber joints.

### **MODULE -II**

Signal Degradation in optical fibers, Attenuation losses, signal distortion in optical waveguides, material dispersion, chromatic dispersion, Intermodal distortion, mode coupling, Advance fiber design: Dispersion shifted, Dispersion flattened, Dispersion compensating fiber, Design optimization of single mode fibers. Coherent optical fiber communication,

### **MODULE -III**

WDM concepts and components, operation, Tunable Filters, Directional coupler, Dispersion Management. Optical Amplifiers – EDFA, Photonic Switching, Optical Networks: SONET/SDH, Optical Interfaces, Ring Topology, Star Architecture

### **MODULE -IV**

Evolution of Satellite Technology, Communication Satellites, Orbital Mechanics, Kepler's Laws of planetary motion, Specialization to Geostationary satellites, Orbital perturbations, Low Earth and Medium orbits, Satellite Link design: Introduction, System Noise Temperature and G/T Ratio, Noise Temperature, Link Budgets, Carrier to Noise ratios in Uplink and Downlink.

Satellite multiple access methods. FDMA, TDMA, CDMA Systems, DS-SSCDMA, Rain attenuation, Antennas: Radiation pattern, half wave Dipole, VSAT systems: Overview, Network architecture, Basic Techniques, Satellite Mobile services, Radarsat, Global positioning Satellite System

#### **Text Books:**

1. G. Keiser, "Optical Fiber Communication (3rd Edition) ", Mc Graw Hill International, 2000.
2. A. Ghatak and K. Thyangarajan, "Int. to fiber optics" Cambridge University press, 1998.
3. « Satellite Communication », Dennis Roddy PHI
4. 4 Richharia, M. Satellite communication
5. Satellite communication by Timotty Pratt.
6. Optical Fibre Communication by Senior. (PHI)

## **RDBMS WITH SQL SERVER (ETC – 704)**

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

### **MODULE-I**

**Database:** Introduction, File based approach & Database approach, Basic Components of database design.

**DBMS:** Introduction, Features, Merits, Limitations, Applications, Components of Database Environment, Roles of DBA, Components of Database Language (DDL, DQL, DML, DCL, TCL).

**RDBMS:** Introduction, Features, Comparison of DBMS & RDBMS.

**Database System Architecture** – Data Abstraction, 3-Level Architecture, Data Independence,

**Data models** – Hierarchical Model, Relational Model, Entity Relationship(ER) Model, Network Model.

**Constraints:** Introduction & Types.

### **MODULE -II**

**Relational Algebra:** Introduction & Operations

Relational Query Languages, Relational Calculus: Tuple and Domain Relational Calculus, SQL and QBE. Relational Database Design: Domain and Data dependency, Armstrong's Axioms, , Comparison of Oracle & DB2

**Normal Forms:** Introduction, Types (1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Dependency Preservation, Lossless design.

### **MODULE -III**

**Query Processing:** Introduction, Phases, Evaluation of Relational Algebra Expressions, Query Equivalence, Evaluation of Cost of Query using different operations.

**Query Optimization Algorithms.**

**File Organization:** Introduction, Types (Sequential, Index-sequential, Direct, Heap, Multilist)

**Hashing:** Introduction, Techniques, Operations

Recovery & Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.

### **MODULE -IV**

**Advanced topics:** Object-Oriented and Object Relational databases, Mobile Database, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

**Text Books:-**

1. Elmaski & Navathe –Fundamentals of Database Systems, 4<sup>th</sup> Edition, Pearson Education
2. C.J.Date – An introduction to Database Systems, Pearson Education
3. Bipin Desai –An introduction to Database System, Galgotia Publication.

**LINEAR IC & APPLICATIONS (ETC – 705)**  
**Full Marks: 100 (Internal-20, End Term 80)**

**MODULE-I**

**Analog system blocks:** Delay equalizer in active filters, cascade video amplifiers, comparators, logarithmic amplifiers, emitter coupled logic, analog multiplexers.

**MODULE -II**

**Signal Convertors:** Sample and hold circuits. analog to digital convertors [successive approximation, ramp compare, dual slope & delta encoded], digital to analog convertors [binary weighted current source & R2R ladder & Delta Sigma].

**MODULE -III**

**Waveform generator:** Phase shift oscillator, Wien bridge oscillators, quadrature oscillators, square, triangular and saw tooth wave generator, voltage controlled oscillators, zero-crossing detector, Schmitt trigger, voltage limiter, voltage to frequency and frequency to voltage conversion.

**MODULE -IV**

**Voltage regulators:** Clipper and clamper circuits using OPAMP, fixed voltage regulators, adjustable voltage regulators, switching regulators, PWM regulators.

**Specialized applications:** Universal active filters, switched capacitor filter, 555-timers & its application, 565-phase locked loop and its application, frequency multiplication and division.

**Text Books:**

1. Op-amps and Linear Integrated circuits : R F Coughlin – Pearson Education/PHI
2. Op-amps and Linear integrated Circuits: Gaykwad

**References:**

- 1) Integrated Electronics by Milliman Halkis

## **ADVANCED COMMUNICATION LAB (ETC – 706)**

### **Full Marks: 100 (Internal-10, End Term 40)**

1. Measurement of Refractive Index profile, Numerical Aperture attenuation and dispersion in a multimode optical fiber.
2. Establishing and Testing an optical Fiber Communication Link.
3. Designing an optical fiber communication link to a given specification.
4. Simulating Program in MATLAB for Unit Impulse & Ramp.
5. Simulation program in MATLAB for Sine & Square wave.
6. Simulation program in MATLAB for Cosine & Triangle wave.
7. Simulation program in MATLAB for Sawtooth wave.

## **RDBMS LAB (ETC – 707)**

### **Full Marks: 100 (Internal-40, End Term 40)**

1. SQL Statements: DDL, DQL, DML, DCL, TCL (Syntax with Example.)
2. SQL Operators, Clauses, Functions
3. SQL Constraints
4. SQL Set Operators & Joins
5. SQL Objects: Synonyms, Views, Sequences and Index
6. Security Management using SQL (DCL Commands)
7. PL/SQL: Simple Statements, Conditional, Iterative, Sequential, Case
8. PL/SQL Cursors
9. PL/SQL Functions & Procedures.



## **SEMESTER-VIII**

### **SOFTWARE ENGINEERING (ETC- 801)**

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

#### **MODULE-I**

Software Engineering: Introduction, Importance, Evolution, Applications.

Software Development Life Cycle: Introduction, Stages with Examples.

Software Development Models, Capability Maturity Model, Modeling the System Architecture.

#### **MODULE -II**

**Software Requirement Analysis**, Software Requirement Specification.

**Software Design**: Types Design methods.

**Software Testing**: Types of Testing Tools.

#### **MODULE -III**

**Software Project Management:**

Software Project Planning, Software Management Activities, Software Management Structures, Programmer Productivity, Different types of project metrics, Software project estimation, Models for estimation, Automated tools for estimation Project Scheduling, Estimating efforts and lines scales, Algorithmic cost modeling, The COCOMO model

**Software Quality Assurance**: Criteria for Software Quality, Software Reliability, Software Standards, Software Metrics, Software validation, Testing Techniques and Strategies, Software Maintenance, Software Configuration Management

#### **MODULE -IV**

**CASE Tools & Environment**

Project Management Tools, Documentation Tools, Analysis and Design Tools, Programming Tools, Integration and Testing Tools, Projecting Tools, Maintenance Tools, Integrated CASE Environment.

**Text Book :**

1. Fundamentals of software Engineering – Rajib Mall. (PHI – 2nd Edition) .
2. Text book on software Engineering –R.Pressman

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

**MODULE –I**

Overview of Data Communications and Networking :

Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.

Digital Transmission : Line coding, Block coding, Sampling, Transmission mode.

Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.

Multiplexing : FDM 150, WDM 155, TDM 157,

Transmission Media : Guided Media, Unguided media (wireless) , Circuit switching and Telephone Network

**MODULE –II**

Overview of OSI Model, Data Link Layer

Error Detection and correction : Type of Errors, Detection, Error Correction

Data Link Control and Protocols: Flow and error Control, Stop-and-wait ARQ. Go- Back. N ARQ, Selective Repeat ARQ, HDLC.

**MODULE –III**

Point-to – Point Access : PPP

Point –to- Point Protocol, PPP Stack,

Multiple Access :

Random Access, Controlled Access, Channelization.

Local area Network : Ethernet.

**MODULE –IV**

Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

Network Layer : Host to Host Delivery: Internetworking, addressing and Routing

Network Layer Protocols: ARP, IPVA, ICMP, IPV6 ad ICMPR6

Transport Layer : Process to Process Delivery : UDP; TCP congestion control and Quality of service.

Application Layer : Client Server Model, Socket Interface Domain Name System (DNS):

Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Security : Cryptography, Message security, User Authentication.

**Text Book :**

1. Data Communications and Networking : Third Edition. Behrouz A. Forouzan Tata Mc Graw-Hill Publishing company Limited.
2. Computer networks by William Stallings .
3. Computer Network by A.S. Tannenbum

# CONTROL SYSTEM (ETC- 803)

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

## **MODULE-I**

Basic concepts of control systems, Open loop and closed loop systems, difference between open loop and closed loop systems, classifications

Mathematical model of physical systems, transfer function, block diagram algebra, signal flow graph (SFG), Mason's gain formula, application of SFG to control systems

**Feedback theory:** Types of feedbacks, effect of degenerative feedback on control system, regenerative feedback.

## **MODULE-II**

**Time domain analysis:** Standard test signals, Step, ramp, parabolic and impulse signals, Time response of first order systems to unit step and unit ramp inputs, Time response of second order systems to unit step input, Time response specifications, Steady state errors and error constants of different types of control systems, Generalised error series method.

**Concepts of stability:** Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, application of Routh stability criterion to linear feedback systems, relative stability.

**Root locus techniques:** Root locus concepts, rules for construction of root loci, determination of roots from root locus, root contours, systems with transportation lag

## **MODULE- III**

Frequency domain analysis of systems, advantages and limitations, co-relation between time domain and frequency domain, Bandwidth, Bode plots for systems, Nyquist plots for systems.

**Compensation of control system:** Types of compensation, compensating networks, Lead and Lag compensator, Compensation using root-locus.

**State variable analysis:** state model of linear systems, State-Space representation using physical phase and canonical variables, Transfer function for State model, Solutions to state models.

## **MODULE-IV**

**Controller Principles:** Properties and classification of controllers, Proportional controllers, Integral controllers, Derivative controllers, Composite controllers, PI, PD and PID controller, effect of controllers on first order and second systems.

### **Text Books:**

1. Control Systems Engineering by I J. Nagrath, M. Gopal, Third Edition, New Age International Publishers.
2. Modern Control Engineering by K. Ogata, PHI
3. ADVANCED CONTROL SYSTEM BY B.C.KUO

## MICROWAVE TECHNOLOGY & RADAR (ETC- 804)

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

### MODULE – I

**Introduction to Microwave:** History, microwave region & band descriptions, advantages of microwave, applications of microwave.

Electromagnetic: Introduction, Maxwell's equation, amperes law, faradays law, gauss's law.

**Transmission Lines:-** Introduction, two wire parallel transmission line, voltage & current relationship, characteristic impedance, reflection co-efficient, propagation constant, input impedance, standing waves, voltage standing wave ratio, impedance at a voltage minimum & at a voltage maximum, impedance matching, stub matching.

### MODULE – II

Waveguides (single line), types of wave guides , propagation of waves in rectangular wave guide , propagation of TEM waves, TE and TM modes, propagation of TM waves in rectangular wave guide , Boundary conditions , Guide wavelength , Group velocity and phase velocity, expression for phase velocity and group velocity, relation between TM modes in rectangular waveguide, propagation of TE waves in a rectangular wave guide, Te modes in rectangular wave guide.

### MODULE – III

**Semiconductor Microwave Tubes:** Klystrones: ( Two cavity, reflex ), magnetrons

Semiconductor Microwave Devices: - Introduction, varactor diodes : construction, equivalent circuit & applications, parametric amplifier, PIN diode : operation & applications, schottky barrier diode, tunnel diode, gunn diode, IMPATT diode, MASER & Laser.

**Microwave Communication Systems:-**Introduction, propagation modes, microwave systems, analog microwave communication ( LOS system, OTH system, transmission interference & signal damping, duet propagation, fading in troposphere and its effect on troposcatter propagation, digital microwave communication microwave antenna (Horn antenna, parabolic reflectors, lens antenna)

### MODULE – IV

**Radar Fundamentals:-** Introductions; Basic concepts, Advantages, limitations, applications, Block diagram of a simple radar, classification (continuous wave and pulsed radar), radar range equation, factors affecting range of a radar, pulsed radar system, radar receivers, plan position indicator, scanning & tracking with a radars, CW doppler radar, moving target indicator (MTI) radar, radar antennas.

Text Books :

- 1 Microwave & Radar Engineering – by M. Kulkarni
2. Microwave & Radar Systems – by A.K. Maini.

Reference Books :

1. Principles of Microwave Engineering By Reich, Oudong and Others.
2. Microwave Device and Circuit, 3rd Edition, Sammuel Y., Liao, Perason

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

**MODULE – I**

Fundamentals of Object – oriented programming. Introduction, concepts of object – oriented programming: Object & Classes, data abstraction & encapsulation, Inheritance, Polymorphism, Dynamic binding & message communication. Introduction to Java, Java features, hardware & software requirements, java environment. An overview of Java:- Simple java program, JVM, command line arguments, constants, variables, data types, arrays, operators, control statements (Branching & Looping).

**MODULE – II**

**Classes, Objects & Methods :-** Introduction, defining a class, adding variables, methods, creating objects, constructors, method overloading, this keyword, garbage collection, finalize method, access control (static, final), Nested & inner classes. Inheritance: Basics, superclass & subclass, method overriding, abstract classes, **Final classes. Package :-** Introduction, Java API packages, creating package, accessing & using a package. **Interfaces: -** Introduction, defining interfaces, extending interfaces, implementing interfaces.

**MODULE – III**

**Multithreaded Programming :-** Introduction, creating threads, extending the thread class, stopping & blocking thread, lifecycle of a thread. Exception Handling:- Exceptions, types of exceptions, try & catch, throw, throwe, finallyStrings:- Strings constructors, length, operations, character extractions, comparison, searching, modifying, string buffer class, string tokenizer & date class.

**MODULE – IV**

**Java.lang:-**Number, character, math & throwable. **Java. io :-** Introduction, concept of stream, stream classes, byte stream classes ; Input stream, output stream, character stream : reader stream, writer stream.**Java.applet :-** Introduction, applet lifecycle, passing parameters to applets. **Graphics Class :-** Introduction, graphics class, line & rectangles, circle & ellipses, ace drawing, drawing polygons, font settings. **Java.awt :-** Text component class, text field, scroll bar, text area, menubar & menu class, button class, label class, applet with buttons and labels, buttons in action, check box, check box group, choice class, list menu. **Event Handling :-** Event classes, event listener, key events, mouse event. **Java Database Connectivity:-** Introduction, JDBC Driver, statements, caching database results.

Text Books:

1. Programming with Java - E. Balagurusamy.
2. Programming with Java2 - C. Xavier.

Reference Books:

1. Java 2 Complete reference (TMH)

**DATA COMM. LAB. (ETC- 806)**

**Total Marks 50**

1. Study of Amplitude Shift Keying
2. Study of Frequency Shift Keying.
3. Study of Phase Shift Keying.
4. Study of Pulse Code Modulation.
5. Study of AM type Transmitter.
6. Study of AM type Receiver.
7. Study of SSB Transmitter.
8. Study of SSB Receiver.
9. Computer Networks (Ethernet)

**OOP'S LAB (ETC- 807)**

**Total Marks 50**

1. Programs on concept of classes and objects.
2. Programs using inheritance.
3. Programs using polymorphism.
4. Programs on use of operator overloading.
5. Programs on use of object management.
6. Programs on exception handling and use of templates
7. Programs on File handling in JAVA.
8. Design problem on stock and accounting of a small organization, railway reservation, payroll preparation and optimization problem.

## SEMESTER – IX

### INTERNET & WEB TECHNOLOGY (ETC- 901)

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

#### **MODULE – I**

**Introduction of Communication:** Dial-up connection, ISDN connection, DSL connection, client server model & types. Introduction to Internet: Modem, characteristics of a modem, connectivity for us.

Protocol: SMTP, POP3, PPP / SLIP, TCP / IP, HTTP, FTP, WAP, internet IP Address, Domain name, browser, URL, internet services, electronic mail & its advantages & disadvantages, World Wide Web, E-commerce & Electronic Data Interchange (EDI)

#### **MODULE – II**

Introduction to HTML, HTML tags, documents, header section, body section, headings, formatting characters (text), font tag, image & pictures, listing, link documents using anchor tag, table handling in HTML, creating frames & forms (Frameset definition, frame definition, nested frameset, HTML forms, elements of a form).

#### **MODULE – III**

Introduction to JavaScript, client-side JavaScript and server-side JavaScript, advantages of JavaScript, writing JavaScript into HTML, Elements of JavaScript: Data types, variables, operators, conditional statements, array objects, date objects, string objects, Objects & Events: Document object, Image object, forms & elements, event handling & data validation.

Functions in JavaScript: (Built in function, declaring functions, passing parameters, recursive functions) Dialog boxes: (Alert, prompt, & confirm dialog boxes).

#### **MODULE – IV**

Introduction to JSP, Client responsibility, server responsibility, JSP architecture, JSP server, JSP tags, request object, response object, business processing with JSP.

JSP with JDBC : creating ODBC data source, introduction to JDBC, prepared statement class, reading from database table, resultset class, extracting data from resultset object, creating new row in a table, update data in a table & deleting rows from the table, Examples.

#### Text Books :

1. Unit- I, II, III & IV ---- Web Technology & Design by C. Xavier.
2. Unit-V -----Web Technologies (part-I) by Ivan Bayross (BPB)

## **DIGITAL SIGNAL PROCESSING (ETC- 902)**

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

### **MODULE – I**

**Discrete Time Signals and System:** Discrete Time Signals (Elementary examples, classification: periodic and a periodic Signals energy and Power signals , Even and Odd Signals).

**Discrete Time System :** Block diagram representation of discrete time systems, classification of discrete time systems time variant and time – invariant, linear and non-linear, casual and anti-casual, stable and unstable.

### **MODULE -II**

Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system. Constant coefficient differences equations and their solutions, impulse response of LTI system, structures of LTI systems Recursive and Non-recursive realization of FIR system.

**The Z transform:** The Z-transform and one-sided Z-transform, properties of Z-transform, inverse of the Z-transform , Solution of difference equations.

### **MODULE -III**

**The Discrete Fourier Transform:** The DFT and IDFT, relationship, DFT with Z- transform, the DFT as a linear transformation Relationship of DFT with Z-transform, properties of DFT: periodicity, linearity, summery and time reversal of a sequence.

Circular convolution, and correlation by DFT method, Overlap add and save filtering by DFT method.

### **MODULE -IV**

**Fast Fourier Transform :** Operation counts by direct copulation of DFT, Radix – 2 FFT algorithm- Decimation –in-time (DIT) and Decimation – in frequency (DIF) algorithm, Efficient computation DFT of Two real sequences , Efficient Computation of DFT of a 2 N-pt real sequences.

#### **Design and Digital Filters:**

Casually and its implication, Design of linear phase FIR filters using different windows. Design of IIR filters – Impulse Invariance Method and Bilinear transformation method.

Implementation of Discrete Time System structure of FIR systems: Direct form, cascaded form. Structure IIR Systems - Direct form I & II realizations

#### **Text Books :**

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 3rd Edition, Pearson.
2. Digital Signal Processing by S. Salivahanan, TMH

#### **Reference Book :**

Digital Signal Processing – schaums Outlines series  
DSP by Ramesh babu  
DSP by Oppen Ham & Shaffer



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

**MODULE-I**

Review of 8086 microprocessor, memory addressing, interrupt mechanism and types of instruction.

80186 and 80286 microprocessor architecture, memory organization, interrupt mechanism, types of instructions, and modes of operation.

**MODULE-II**

80386 and 80486 microprocessor architecture, memory organization, interrupt mechanism, DMA mechanism.

Memory addressing, virtual memory, paging and segmentation

**MODULE-III**

RISC and CISC architecture, Superscalar architecture, floating point unit and MMX unit in Pentium processors, Pentium architecture, Hyperthreading, Cache memory organization, Virtual memory, Interrupt mechanism, DMA mechanism Types of instructions.

Multicore processor architectures.

**MODULE-IV**

ARM microprocessor architecture, types instructions, interrupt mechanism and DMA mechanism  
Digital Signal Processor (TMS 320 series) architecture, types instructions, interrupt mechanism, DMA mechanism

Motorola 680X0 processor architecture, types of instruction interrupt mechanism, DMA mechanism

**Case studies:** Traffic control system, Electronic weighing scale, Barcode reader.

**TEXT BOOKS :**

1. Advanced microprocessors and peripherals by A.K.Ray and K.M. Bhurchandi
2. Computer organisation by Hamacharvransic and Zaky
3. Intel microprocessors by Bary B Brey

### **MODULE-I**

Different stages of Image processing & Analysis Scheme. Components of Image processing System, A Review of various Mathematical Transforms. Fuzzy sets and properties: Mathematical Morphology, Image Formation: Geometric Model, Image Digitization: A review of Sampling and quantization process. A digital Image.

### **MODULE-II**

Image Enhancement: Contrast Intensification, Smoothing, Image sharpening. Restoration: Minimum Mean-Square Error Restoration Restoration by Homomorphic Filtering. Image Compression: Schematic diagram of data Compression Procedure, Lossless Compression-Coding, Geometric Transformation.

2-D DFT & IDFT. Image Segmentation: Detection & Discontinuity, Edge Linking & boundary detection, Thresholding Region based Segmentation, Wavelet Transform: Perception of colour, Processing of colour images.

### **MODULE-III**

The Fundamentals of Digital Speech Processing, Digital Representations of Speech Waveform. Sampling speech signals, Time –Domain Methods for Speech Processing. Time- Dependent processing of speech, Short-time energy and Average Magnitude, Short time Average Zero- Crossing Rate.

Statistical Model, Instantaneous quantization, Instantaneous Companding, Quantization for optimum SNR, Adaptive Quantization, Feed-Forward and Feedback adaptations.

### **MODULE-IV**

Linear predictive Coding Speech.

Block diagram of simplified Model for speech production, Basic principle of Linear Predictive Analysis The Auto Correlation Method. The predictive Error Signal.

Digital Speech Processing for Man-Machine Communication by Voice, Speaker Recognitions System-Speaker verification and speaker Identification systems.

#### **Textbook: (Digital Image Processing)**

Digital Image Processing and Analysis by B.Chanda & D.DuttMajumdar, PHI,2001, Selected persons from Chapter 1-10.

Fundamentals of Digital Image Processing by Anil K Jain, Pentice Hall of India- 2002.

Digital Image Processing- 2nd Editions by Rafael C. Gonzalez and Richard E. Woods, Pearson Education.

Additional Reading

Digital Image Processing using MATLAB by R.C. Gonzalez, R.E. Woods and Steven L. Eddins, Pearson Education.

Textbook: (Digital Speech Processing)

## VLSI DESIGN (ETC- 905)

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

### **MODULE-I**

**INTRODUCTION:** Introduction to IC Technology, VLSI Design Methodology, Y-Chart, VLSI Design Flow, Design Hierarchy, Concept of Regularity, Modularity and Locality, VLSI Process Technology: Photolithography, Oxidation, Diffusion, Ion Implantation, Etching, Metallization, Packaging, MOS Transistor: Structure, Structure & Operation of MOS transistor, V-I Characteristics Of MOSFET, MOSFET Scaling, MOSFET Capacitances, MOSFET Threshold Voltage

### **MODULE-II**

**CMOS Logic Design:** Design of CMOS Inverter, Design of CMOS NAND gate, NOR gate, XOR gate, XNOR gate, AND gate, OR gate, BiCMOS Inverter, VLSI CIRCUIT DESIGN PROCESSES: Stick Diagrams, Design Rules and Layout, 2m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for CMOS Inverters and Gates, GATE LEVEL DESIGN : Logic Gates and Other complex gates

### **MODULE-III**

Combinational MOS logic circuits, CMOS logic circuits, Complex logic circuits, Pass transistor Logic, Sequential Logic Circuit-Introduction, SR latch, Clocked latch & Flip Flop Circuits, CMOS D latch and edge triggered flip flop, Dynamic logic circuits: Dynamic logic, Basic principles, High performance dynamic CMOS circuits, Dynamic RAM, SRAM, Flash Memory.

### **MODULE-IV**

**SUBSYSTEM DESIGN:** Subsystem Design, Shifters, Adders, ALUs, Multiplexers and Comparators, Semiconductor integrated circuit design: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Digital Design Using VHDL: Introduction, Modeling in VHDL: Combinational & sequential circuit design Using Dataflow, Behavioral and Structural Modeling, Design capture tools, Design Verification Tools, VLSI TESTING : Introduction, Importance of Testing, Fault Models & Simulation, Design for Testability, Boundary Scan Test, Built-In Self Test,

#### **Text Book:**

Digital Integrated Circuits- Analysis & Design – Sung Mo-Kang & Yussuf Leblebici, TMH.

VHDL Programming by example – Perry TMH.

#### **Reference Books:**

Digital Integrated Circuits: A Design Perspective- Rabey et.al.Pearson Education.

VLSI design Techniques for analog and digital circuits- Geiger et.AI.McGraw Hill.

VLSI – Puckneln & Eshagraine (PHI)

**DSP MATLAB (ETC- 906)**

**Total Marks 50**

1. Different types of Signal generation using Matlab. (both continuous and discrete.)
2. Linear Convolution of sequences. (Without using the inbuilt function (conv) available in Matlab.)
3. Circular Convolution of two Sequences Comparison of result with the result obtained from Linear convolution.
4. i) Finding Auto correlation of a sequence  
ii) Finding cross correlation of 2 sequences .  
iii) Finding power spectral density of a sequence .
5. Finding the convolution of periodic sequence using DFT and IDFT.
6. Implementation of FFT (Fast Fourier Transform) algorithm  
i) Decimation in Time (DIT)  
ii) Decimation in Frequency (DIF)
7. Design of FIR filter (lowpass, highpass,bandpass). Using windowing technique (hanning window, hamming, window rectangular window, Kaiser window.
8. Design of IIR filter. (Design of Butterworth Filter Design of Chebyshev filter)
9. Convolution of long duration sequences using overlap add, overlap save meter.
10. Working with a DSP processor. (fixed point -TMS320C-5X / Floating point ) series.  
i) Implement convolution (Linear & circular convolution )  
ii) FIR & IIR implementation .

***Lab. Reference :***

Digital Signal Processing a hands –on approach by Schucer C, Mohesh Chgave. (TMH)

DSP – using MATLAB by Sanjit Mitra

**WEB DEVELOPMENT LAB (ETC- 907)**

**Total Marks 50**

Internet Concepts & Browsing

HTML programming.

JavaScript /VB script programming.

JSP Programming

Servlet Programming

XML programming.

**SEMESTER-X**  
**BROADBAND COMMUNICATION (ETC-1001)**  
**Full Marks: 100 (Internal-20, End Term 80)**

**MODULE -I**

**Telecommunication Concepts:** Components of Broadband Communication Systems, Communication Network Architecture & Cable Broadband Data Network Architecture & its Importance, Internetworking, Intranet & Extranet: Overview, technologies, Applications, Design Issues, Power-Law Rule for Intranet & extranet

**MODULE -II**

**Integrated Service Digital Network (ISDN):** ISDN Devices & Interfaces, Services, Architecture, BISDN: Interface & Terminals, ATM technology, ATM Standards & Network, BISDN Architecture and its application  
**Virtual Private Network:** General Architecture, Dial-In VPN, Advantages & Disadvantages, VPN Standards & Security Issues

**MODULE -III**

**Cellular Communication:** Fundamental Features, Cellular Network, Cellular Standards, Cellular Digital Packet data network Architecture & its application, Fax Machine-Introduction to various working and operational Techniques, Important Features, Application, Cable Modem technology, External & Internal Cable Modem, Cable Modem systems Standards compliance

**MODULE -IV**

**Introduction to New technologies:** Wi-fi, Wi-Max, IPTV, Wireless ATM

**Networking Technologies:** X.25 Technology: X.25 devices, X.25 Virtual Circuits, X.25 Protocol Suite, Benefits and Drawbacks of X.25, Frame Relay Technology: Frame Relay Protocol Data Unit, Advantages & disadvantages, Frame relay Versus X.25, Application of Frame relay

**Internet-Based Networks:** internet protocol Suite, IPv6, Applications and services, Voice over IP: VoIP network, applications & benefits, Internet security, Flow control

Digital Subscriber Line Systems (DSL) Technology, IDSL, CDSL, VDSL

**BOOKS:**

1: Broadband communication Systems: C.M.Akujuobi, M.N.O. Sadiku , PHI Publications

## WIRELESS MOBILE COMMUNICATION (ETC-1002)

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

#### MODULE-I

A brief introduction to Mobile Telephony, Technologies and Choices.

**Cellular Concept** – System Design: Fundamentals: Frequency reuse, Channel Assignment, Handoff Strategies, Interferences and System Capacity, Trunking and Grade of Service; Improving coverage and capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters and Range Extension, Microcell & Picocell Zone Concept. Antennas for Base Station and hand held Cellular phone.

#### MODULE -II

**Mobile Radio Propagation:** Large –Scale path loss, Ground Reflection Model , Diffraction, Scattering, Outdoor propagation Model – Okumura Model; Indoor Propagation Model: Partition losses, Log distance Path loss Model.

Small Scale Fading and Multipath, Doppler Shift . Types of Small Scale Fading and their effect on received signal.

#### MODULE -III

**Wireless Networking:** Various Generations of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks – Circuit Switching, Packet Switching. The X . 25 Protocol.

**Global System for Mobile (GSM):** features, architecture, channel types, Frame Structure in GSM. Signal processing in GSM , CDMA Architecture.

#### MODULE -IV

**Wireless Application Protocol (WAP) :** The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML), Wireless Local Loop (WLL) : Introduction to WLL Architecture, wireless Local Loop Technologies.

**Third Generation (3G) Mobile Services :** Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision,

**General Packet Radio Services (GPRS):** GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs) IEEE 802.II standard, Mobile IP.

#### Text Books :

1. Wireless Communication, 2nd Edition by Theodore S. Rappaport , Pearson Publication.
2. Mobile Communication Engg., 2nd Edition by William C. Y. Lee Mc Graw Hill International Edition.
3. Mobile Cellular Communications, 2nd Edition by William C. Y. Lee Mc Graw Hill International Edition.
4. Mobile Communication, 2nd Edition by Jocken Schiller, Pearson Education.
5. Wideband Wireless Digital Communication by Andreas F. Molisch Editor Pearson Education.

## **EMBEDDED SYSTEM (ETC-1003)**

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

### **MODULE-I**

**Introduction:** An embedded system, Processor in the system, other hardware units, software embedded into a systems, exemplary embedded system-on-chip (SOC) and VLSI circuit

**Devices and Device Drivers:** I/O devices, Timer and counting devices, serial communication using the IC, CAN and advance I/O buses between the networked multiple devices, Host system or computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advance buses, Device drivers, Parallel port devices drivers in a system, Serial port devicedrives in a system, Interrupt servicing (Handling) mechanism.

### **MODULE -II**

**Software and Programming Concept :** Processor selection for an embedded system, memory selection for an embedded system, Embedded programming in C ++, Embedded programming in JAVA, Unified modeling language (UML), Multiple processes and application, problem of sharing data by multiple tasks and routines, Inter process communication.

### **MODULE -III**

**Real time Operating System:** Operating system services, I/O subsystem, Network operating system, Real Time and embedded system, Need of well tested and debugged Real time operating system (RTOS), Introduction to C/ OS- II.

### **MODULE -IV**

**Case studies of programming with RTOS:** Case study of an embedded system for a smart card Hardware and Software Co-design : Embedded system project management, Embedded system design and co-design issues in system development process, design cycle in the development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

#### **Text Books:**

1. Embedded System Architecture, Programming and Design, Raj Kamal, TMH
2. Hardware Software Codesign of Embedded System, Ralf Niemann, Kulwer Academic
3. Embedded Real time system Programming, Sriram V. Iyer and PankajGupat, TMH

## **SOFT COMPUTING (ETC-1004)**

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

### **MODULE-I**

Basic tools of Soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing, Non-linear Error surface and optimization **Fuzzy Systems:** Fuzzy Logic Systems: Basic of fuzzy logic theory, Crisp and fuzzy sets, Basic Operations of Crisp and Fuzzy Set. Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference, De-Fuzzification

### **MODULE -II**

Fuzzy Logic Control; Mamdani and Takagi - Sugeno Architectures, Applications to Pattern Reorganization.

**Neural Networks:** Single and Multi layer Neural networks, Perceptron Network, Activation functions, ADALINE: Its training Algorithm and capabilities, Weights learning, Multilayer Perceptrons; Error Back propagation, Generalized delta rule, Radial Basis Function Networks.

### **MODULE -III**

Least-Square training algorithm, Kohonen's Self-organizing map and Learning vector Quantization networks. Recurrent Neural networks, Simulated Annealing Neural Networks, Adaptive Neuro-Fuzzy Inference System (ANFIS), Applications to control and Pattern Recognizations.

### **MODULE -IV**

**Evolutionary Computing:** Genetic algorithms: Basic concepts, Encoding, Fitness function, Reproduction, Crossover: Single, Two points and Ordered Crossover. Differences of GA and Traditional Optimizations Methods. Basic Genetic Programming Concepts and Applications.

#### **Books of prescribed:**

Neuro-fuzzy and Soft Computing J.S.R. jang. C.T. SUN and E. Mizutani, PHI Pvt. Ltd., New Delhi.

#### **Books of Reference:**

1. Principles of Soft Computing S.N.Sivanandan & S.N.Deepa, Wiley India Pvt.Ltd.
2. S. Haykins, "Neural networks: a comprehensive foundations". Pearson Education.



**PROJECT (MAJOR) ETC-1005**

**Total Marks 200**

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 - 100(4 Credit)
2. Presentation / Seminar – 50 (4 Credit)
3. Viva - 50 (2 Credit)