

**SYLLABUS**  
**PRESCRIBED FOR**  
**FOUR YEAR DEGREE COURSE IN**  
**BACHELOR OF ENGINEERING**  
**ELECTRONICS & TELECOMMUNICATION /**  
**ELECTRONICS ENGINEERING**  
**SEMESTER PATTERN (CREDIT GRADE SYSTEM)**  
**SEMESTER: THIRD**

**3XT01 / 3XN01**

**MATHEMATICS-III**

Prospectus No. 111719, 3 SULLI Mathematics-III, III & IV semester B.E. Electronics & Telecommunication / Industrial Electronics, Semester Pattern

**3XT02 / 3XN02**

**COMPUTER PROGRAMMING AND APPLICATIONS**

**SECTION-A**

- Unit I :** Principles of object oriented Programming: OOP'S paradigm, basic concept of OOP'S Benefits of OOP'S, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.
- Unit II :** Functions classes and object in C++: Functions, Function over loading, Friend Functions, types of classes and its use, concept of object and its implementation, constructor and destructors.
- Unit III :** Operator's overloading:  
 Operator and their definition, overloading unary and binary operator, Rules for overloading operators, overloading binary operators using friends and string manipulation.

**SECTION-B**

- Unit IV :** Inheritance and Polymorphism:  
 Defining derived classes, single and multiple inheritance, multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual function.
- Unit V :** Solution of Nonlinear and Polynomial Equations:  
 False position, modified false position, secant, Newton Raphson Method.  
 Solution of Linear Systems of Equations: Gauss elimination method, L.U. factorization method, Gauss seidel iterative method.
- Unit VI:** Solution of differential equation: Euler's method, Runge Kutta method, Predictor Corrector method.  
 Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 th rules.  
 Finite differences: Newton forward and backward interpolation formula.

**Textbooks:**

- 1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata -Graw Hill publishing Co.Ltd., New Delhi, 1995.
- 2) Introduction to method of Numerical Analysis- S. S. Shastri, Second Edition, PHI Pvt. Ltd., New Delhi.

**Reference Books:**

- 1) Object Oriented Programming in Turbo C++ Rober Lofore Galgotia Publications Pvt.Ltd., New Delhi, 1995
- 2) The C++ Programming Language (Third Edition) Bjarne Stroustrup Pub.Co., New York, 1995 (Addison Wesley)
- 3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesley Pub. Company, 1995
- 4) Computer Oriented Numerical Methods:-V. Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
- 5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI publication.

**3XT03 / 3XN03**

**ELECTROMAGNETIC FIELDS**

**SECTION-A**

- Unit I:** Review of Vector Analysis:  
 Cartesian, cylindrical and spherical co-ordinate systems, vector products, Projection of Vectors, Gradient, Divergence & Curl, Stokes & divergence theorem. (08)
- Unit II:** Electrostatics:  
 Coulomb's law, Electric field intensity, Evaluation of electric field intensity due to line charge, surface charge & volume charge distribution, Electric flux density, Gauss Law, Electrostatics potential, Potential gradient, Electric dipole & Polarization. (08)
- Unit III:** Magneto statics: Amper's law of forces, Biot-Savart's law, Ampere's law in integral and differential form., Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux & flux density, Magnetic dipole moment, Magnetization. (08)

**SECTION-B**

- Unit IV:** Boundary conditions & Maxwell's equations:  
 Boundary condition of dielectric-dielectric interface, dielectric-conductor interface, boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equation for steady & time varying fields. (08)

**Unit V: Electro magnetic wave propagation:**

Electromagnetic wave equation for free space, lossy dielectrics, perfect conductors, propagation constant, attenuation constant, phase shift constant, Skin depth, Concept of power flow, Poynting Theorem, Reflection of a plane wave in a normal incidence at dielectric-dielectric interface, dielectric-conductor interface. (10)

**Unit V: Radiation:**

Magnetic scalar and vector potential, retarded potential, Electric & Magnetic fields Power radiated & radiation resistance, due to oscillating dipole, quarter wave monopole & half wave dipole. (08)

**Text Books:**

- 1) Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill
- 2) Jordan E.C. and Balmain K.C.: "Electromagnetic Waves and Radiating System" Prentice Hall of India Private Limited (Second Edition)

**Reference Books:**

- 1) Mathew N.O.Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press
- 2) Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)
- 3) Ramo S. and Whinnery R.: "Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

**3XT04/3XN04**

**ELECTRIC DRIVES & MEASUREMENTS**

**SECTION- 'A'**

Unit-I : Measurement of resistance: Kelvin Double Bridge, Loss of charge method and megger. Measurement of Inductance and Capacitance: Maxwell's bridge, Hay's bridge, Anderson's bridge, Schering bridge, De Sautys Bridge and Carey Foster bridge. Measurement of Q factor and  $\tan \delta$ .

Unit-II : Measurement of active and reactive power in 3-phase balanced and unbalanced load. Electrodynamic meter type power factor meter, frequency meter. Watt meter, Digital Energy Meter

Unit-III : D.C.Motors: Electrical and mechanical characteristics of motor, Speed control methods for constant torque and constant horse power. Application of D.C.motors. Braking-resistance, plugging and regenerative braking

**SECTION- 'B'**

Unit-IV : Induction Motors: Characteristics, Speed control methods: Armature voltage, V/f control, rotor control, slip power recovery scheme and applications, plugging, Resistance braking, Regenerative Braking.

Eddy current coupling and its application.

Unit-V : Transformers: 3 phase transformers, rectifier transformers, pulse transformers. Open delta connection, Scott connection, Ferrite core transformer.

Unit-VI : Construction, principle of operation, characteristics and applications of : Tachogenerator, (DC & AC), Stepper motor, A.C.Servo motor 1 Phase induction motors and Universal motor.

**TEXT BOOKS:**

- i) M.V.Deshpande:- Elements of Electrical Machines.
- ii) A.K.Sawhney:- Electrical and Electronic Measurement and Instrumentation.

**REFERENCE BOOKS:**

- i) E.W.Golding:- Electrical measurement and measuring Instrument, ELBS Pub.
- ii) First Course on Electrical Drives -S.K.Pillai
- iii) B.L.Theraja VOL II :- Electrical Engineering.

**3XT05/3XN05**

**Electronics Devices and Components**

**Section A**

Unit I : Construction, selection and failures of

- Resistors: Fixed type, Variable Type, Network and Chip type
- Capacitors: fixed and variable Type

Unit II

- Switches & Relays: Types, Construction and Testing
- Fuses, Cables and Connectors: Types, Construction, Specification and Application
- Introduction to Heat sink, Choke and Transformer

Unit III : Basics of Electronic Component layout, PCB material, Properties and specifications, Basic manufacturing process of PCB, Soldering and De-soldering Techniques.

## Section B

Unit IV : P-N Junction diode theory- V-I Characteristics, Temperature dependency, Diode Resistance, Zener diode : characteristics, Avalanche & Zener breakdown, Testing of diode using Ohmmeter and CRO

Unit V: Theory, Construction, Characteristics and application of Tunnel, Varactor, Shottkey diode Opto-Devices: LED, Photo Diode, LCD

Unit VI : Theory of PNP and NPN Transistor, Transistor Configurations, Their Characteristics and current Components. Transistor as an amplifier, Testing of Transistor using Ohmmeter and CRO

Text Books:

1. Maduri Joshi, " Electronic Component and Material" 3<sup>rd</sup> Edition, Shroff Publication
2. Millman H Halkies, " Integrated Electronics" TMH Co. New Delhi

References:

1. Bosshart, " Printed Circuit Board" TMH
2. David Bell " Electronic Devices and Circuits" Oxford University Press, 2010
3. Boylestad R, "Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi.

### **3XT06/3XN06**

### **COMPUTER PROGRAMMING AND APPLICATIONS-LAB.**

Minimum Eight experiments based on the 3XT2/3XN2 out of which at least four experiments should be based on the last two Units.

### **3XT07/3XN07**

### **ELECTRIC DRIVES & MEASUREMENTS -LAB.**

Minimum Eight experiments based on **3XT4/3XN4**.

### **3XT08/3XN08**

### **Electronics Devices and Components-LAB.**

Minimum eight Practicals Should be conducted based on the **3XT5/3XN5**. (atleast one on PCB)

## **SEMESTER : FOURTH**

### **4XT01/4XN01**

### **COMMUNICATION ENGINEERING-I**

#### **SECTION-A**

**Unit I** Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video.

External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature, Friiss formula. (6)

**Unit II** Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density, Correlation: Auto-correlation, Cross-correlation. (9)

**Unit III** Probability and Random Signal Theory : Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions, Ergodicity, Gaussian Process, White Gaussian Noise. (8)

#### **SECTION-B**

**Unit IV** Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. (7)

**Unit V** RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic(shunt) impedance, quarter wave and half wave length transform, Smith chart, Single stub (shunt) matching using smith chart, balun. (8)

**Unit VI** Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna. (10)

**Text books:-**

- (1) Kennedy G : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)
- (2) Simon Haykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

**Reference books**

- (1) Collins Dennis, Collins John "Electronic Communications" (PHI)
- (2) B. P. Lathi : " Modern Digital and Analog Communication systems" 3<sup>rd</sup> Edition, Oxford Uni. Press.
- (3) Taub and Schilling D.L. : Principles of Communication Systems, Mc- Hill Co, Tokyo, 1994 (II Ed.)
- (4) Hari Bhat: "Analog communication, 2<sup>nd</sup> Edition Pearson India, 2010"

## SECTION-A

Unit I : Rectifiers : Half wave, full wave and bridge rectifiers and their analysis. Filters : Analysis of capacitor filter, Theory of L, LC & CLC ( $\pi$ ) filter, Zener diode as a Voltage regulator.

Unit II : DC load line and operating point (Q point); Methods of biasing & stability factor; ac equivalent circuit and hybrid model analysis of CE configuration.

Unit III : Feed back Amplifier and Oscillator : Classification of amplifier: Voltage current, trans-conductance, Trans-resistance amplifier, feedback concept, effect of negative feedback in amplifier, Methodology of feedback in amplifier and analysis.

Oscillators : Barkhausen's criterion for sustained oscillations; study of Harley, Collpit, RC oscillators and crystal oscillator.

## SECTION-B

Unit IV : Study of multistage transistor amplifier circuit  
 i) RC coupled amplifier,  
 ii) Transformer coupled amplifier,  
 iii) Direct coupled amplifier,  
 iv) Emitter follower; Darlington emitter follower, Bootstrapping principle,  
 v) Cascade stage.

Unit V : Power Amplifier : Transformer coupled Class A amplifier, Transformer coupled Class B amplifier & transformer coupled Class AB amplifier, capacitor coupled and direct coupled output stages, modifications to improve power amplifier performance, Class C amplifier and analysis.

Unit VI : JEET : Theory, Construction and Characteristics; parameters ( $\mu$ ,  $g_m$  &  $r_{ds}$ ); Biasing of JEET amplifiers, MOSFET : Theory, Construction and Characteristics of enhancement & depletion type MOSFET  
 UJT: Theory, Construction and Characteristics; UJT as relaxation oscillator.

Text Books :

- 1) David Bell : Electronic Devices and Circuits, Oxford University Press, 2010.
- 2) Milliman H. and Halkies : Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books :

- 1) Mottershead Allen : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, 1986
- 2) Boylestad R. : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, V Edi. 1993
- 3) Ramanan K.V. : Functional Electronics, Tata McGraw Hill, New Delhi, 1989
- 4) Milliman S., Taub H and Halkies : Electronics Devices and Circuits, McGraw Hill Int. Co., Auckland, 1982

## SECTION-A

Unit I : a) Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b) Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem, Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

## SECTION-B

Unit IV : a) Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. (*Review to be done by students. No class hour will be spent for this review.*)

b) Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance - Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a) Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b) Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

- 1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
- 2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
- 3) Electrical Linear Circuits – David Bell, Oxford University Press, 2008
- 4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009
- 5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
- 6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
- 7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

#### 4XT04/4XN04

#### INDUSTRIAL MANAGEMENT & QUALITY CONTROL

##### SECTION-A

##### UNIT- I

**Principles and Techniques of Management :** Meaning of and differences among business, management, administration and organisation, Principles of management, functions of management, planning, organisation structure and relationships, direction, co-ordination, control, motivation, delegation and decentralisation, communication, leadership and decision making. (7)

##### UNIT- II

**Market and Materials Management :**

A) Marketing strategy, market research, consumer behaviour, advertising and sales promotion, channels of distribution, pricing of products.

B) Classes of material, scope of material control, scope of purchasing department, purchasing procedures, order procedures, inventory control, introduction to production, planning and control. (9)

##### UNIT- III

**Personnel Management :** Meaning and functions of personnel management, recruitment, selection, promotion, wages and salary administration, training and development, functions and scope of trade unions in Indian industries. Welfare of labour, Problems of labour turn over & retention.

**Merit Rating:** Job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. (9)

##### SECTION-B

##### UNIT- IV

**Project and Financial Management :**

A) Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis.

B) Principles of costing , cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance. (9)

##### UNIT- V

**Quality Control :** Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques, vendor inspection, sampling inspection, sampling plans, Quality audit system. (8)

##### UNIT- VI

**Quality Management :** Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality planning and total quality management, elements of TQM, Quality Circles. (8)

##### TEXT BOOKS:

1. INDUSTRIAL ENGINEERING AND MANAGEMENT ,O P Khanna ,2011 ,JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA) ,81-899-2835-3.
2. INDUSTRIAL & BUSINESS MANAGEMENT ,Telsang Mertand.T , ,S.Chand & Company Limited, NEW DELHI ,81-219-2056-6.
3. MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES ,Anil Bhat, Arya Kumar ,2008 ,Oxford University Press, NEW DELHI . ,978-01-956-9445-1.
4. TOTAL QUALITY ,BHARAT WAKHLU ,2/e, 2007 ,S.Chand & Company Limited, NEW DELHI . ,81-219-2866-4.
5. TOTAL QUALITY CONTROL, 4TH ED. ,Armand V. Feigenbaum ,2005 ,Tata McGraw-Hill Education, New Delhi . ,978-00-702-2003-4.

##### REFERENCE BOOKS:

1. PRINCIPLES OF BUSINESS MANAGEMENT ,Dr. Virendra Sharad Sherlekar ,Prof.S.A.Sherlekar ,3/e, 2009 ,Himalaya Publishing House Pvt. Ltd, MUMBAI . ,978-81-8488-082-3 .
2. FUNDAMENTALS OF FINANCIAL MANAGEMENT ,BOSE, D. CHANDRA ,2/e ,PHI Learning Private Limited, NEW DELHI . ,978-81-203-4074-9.
3. PRINCIPLES OF MANAGEMENT AND ADMINISTRATION • ,Chandra Bose , ,PHI Learning Private Limited, NEW DELHI . ,978-81-203-1929-5.

4. PROJECT MANAGEMENT ,Prof. Abdul Matheen ,2/e, 2009 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0694-4.
5. TOTAL QUALITY MANAGEMENT • ,Suganthi & Samuel , ,PHI Learning Private Limited, NEW DELHI . ,978-81-203-2655-2.
6. TOTAL QUALITY MANAGEMENT ,Dr. S. Kumar ,1/e, 2006 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0568-8.
7. QUALITY MANAGEMENT ,Dr. Rajan Misra ,2006 ,Oxford University Press, NEW DELHI . ,978-01-956-7795-9.
8. TQM : PLANNING, DESIGN & IMPLEMENTATION ,Khanna, V.K. , ,1/e, 2009 ,New Age International (P) Ltd., Publishers, NEW DELHI . ,978-81-224-2233-7.
9. Fundamentals of Quality Control and Improvement, Mitra Amitava ,2/e, 2009 ,PHI Learning Private Limited, NEW DELHI . ,978-81-203-2377-3.

#### 4XT05/4XN05

#### INSTRUMENTATION

##### SECTION-A

**Unit I :** Transducer & Instrumentation systems (1)Transducer classification: Active/Passive. Primary/Secondary. Analog/Digital and transduction Principles. Basic Signal conditioning Circuits. Resistive/Capacitive/Inductive reactance bridge. Current/Voltage Sensitive Wheatstons bridges & Generalized instrumentation system with particular examples (9 Hrs)

**Unit II :** Static characteristics, errors & statistical parameters: (1) Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram, Normal & Gaussian curve of errors. (7 Hrs)

**Unit III :** Electronics Instrumentation: (1,2,3):Analog & Digital data acquisition system, Analog electronic multimeter, Introduction to digital voltmeter & universal counter. Stripchart & X-Y recorders. Optical Encoders. Siesmic mass vibration transducer. (3)Introduction to microphones & loud speaker. (9 Hrs.)

##### SECTION-B

**Unit IV :** Measurement of Temperature & Strain (1,3) Temperature Sensors: LM 335, RTD. THERMISTORS, Thermocouples, Thermocouples laws & its compensation methods. Pyrometers: Total/Partial radiation & optical pyrometers. Strain Gauges, Gauge factor. Strain measurement & temperature compensation methods.

**Unit V :** Measurement of Displacement. Pressure & Level. Displacement Measurement: (1) using resistive, capacitive, inductive (LVDT & RVDT) & Eddy current. Pressure Measurement: (1) Elastic, Inductive, Peizoelectric & capacitive transducers, Low pressure measurement using ionization gauge, pirani gauge, thermocouple vacuum gauge. Level Measurement: (1, 3) Using ultrasonic, capacitive, inductive, resistive with float, gamma rays & eddy currents techniques. (8 Hrs.)

**Unit VI :** Measurement of Flow, Humidity, Velocity (1) Flow Measurement: using ultrasonic, electronaquatic & hot wire Anemometer. Humidity Measurement : using resistive, Capacitive & Crystal transducers. Velocity Measurement: Using photo detectors (both linear & angular velocity). Introductory block diagram of smart sensors , Wave analyzer & spectrum analyzers.

#### Books Recommended:

- 1) Sawhney A.K.: A course in Electrical/Electronics Measurement & Instrumentation, Dhanpat Rai & Sons., Delhi.
- 2) Rangan C.S., Sharma G.R. , & Mani V.S.V.: Instrumentation Devices & System,Tata Mc-Graw Hill.
- 3)R. K. Rajput: Electrical & Electronics Measurement & Instrumentation.

#### Reference Books :

- 1) Patranbis D. : 'Sensors & Transducers', A.H.Wheeler & Company, Prayag, India.
- 2) H. S. Kalsi : Electronics Instrumentation, Tata Mc Graw Hill, 2<sup>nd</sup> Edition
- 3) U.A. Bakshi & A. V. Bakshi : Electronics Instrumentation, Technical Publication
- 4) Robert A. Witte: Electronics Test Instrumentation : Analog & Digital Measurement.

#### 4 XT 06/4 XN 06

#### ELECTRONIC DEVICES AND CIRCUITS -I-LAB.

Any TEN experiments based on contents of 4 XT 02/4XN 02 ELECTRONIC DEVICES AND CIRCUITS-I

#### 4 XT 07/4XN 07

#### NETWORK ANALYSIS - LAB.

Any TEN experiments based on contents of 4 XT 03 / 4 XN 03 NETWORK ANALYSIS

#### 4 XT 08/4XN 08

#### INSTRUMENTATION-LAB.

Minimum Eight experiments based on 4XT 05/4XN 05 INSTRUMENTATION

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Environmental Studies  
 + | Environmental Studies  
 + | Environmental Studies

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