



**B.E ELECTRICAL AND ELECTRONICS ENGINEERING  
 (FOUR YEAR FULL TIME)  
 CURRICULUM 2008  
 SEMESTER I**

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE101	Technical English	3	1	0	3
XEE102	Mathematics- I	3	1	0	4
XEE103	Applied Physics	3	1	0	3
XEE104	Applied Chemistry	3	1	0	3
XEE105	Engineering Graphics	1	0	3	4
XEE106	Engineering Mechanics	3	1	0	4
<b>PRACTICAL</b>					
XEE107	Applied Physics Lab	0	0	3	2
XEE108	Applied Chemistry Lab	0	0	3	2
XEE109	Basic Workshop Practice	0	0	3	2

**Total Hours: 33**

**Total Credits: 27**

**SEMESTER II**

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE201	Mathematics – II	3	1	0	4
XEE202	Data Structures and Algorithms	3	1	0	3
XEE203	Computer Programming	4	0	0	3
XEE204	Electric Circuit Analysis	3	1	0	4
XEE205	Electronic Devices	3	0	0	3
XEE206	Mechanics of Fluids and Solids	3	1	0	3
<b>PRACTICAL</b>					
XEE207	Computer Programming Lab	0	0	3	2
XEE208	Communication Skills Enhancement	2	0	2	3
XEE209	Electric Circuits Lab	0	0	3	2

**Total Hours: 31**

**Total Credits: 27**



### SEMESTER III

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE301	Mathematics – III	3	1	0	4
XEE302	Electromagnetic Field Theory	3	1	0	4
XEE303	Electrical Machines - I	3	1	0	4
XEE304	Electronic Circuits	3	1	0	4
XEE305	Professional Ethics and Human values (EEE)	3	0	0	3
XEE306	Applied Thermodynamics	3	1	0	4
<b>PRACTICAL</b>					
XEE307	Electrical Machines Lab - I	0	0	3	2
XEE308	Electronic Devices and Circuits Lab	0	0	3	2

**Total Hours: 29**

**Total Credits: 27**

### SEMESTER IV

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE401	Numerical Methods	3	1	0	4
XEE402	Environmental Science and Engineering	3	0	0	3
XEE403	Electrical Machines – II	3	1	0	4
XEE404	Transmission & Distribution	3	1	0	4
XEE405	Control Systems	3	1	0	4
XEE406	Object oriented Programming	3	1	0	4
<b>PRACTICAL</b>					
XEE407	Electrical Machines Lab – II	0	0	3	2
XEE408	Object oriented Programming Lab	0	0	3	2

**Total Hours: 29**

**Total Credits: 27**

## SEMESTER V

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE501	Power Electronics	3	1	0	4
XEE502	Communication Engineering	3	0	0	4
XEE503	Protection & Switchgear	3	1	0	4
XEE504	Measurements and Instruments	3	0	0	4
XEE505	Digital Logic Circuits	3	1	0	4
XEE506	Linear Integrated Circuits	3	0	0	4
<b>PRACTICAL</b>					
XEE507	Power Electronics Lab	0	0	3	2
XEE508	Control Systems Lab	0	0	3	2

**Total Hours: 27**

**Total Credits: 28**

## SEMESTER VI

Code No.	Course Title	L	T	P	C
<b>THEORY</b>					
XEE601	Solid State Drives	3	0	0	4
XEE602	Power System Analysis	3	1	0	4
XEE603	Total Quality Management	3	0	0	3
XEE604	Digital Signal Processing	3	1	0	4
XEE605	Microprocessors & Micro controllers	3	1	0	4
XEEE**	Elective –I	3	0	0	3
<b>PRACTICAL</b>					
XEE607	Linear Integrated Circuits and Microprocessors & Micro controllers Lab	0	0	3	2
XEE608	Measurements & Instruments Lab	0	0	3	2

**Total Hours: 27**

**Total Credits: 26**

## SEMESTER VII

Code No.	Course title	L	T	P	C
<b>THEORY</b>					
XEE701	Social Engineering	3	0	0	3
XEE702	High Voltage Engineering	3	0	0	3
XEE703	Design of Electrical Apparatus	3	1	0	4
XEE704	Power System Operation and Control	3	1	0	4
XEE705	Elective – II	3	0	0	3
XEEE**	Elective – III	3	0	0	3
<b>PRACTICAL</b>					
XEE707	Power System Simulation Lab	0	0	3	2
XEE708	Mini Project (Hardware only)	0	0	4	4

**Total Hours: 27**

**Total Credits: 26**

## SEMESTER VIII

Code No.	Course Title	L	T	P	C
XEE801	Entrepreneurial Development Management	3	0	0	3
XEEE**	Elective – IV	3	0	0	3
XEEE**	Elective – V	3	0	0	3
<b>PRACTICAL</b>					
XEE804	Project Work	0	0	20	12

**Total Hours: 32**

**Total Credits: 21**

**Over all Credits: 209**

## LIST OF ELECTIVES

<b>**ELECTIVE CODE</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
XEEE51	Fibre Optics and Laser Instruments	3	0	0	3
XEEE52	Visual Languages and Applications	3	0	0	3
XEEE53	Advanced Control System	3	0	0	3
XEEE54	Control and Maintenance of Electrical Machines	3	0	0	3
XEEE55	Special Electrical Machines	3	0	0	3
XEEE56	Bio-Medical Instrumentation	3	0	0	3
XEEE57	Artificial Intelligence and Expert Systems	3	0	0	3
XEEE58	Internetworking Technology	3	0	0	3
XEEE59	Power System Dynamics	3	0	0	3
XEEE60	Computer Architecture	3	0	0	3
XEEE61	Power Plant Engineering	3	0	0	3
XEEE62	Power System Transients	3	0	0	3
XEEE63	Data Communication and Networks	3	0	0	3
XEEE64	Embedded System Design	3	0	0	3
XEEE65	Mobile Communication	3	0	0	3
XEEE66	Operations Research	3	0	0	3
XEEE67	VLSI Design	3	0	0	3
XEEE68	Neural Network and Fuzzy Logic Control	3	0	0	3
XEEE69	Electric Energy Generation, Utilization and Conservation	3	0	0	3
XEEE70	Non – Conventional Energy Sources	3	0	0	3

## SEMESTER I

**XEE101 TECHNICAL ENGLISH**

**3 1 0 4**

**UNIT I FOCUS ON LANGUAGE**

**15**

Word formation with prefixes and suffixes - synonyms and antonyms - nominal compounds, prepositions, homonyms, homophones and hyponyms, Parts of speech, use of words as nouns and verbs, phrasal verbs, connectives, sentences patterns.

### **Suggested Activities**

- Using prefixes and suffixes to change the grammatical functions of words – giving synonyms and antonyms, using the same words and its derivatives of different forms
- Expansion of noun + noun phrases - correction of errors in the given sentences.
- Using comparative forms of adjectives in sentences giving a pair of purpose and function statements to be linked with expressions like to in order to so as to (Eg: He used the ignition key. He started the engine. He used the ignition key in order to start the engine)
- Identification of content words in the given text.
- Learning multi functional words that can serve both nouns and verbs
- Analyzing sentences into S,V,O, C and A.

**Note:** All examples pertaining to this unit should preferably be related to science and technology.

**UNIT II FUNCTIONAL GRAMMAR**

**15**

Tense forms and voice forms, concord, degrees of comparison, conditional clause, definition of technical terms, Sentences expressing, (purpose and function,) comparison and contrast, cause and effect constructions, imperatives, reported speeches, Modal verbs, infinitives, gerund, participles

### **Suggested Activities**

Giving pairs of cause and effect statements to be linked with expressions like *as / since / because*. Rewriting imperative sentences using assertive form '*should*' (Store energy and tap it when required energy should be and tapped when it is required)

- Rewriting infinitive forms as gerunds (eg: To modernize the administrative office with computers is expensive, Modernizing the administrative office with computers is expensive) Fill in the blanks with appropriate prepositions.
- Choosing sentences in a given text that use different tense forms
- Subject-verb agreement of the sentences given practical
- Providing a context for the use of the tense forms - rewriting the sentence in the impersonal passive form

Rewriting the sentences in the reported speeches

Techniques of Reading – Technical articles on invention and discoveries, Reading comprehension on biographies of eminent scientists, engineers and successful entrepreneurs, Practicing -skimming and scanning, Rhetorical functions (narrative, descriptive and argumentative) sequencing of sentences. Connective adverbs. Idioms and phrases, phrasal verbs and cloze test.

**Suggested Activities**

- Taking a quick glance at the text to predict the content – reading to identify the main theme.
- Identifying the topic sentence in a paragraph – providing suitable titles for paragraphs – matching the titles with the paragraphs.
- Guessing the contextual meaning of words – comprehending a passage and answering questions of varied kinds.
- Transferring of information from a text to graphical representations like tree diagram / flow chart / bar chart / pie chart/ tables.
- Filling the gaps with appropriate missing words from the given list.
- Making notes based on a passage in the format given.
- Using an appropriate format to make notes from a given passage.
- Providing a suitable title after reading the passage.
- Identifying main and supporting ideas by scanning.
- Sequencing of jumbled sentences using linguistic clues (e.g.: reference words).

Framing questions and answering, (“Wh” type and “Yes or No”) type note making, (guided and open) making lists, stating problems and proposing solutions, recommendations, instructions, check lists, technical report writing, decoding from graphical representation (flow chart, pie chart, tree diagram) numerical expressions.

## SUGGESTED ACTIVITIES

- IDENTIFYING THE PHRASES USED FOR MAKING RECOMMENDATIONS IN GIVEN TEXTS AND EMPLOYING THEM IN MAKING RECOMMENDATIONS.
- WRITING CHECKLISTS IN THE APPROPRIATE FORMAT.
- WRITING INSTRUCTIONS FOR PERFORMING TASKS AT HOME OR AT WORK (USE OF IMPERATIVES).
- SUMMARIZING THE DISCUSSIONS AND OTHER ORAL PRACTICE ACTIVITIES LIKE ROLE PLAY IN THE PRESCRIBED TEXTBOOKS.
- ESSAY WRITING BASED ON DISCUSSION OF SCIENTIFIC AND TECHNICAL TOPICS GIVEN IN THE PRESCRIBED TEXTBOOKS.

## UNIT V WRITING I I

10

Paragraph writing, essay writing, technical report writing, letter writing, (personal, business, letter of application, letter to the editor) resume writing, drafting e-mails, minutes of meeting, memorandum, creative writing.

### Suggested Activities

- Using appropriate expressions to define a concept / describe an object / device / process.
- Writing paragraphs on different scientific discourse patterns like classification, comparison and problem / solution – identifying the topic sentence.
- Using unity, cohesion and coherence in paragraph writing.
- Writing formal and business letters using the appropriate format.
- Note – making (guided and open).
- Summarizing and writing paragraphs based on listening tasks in the prescribed textbooks.
- Making recommendations by using modal auxiliary verbs like *should*, *must*, *ought to* etc.

**L:45; T:15; Total: 60**

**TEXT BOOKS:**

1. Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Vols. I & II (Combined Edition), Orient Longman Pvt. Ltd., 2006.

**REFERENCES:**

1. V.R. Narayanaswami, Strengthen Your Writing, 3<sup>rd</sup> Edition, Orient Longman, 2005.
2. Andrea J. Rutherford, Basic Communication Skills for Technology, 1<sup>st</sup> Edition, Pearson Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.
3. Nell Ann Pickett, Ann A. Laster, Katherine E. Staples, Technical English (Writing, Reading and Speaking), 8<sup>th</sup> Edition, Pearson Education, USA, Addison Wesley Longman Inc., 2001.
4. “ Power words in Pairs”. Emerald Publishers – Chennai

# **XEE102 MATHEMATICS - I**

**3 1 0 4**

## **UNIT- I        MATRICES**

**9**

Eigen values and Eigenvectors of a real matrix – Characteristic equation  
Properties of Eigen values and Eigen vectors - Cayley - Hamilton theorem  
(excluding proof) - Similarity transformation (Concept only) – Orthogonal matrix -  
Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of  
quadratic form to Canonical form by Orthogonal transformation.

## **UNIT- II        THREE DIMENSIONAL ANALYTICAL GEOMETRY**

**9**

Direction Cosine and Ratios – Angle between two lines – Equation of plane –  
Equation of Straight line – Coplanar lines – shortest distance between skew lines  
– Sphere – Tangent plane – Plane section of a sphere,

## **UNIT –III        GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS**

**9**

Curvature – Cartesian and polar co – ordinates – Centre and radius of curvature  
– Circle of curvature – Involutives and evolutes – Envelops – Properties of  
envelopes and evolutes.

## **UNIT –IV        FUNCTION OF SEVERAL VARIABLES**

**9**

Functions of two variables – Partial derivatives – Total differential – Taylor's  
expansion – Maxima and Minima – Constrained maxima and minima –  
Lagrange's Multiplier method – Jacobians

## **UNIT- V        ORDINARY DIFFERENTIAL EQUATIONS (ODE) AND APPLICATIONS**

**9**

Linear equations of second order with constant and variable coefficients -  
Simultaneous first order linear equations with constant coefficients – Method of  
variation of parameters.

**L: 45; T: 15; Total: 60**

### **TEXT BOOKS:**

1. Grewal .B.S., “Higher Engineering Mathematics”, 38<sup>th</sup> Edition- Khanna Publication –Delhi, 2004.
2. Kreyszi.E., “Advance Engineering Mathematics”, 8<sup>th</sup> Edition-John Wiley & Son (Asia) Ltd, Singapore,. 2001.

### **REFERENCES:**

1. Bali. N.P., Narayana Iyengar, and Chand.N., “Engineering Mathematics” Laxmi Publication Pvt. Ltd-New Delhi, 2003.
2. Veerarajan.T., “Engineering Mathematics (For First Year )”, 4<sup>th</sup> Edition , John Wiley & Son -Hill Publishing company Ltd, New Delhi, 2005.
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K., “Engineering Mathematics”-Volume I &II, S. Chand & Co, New Delhi, 2005.
4. Venkataraman. M. K., “Engineering Mathematics”-Volume I & II, Revised enlarged 4<sup>th</sup> Edition, The National Publishing Company, Chennai, 2004.

**APPLIED PHYSICS**  
**(Common to B.E. / B.Tech all Branches)**

**XCE103 APPLIED PHYSICS 3 1 0 4**

**UNIT-I ACOUSTICS AND ULTRASONICS 9**

**Acoustics:** Classification of sound – Characteristics of musical sound – Loudness – Weber-Fechner law – Decibel – Absorption Coefficient – Reverberation – Reverberation time – Sabine's Formula (growth & decay) – Factors affecting acoustics of buildings (reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies.

**Ultrasonics:** Production: Magnetostriction and Piezo electric methods – Applications

**UNIT-II WAVE OPTICS, LASERS AND FIBRE OPTICS 9**

**Wave Optics:** Photo elasticity: Birefringence – Stress-optic law - Effect of a stressed model in a plane polariscope – Isoclinic and Isochromatic fringes (definitions) – Photoelastic bench.

**Laser:** Nd – YAG laser, CO<sub>2</sub> laser, semiconductor laser (homojunction) – Uses of lasers – Holography.

**Fibre Optics:** Principle and propagation of light in optical fibres – Numerical Aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – Applications: Fibre optics communication system (block diagram only).

**UNIT-III CRYSTAL PHYSICS AND NDT 9**

**Crystal Physics:** Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures.

**NDT:** Liquid penetrant method – Ultrasonic flaw detection – Ultrasonic flaw detector (block diagram)– X-ray Radiography: displacement method – X-Ray Fluoroscopy– Merits and Demerits of each method

**UNIT- IV CONDUCTING MATERIALS 9**

**Conductors:** Wiedermann Franz law - Lorentz number –Fermi distribution function – Density of energy states – carrier concentration - effect of temperature on fermi energy level

**Semiconductors:** Semiconductor-properties- types of semiconductor, Hall effect – Determination of Hall co-efficient.

**Superconductors:** Super conducting phenomena – Properties of superconductors – Meissner effect , Isotope effect – Type I and Type II superconductors– Applications – Magnetic levitation and SQUID

## **UNIT–V DIELECTRICS AND NEW ENGINEERING MATERIALS\_ 9**

**Dielectrics:** Electrical susceptibility - Dielectric constant – Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarization – Internal field – Claussius-Mosotti relation (derivation) - Dielectric loss – Dielectric breakdown – Uses of dielectric materials (Capacitor and Transformer).

**Introduction to New Materials:** Metallic glasses – Nano materials – Shape memory alloys – Bio-materials.

**L:45; T:15; Total:60**

### **TEXT BOOKS:**

1. Avadhanulu M.N. and Kshirsagar P.G., “A Text Book of Engineering Physics”, S.Chand & Company Ltd., 7<sup>th</sup> Enlarged Revised Ed., 2005.
2. Gaur R. K. and Gupta S. L., “Engineering Physics”, Dhanpat Rai Publishers, New Delhi, 2001.

### **REFERENCES:**

1. Pillai S. O., “Solid State Physics”, New Age International Publication, New Delhi, Fifth Edition, 2003.
2. Rajendran V. and Marikani A., “Materials Science”, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.

**UNIT- I WATER TECHNOLOGY****9**

Source and types of water – water quality parameters – definition and expression – hard water – estimation of hardness (EDTA method) and alkalinity – boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination (RO method) – domestic water treatment.

**UNIT- IIELECTROCHEMISTRY****9**

Electrode potentials – difference between electrolytic cells and electrochemical cells – Standard electrodes ( $H_2$  and calomel electrodes) – Determination of pH using glass electrodes – Nernst equation – problems – electrochemical series – emf – measurements and its applications – Galvanic cells – Concentration cell – problems – reversible and irreversible cells – conductometric titrations.

**UNIT –III CORROSION AND ITS INHIBITION****9**

Corrosion – principles of chemical corrosion – Pilling – Bedworth rule – principles of electrochemical corrosion – difference between chemical and electrochemical corrosion – types of corrosion – factors influencing corrosion – corrosion control methods – pre-treatment of metal surface – electroplating and electroless plating.

**UNIT- IV NUCLEAR ENERGY AND ENERGY STORAGE DEVICES****9**

Nuclear fission process – definition, mechanism and characteristics – chain reactions – nuclear energy and its calculations – types of nuclear fission reaction – atom bomb – light water nuclear power plant – breeder reactor – batteries – introduction – types of batteries – primary and secondary batteries – dry cell – lead acid, Ni-Cd and Li batteries – alkaline batteries – principles and applications of solar cells.

**UNIT –V POLYMERS****9**

Monomers and polymers – types of polymerization reaction – mechanism of polymerization (free radical) – engineering plastics – PVC, teflon, polycarbonate, polyurethane and thermocole – properties – applications – compounding of plastics, moulding methods – injection, compression moulding and blow moulding – polymer blends and alloys.

**L:45, T:15 ,Total: 60**

**TEXT BOOKS:**

1. P.C. Jain and Monicka Jain, Engineering Chemistry, Dhanpat Raj Publishing Company (P) Ltd, New Delhi – 2002.
2. S.S. Dara. A Textbook of Engineering Chemistry, S. Chand & Company Ltd, New Delhi – 2003.

**REFERENCES:**

1. B.K. Sharma, Engineering Chemistry, Krishna Prakasam Media (P) Ltd., Meerut, 2001.
2. Mars G. Fontana, Corrosion Engineering, Tata McGraw Hill Publishing Co., New Delhi, 2005.

**XEE105 ENGINEERING GRAPHICS  
(First Angle Projection only)**

**2 0 3 4**

**UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES 6+9**

General principles of orthographic projection- Layout of view – Projection of points, straight lines – Determination of true lengths and true inclinations and location of traces.

**UNIT II PROJECTION OF SOLIDS AND SECTION OF SOLIDS 6+9**

Projection of polygonal surface and circular lamina inclined to any one plane – Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to both the reference plane.

**UNIT III SECTION OF SOLIDS 6+9**

Sectioning of solids in simple vertical position by cutting planes inclined to both the reference plane - Obtaining true shape of section.

**UNIT IV DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS 6+9**

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones -Development of lateral surfaces of two Intersecting solids – prism & cylinder, cylinder & cylinder – Axis at right angles with no offset.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of regular solids -by visual ray and vanishing point methods.

**L:30; P:45; Total:75**

**TEXT BOOKS:**

1. K.Venugopal “Engineering Graphics”, New Age International (P) Limited, 2002.
2. K.V. Natarajan “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2006.

**REFERENCES:**

1. N.D. Bhatt “Engineering Drawing” Charotar publishing House 46<sup>th</sup> Edition, 2003.
2. K.R. Gopalakrishnana. “Engineering Drawing” (Vol. I & II) Subhas Publications – 1998.
3. Luzadder and Duff, “Fundamentals of Engineering Drawing” Prentice Hall of India Pvt Ltd, XI Edition - 2001.

**STANDARDS:**

1. IS10711 – 2001 Technical products Documentation – Size and Layout of Drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001 Technical product Documentation – Lettering.
3. IS11669 – 1986 Dimensioning on Technical Drawings.
4. IS15021 (Parts 1-4) – 2001 Technical Drawings – Projection Methods.

**NOTE:**

1. Five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

**XEE106      DIGITAL COMPUTER FUNDAMENTALS      4 0 0 4**

**UNIT I      DIGITAL CONCEPTS      8**

Digital Computer Fundamentals – Block diagram of a computer – Components of a computer system – Digital and Analog quantities – Binary digits – Logic Levels – Digital Waveforms – Basic Logic operations – Digital Integrated Circuits.

**UNIT II      NUMBER SYSTEMS      12**

Number Representaion – Decimal, Binary, Octal, Hexadecimal and BCD number – Binary Arithmetic – Binary addition – Unsigned and Signed numbers – one's and two's complements of Binary numbers – Arithmetic operations with signed numbers – Number system conversions – Digital codes.

**UNIT III      BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION      16**

Logic gates – AND, OR,NOT,NAND, NOR, XOR and XNOR Gates – Laws and Rules of Boolean algebra – DeMorgan's Theorems – Standard forms of ?Booleans Expressions – Sum of products – Product of sums – Boolean Expression and Truth Tables – Boolean Expression Minimization using Boolean laws – The kamaugh Map – Sum of Products and Products of Sum Minimization.

**UNIT IV      HARDWARE AND SOFTWARE      10**

Proceesion Devices – Memory Devices – Input and Output Devices – Optical Input Device – Audiovisual Input Devices – Monitors – Printing Devices – Storage Devices – Magnetic and Optical Storage Devices – System – Application Software – Graphics and Multimedia.

**UNIT V      NETWORKING FUNDAMENTALS      14**

Data Communication with Standard Telephone Lines – Modems – Digital Data Connections – Broadband Connections – DSL Technologies – Cable Modem Connections – Computer Networking Basics – Common Type of Networks – Structuring of Networks – Network Media and Hardware.

**L:60; Total: 60**

**TEXT BOOKS:**

1. Thomas L.Floyd and R.P.Jain, “digital Fundamentals”, 8<sup>th</sup> Edition, Pearson Education,2007.
2. Peter Norton. “Introduction to Computers”. 6<sup>th</sup> Edition, Tata Mc Graw Hill, New Delhi, 2006.

**REFERENCES:**

1. Morris Mano, “Digital Design”, 3<sup>rd</sup> Edition, Pearson Education, 2006.
2. Raj kamal, “Digital System: Principles and Design”, 1<sup>st</sup> Edition, Pearson Educaion, 2007.
3. Albert Paul Malvino, Donald p.Leech, ”Digital Principles and Applications”, 6<sup>th</sup> Edition, Mc Graw Publishers, 2007.

**PHYSICS LABORATORY**  
**(Common to all branches of B.E. / B.Tech)**  
**Semester I**

**XEE107**

**APPLIED PHYSICS LAB**

**0 0 3 2**

**LIST OF EXPERIMENTS**

1. Torsional Pendulum – Determination of moment of inertia of disc and rigidity modulus of the material of a wire.
2. Non -Uniform Bending – Determination of Young’s Modulus.
3. Viscosity – Determination of Co-efficient of Viscosity of a liquid by Poiseuille’s flow.
4. Spectrometer – Dispersive power of a prism.
5. Air wedge - Determination of thickness of thin wire.
6. Lee’s Disc – Determination of thermal conductivity of a bad conductor.
7. Spectrometer – Determination of wavelength of Hg source using Grating.
8. Band gap determination of a semiconductor.
9. Spectrometer – id curve.
10. Semiconductor laser –
  - i. Determination of wavelength of Laser using grating.
  - ii. Particle size determination.
  - iii. Determination of numerical aperture and acceptance angle of an optical fibre.

**LIST OF EXPERIMENTS (Any 10 Experiments)**

- 1) Determination of total hardness, temporary & permanent hardness of water by EDTA method.
- 2) Determination of alkalinity of water sample.
- 3) Determination of chloride content of water sample by argentometric method.
- 4) Determination of DO content by Winkler's method.
- 5) Estimation of copper in brass.
- 6) Determination of strength of Hydrochloric acid by pH metric method.
- 7) Conductometric titration between strong acid and strong base.
- 8) Conductometric titration of mixture of acids.
- 9) Conductometric precipitation titration using barium chloride and sodium sulphate.
- 10) Determination of strength of iron by potentiometric method using dichromate.
- 11) Estimation of iron (1,10 – phenanthroline / thiocyanate method) or Ni (DMG) in the given solution by spectrometric method
- 12) Determination of sodium and potassium ions in water sample by flame photometric method.
- 13) Determination of molecular weight of a polymer by viscometry method.
- 14) Determination of percentage of calcium in limestone by EDTA method.

**PRACTICAL HOURS = 45**

**References for Chemistry Lab**

- (1) J. Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6<sup>th</sup> Edition, Pearson Education, 2004.
- (2) D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw Hill, London.

- A) WOOD WORK** : Sawing, planing and making common joints like TEE, Half lap and dovetail (any two)
- B) PLUMBING** : Basic pipe connection using valves, taps, couplings, unions, reducers, elbows in household fitting - Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances Preparation of line sketches for (i) water supply lines (ii) sewage lines.
- C) DEMONSTRATION (CIVIL ENGINEERING)** : Study of pipe connections on the suction and delivery pipe layouts.  
Study of joints in door panels, wooden furniture.  
Bar bending -Straightening of rods and cutting- 90°, 130° bend formation - 45°, 30° crank formation-Stirrups fabrication-Binding and placing of steel reinforcement
- D) FITTING** : Square, dovetail and hemisphere fitting of metal plate of 3mm
- E) WELDING** : (i) Preparation of arc welding of butt joints, lap joints and tee joints.  
(ii) Gas welding practice.

**P: 45**

**XEE201 MATHEMATICS - II****3 1 0 4****UNIT- I      MULTIPLE INTEGRALS****9**

Double integration-Cartesian and polar coordinates-change of order of integration-area as a double integral-change of variables between Cartesian and polar coordinates-triple integration.

**UNIT- II      VECTOR CALCULUS****9**

Gradient, divergence and curl-directional derivative-irrotational and solenoidal vector fields-Line, Surface and Volume Integral - Greens theorem in a plane, Guass divergence theorem and Stoke's theorem (excluding proof)-simple applications.

**UNIT –III      ANALYTIC FUNCTIONS****9**

Function of a complex variable-analytic function -necessary condition-Cauchy - Riemann equation - sufficient condition (excluding proof)-properties of analytical function-harmonic conjugate-construction of analytic function.

**UNIT – IV      COMPLEX INTEGRATION****9**

Statement and application of Cauchy's integral theorem and integral formula-Taylor and Laurent expansion – isolated singularities – residuals - cauchy residue theorem. Contour integration over unit circle and semicircular contours (excluding poles on boundaries).

**UNIT- V      LAPLACE TRANSFORM****9**

Laplace Transform-conditions for existence- elementary functions- properties-derivatives and integrals of transforms-Transform of derivatives and integrals - Transforms of unit step function and impulse function-Transform of periodic functions – Convolution Theorem – Inverse transforms – Application to solution of linear ordinary differential equations up to second order with constant coefficients.

**L:45; T:15; Total:60****TEXT BOOKS:**

1. Grewal.B.S. Higher Engineering Mathematics, Thirty eighth Edition, Khanna Publication, Delhi 2004.
2. Kreyszig, E, Advance Engineering Mathematics, Eighth Edition, John Wiley and Son (Asia) Ltd Singapore 2001.

## REFERENCES:

1. Bali N.P and Narayana Iyengar, N.Chand, Engineering Mathematics Laxmi Publication Pvt, Ltd, New Delhi, 2003.
2. Veerarajan. T., Engineering Mathematics Fourth Edition, Tata McGraw Publishing company Ltd, New Delhi, 2005.
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K Engineering Mathematics Volume I, II and III S. Chand & Co, New Delhi, 2005.
4. Venkataraman. M. K., Engineering Mathematics, Volume I and II Revised enlarge Fourth Edition, The National Publishing Company, Chennai, 2004.

**UNIT - I INTRODUCTION TO DATA STRUCTURES 9**

Abstract data types - Sequences as value definitions - Data types in C - Pointers in C - Data structures and C - Arrays in C - Array as ADT - One dimensional array - Implementing one dimensional array - Array as parameters - Two dimensional array - Structures in C - Implementing structures - Unions in C - Implementation of unions - Structure parameters - Allocation of storage and scope of variables. Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

**UNIT - II STACK, QUEUE AND LINKED LIST 9**

Stack definition and examples – Primitive operations – Example - Representing stacks in C - Push and pop operation implementation. Queue as ADT - C Implementation of queues - Insert operation - Priority queue - Array implementation of priority queue. Inserting and removing nodes from a list-linked implementation of stack, queue and priority queue - Other list structures - Circular lists: Stack and queue as circular list - Primitive operations on circular lists. Header nodes - Doubly linked lists - Addition of long positive integers on circular and doubly linked list.

**UNIT - III TREES 9**

Binary trees: Operations on binary trees - Applications of binary trees - Binary tree representation - Node representation of binary trees - Implicit array representation of binary tree – Binary tree traversal in C - Threaded binary tree - Representing list as binary tree - Finding the  $K^{\text{th}}$  element - Deleting an element. Trees and their applications: C representation of trees - Tree traversals - Evaluating an expression tree - Constructing a tree.

**UNIT - IV SORTING AND SEARCHING 9**

General background of sorting: Efficiency considerations, Notations, Efficiency of sorting. Exchange sorts: Bubble sort; Quick sort; Selection sort; Binary tree sort; Heap sort. Heap as a priority queue - Sorting using a heap-heap sort procedure - Insertion sorts: Simple insertion - Shell sort - Address calculation sort - Merge sort - Radix sort. Sequential search: Indexed sequential search - Binary search - Interpolation search.

**UNIT - V GRAPHS 9**

Application of graph - C representation of graphs - Transitive closure - Warshall's algorithm – Shortest path algorithm - Linked representation of graphs - Dijkstra's algorithm - Graph traversal - Traversal methods for graphs - Spanning forests - Undirected graph and their traversals - Depth first traversal - Application of depth first traversal - Efficiency of depth first traversal - Breadth first traversal - Minimum spanning tree - Kruskal's algorithm - Round robin algorithm.

**L:45; T:15; Total:60**

**TEXT BOOK:**

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.

**REFERENCES:**

1. E. Balagurusamy, 'Programming in Ansi C', Second Edition, Tata McGraw Hill Publication, 2003.
2. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.

## **XEE 203 COMPUTER PROGRAMMING**

**4 0 0 4**

### **UNIT I BASICS OF COMPUTER AND PROGRAMMING**

**12**

Digital Computer Fundamentals –Block diagram of a computer–Component of a computer system–Hardware and Software–Categories of Software–Bootting–Installing and uninstalling Software–Software piracy–Software terminologies–Applications of Computers–Algorithm – Design - Flow chart –History of Internet–Internet Services.

### **UNIT II BASIC ELEMENTS OF C** **12**

Introduction to C – Lexical elements of C – Operators and expressions – Operator precedence and associativity of operators – Input and Output Functions – Simple computational problems - Program Control Structures- Control statements – Branching, looping, nested control structures, switch, break, continue, goto statements – Problems using control structures.

### **UNIT III FUNCTIONS AND PROGRAM STRUCTURES**

**12**

Prototypes and Functions–Declaring, defining and accessing functions–Parameter passing methods–Recursion–Storage classes–auto, extern, static and register–Library functions-Programs using functions.

Defining and processing arrays–Passing arrays to functions–Multi-dimensional arrays–Strings and basic operations on strings–Enumerated data types–Programs using simple sorting, searching and merging of arrays.

### **UNIT IV POINTERS** **12**

Pointer concept–Declaration–Accessing variable through pointer–Initializing pointer variable–Pointers and Functions–Pointers and Arrays–Pointers and Structures–Example programs using pointers with function, arrays and structures–Command line arguments – Dynamic memory allocation–Operations on pointers.

### **UNIT IV STRUCTURES, UNIONS AND FILE HANDLING**

**12**

Structures–User defined data types–Union–Nested structure, passing structures to functions - Self referential structures - File pointer–High level File operations–Opening and closing of file–Creating, Processing and Updation on files–Simple file handling programs.

**L: 60; Total : 60**

**TEXT BOOKS:**

1. Byron Gottfried, "Programming with C", II Edition, (Indian Adapted Edition), TMH publications, 2006.
2. Yeshwant Kanethker, "Let us C", BPB Publications, 2004

**REFERENCES:**

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
2. Behrouz A. Forouzan and Richard. F. Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks–Cole Thomson Learning Publications, 2001.
3. Johnsonbaugh R. and Kalin M., "Applications Programming in ANSI C", III Edition, Pearson Education India, 2003.

**UNIT - I BASIC CIRCUIT CONCEPTS****9**

Lumped circuits – circuit elements, ideal sources (independent and dependent), linear passive parameters R, L and C, V-I relationship of circuit elements – Sinusoidal voltage and current: RMS value, form factor – Kirchoff's Laws – analysis of series and parallel circuits – network reduction: voltage and current division, source transformation, star/delta transformation

**UNIT - II TRANSIENT ANALYSIS OF FIRST & SECOND ORDER CIRCUITS****9**

Source free response of RL and RC circuits – forced (step) response of RL and RC circuits – source free response of RLC series circuit – forced (step) response of RLC series circuit – forced response of RL, RC and RLC series circuit to sinusoidal excitation – Time constant and natural frequency of oscillation of circuits – Laplace Transform application to the solution of RL, RC & RLC circuits – Initial and final value theorems and applications – concept of complex frequency – driving point and transfer impedance – poles and zeros of network function.

**UNIT - III SINUSOIDAL STEADY STATE ANALYSIS****9**

Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (voltampere), power factor and energy associated with these circuits – concept of complex power – phasor diagram, impedance triangle and power triangle associated with these circuits – resonance in series and parallel circuits – Q factor, half-power frequencies and bandwidth of resonant circuits.

**UNIT - IV MULTI DIMENSIONAL CIRCUIT ANALYSIS & NETWORK THEOREMS****9**

Node–voltage analysis of multi node circuit with current sources – rules for constructing nodal admittance matrix [Y] for solving matrix equation  $[Y][V]=[I]$  – Mesh current analysis of multi node circuits with voltage sources – rules for constructing mesh impedance matrix [Z] for solving matrix equation  $[Z]I=V$  – Super position theorem – Thevenin's theorem – Norton's theorem – Reciprocity theorem – Compensation theorem – Tellegen's theorem – Millman's theorem – maximum power transfer theorem for variable resistance load, variable impedance load and variable resistance and fixed reactance load.

**UNIT - V COUPLED CIRCUITS AND THREE PHASE CIRCUITS****9**

Coupled circuits: mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits – Three phase circuits: three phase balanced/unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages & currents – power and power factor measurements in three phase circuits.

**L:45; T:15; TOTAL:60**

## **TEXT BOOKS:**

1. William H.Hayt Jr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002
2. Joseph A.Edminister, Mahmood Nahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.

## **REFERENCES:**

1. R.C. Dorf, "Introduction to Electric Circuits" John Wiley & Sons Inc, New York, Second Edition, 1993
2. Charles K.Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuit", McGraw-Hill, N.Y, 2003.

**UNIT - I SEMICONDUCTOR DIODE 9**

Semiconductor – Types - Theory of p-n junction – p-n junction as diode – p-n diode currents – Volt-amp characteristics – Diode resistance – Temperature effect of p-n junction – Transition and diffusion capacitance of p-n diode – Diode switching times.

**UNIT - II BI-POLAR TRANSISTOR 9**

Junction transistor – Transistor construction – Detailed study of currents in transistor – Input and output characteristics of CE, CB and CC configurations – Transistor hybrid model for CE configuration – Analytical expressions for transistor characteristics – Transistor switching times – Voltage rating – Power transistors.

**UNIT - III FIELD EFFECT TRANSISTORS 9**

Junction field effect transistor – Pinch off voltage – JFET volt-ampere characteristics – JFET small signal model – MOSFETS and their characteristics – FET as a variable resistor – Unijunction transistor.

**UNIT - IV OPTO ELECTRONIC DEVICES 9**

Photo emissivity and photo electric theory – Theory, construction and characteristics: light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

**UNIT - V MISCELLANEOUS DEVICES 9**

Theory, characteristics and application: SCR, TRIAC, PUT, tunnel diode, thermistors, piezo electric devices, zener diode, Scottky diode, PIN diode - charge coupled devices, varactor diode and LDR.

**L:45; Total:45**

**TEXT BOOKS:**

1. Jacob. Millman, Christos C.Halkias, 'Electronic Devices and Circuits', Tata McGraw Hill Publishing Limited, New Delhi, 2003.
2. David A.Bell, 'Electronic Devices and Circuits', Prentice Hall of India Private Limited, New Delhi, 2003.

**REFERENCES:**

1. Theodre. F. Boghert, 'Electronic Devices & Circuits', Pearson Education, VI Edition, 2003.
2. Ben G. Streetman and Sanjay Banerjee, 'Solid State Electronic Devices', Pearson Education, 2002 / PHI
3. Allen Mottershead, 'Electronic Devices and Circuits – An Introduction', Prentice Hall of India Private Limited, New Delhi, 2003.

**MECHANICS OF SOLIDS****UNIT - I DEFORMATION OF SOLIDS 6**

Concept of Stress and Strain – Normal and Shear Stresses – Simple and Compound Stresses - Explanation of Principal Stresses and Principal Planes – Normal, Shear and Volumetric Strains – Constitutive Relationship between Stress and Strain – Elasticity and Elastic Moduli – Poisson’s Ratio – Concept of Free Body – External and Internal Equilibrium – Concepts of Strength, Stability and Stiffness.

**UNIT- II BENDING OF BEAMS 6**

Concept of Shear force and Bending Moment – Beams and Support Forces – Relationship between Bending Moment and Shear Force – Bending Moment and Shear Force Diagrams for Simply Supported, Cantilever and Overhanging Beams.

**UNIT - III STRENGTH OF BEAMS AND COLUMNS 6**

Theory of Simple Bending – Stress and Strain Variation along the depth of Beams – Struts and Columns - Concept of Strain Energy– Stability and Buckling – Euler Buckling Load for Columns.

**UNIT - IV SHAFTS AND SPRINGS 6**

Torsion – Shear Stresses in circular solid and hollow shafts - Torque and Power – Helical and Leaf Springs – Load, Deflection, Stress and Stiffness Relationships.

**UNIT - V PLANE TRUSSES 6**

Plane trusses and frames – Types of trusses – Analysis of forces in truss members – Method of joints.

**MECHANICS OF FLUIDS****UNIT - VI FLUID PROPERTIES AND FLOW CHARACTERISTICS 6**

Surface Tension – Capillarity – Viscosity – Newton’s Law – Fluid Pressure and Pressure Head - Fluid Velocity and Acceleration – Uniform and Steady Flow – Stream Lines and Path Lines – Reynold’s Number – Classification as Laminar and Turbulent Flow – Continuity Equation – Potential and Stream Functions.

**UNIT - VII FLOW DYNAMICS 6**

Euler’s and Bernoulli’s Equations – Pressure Losses along the Flow – Categorisation into Major and Minor Losses - Flow through Circular Pipes – Poiseulle’s Equation – Statement of Darcy – Weisbach equation – Friction factor – Hydraulic grade line.

**UNIT - VIII FLOW MEASUREMENT AND PIPE NETWORKS 6**

Manometer - Venturi and Orifice Meters –Flow through Weirs - Principles of open channel flow – Pipes in series and parallel – Kirchoff's Laws

**UNIT - IX TURBINES 6**

introduction to and classification of turbines – rotor blade profiles and their importance with respect to hydraulic efficiency – specific speed – turbine characteristics – speed governance.

**UNIT - X PUMPS 6**

Classification – Principles of Positive Displacement Pumps – Slip – Centrifugal Pumps – Impeller Blade Profiles – Pump Characteristics - Efficiency

**L:45; T:15; TOTAL: 60**

**TEXT BOOKS:**

1. R. K. Rajput, Strength of Materials (Mechanics of Solids), S. Chand & Company Ltd., 2003
2. K. L. Kumar, Engineering Fluid Mechanics, S. Chand & Company Ltd., 2002

**Simple exercises using the following Application Packages**

1. Word
2. Spread sheet
3. Power point

**Exercises using C**

1. Programs using Operators and Expressions
2. Programs using IO Formatting
3. Programs using Control Structures
4. Programs using Looping Structures
5. Programs using Arrays and String manipulations
6. Programs using Functions and Recursion
7. Programs using Structures and Unions
8. Programs using Pointers
9. Programs using Files
10. Programs using Command line arguments



**UNIT I EXTENSIVE LISTENING****12**

Listening and typing –Listening and sequencing of information – Filling in the blanks – Listening and answering the question. Close Exercises- Vocabulary building – Dictionary habits a brief note on Thesaurus.

Listening to specific speeches, discussions, interviews, debates, lectures. (Instructional Aids: Audio cassettes, Tape recorders, Language Software

**Suggested Activities**

- Gap filling activities while listening to a text
- Listening and identifying the missing words in a given text
- Listening to a brief conversation and answering questions orally
- Listening to commentaries on television or radio to improve listening skills
- Paying attention to speaker's appearance, expressions, body movements and posture that convey meaning to his/her words.
- 

**UNIT II INTENSIVE LISTENING****12**

List for specific information – note taking-guided and open – listening comprehension – listening to specific speeches – interviews – debates lectures.

**Suggested Activities**

- Taking notes during lectures.
- Listening to a discourse and filling up gaps in a work sheet.
- Informational comprehension and literal comprehension tasks based on listening- post listening quiz.
- Listening to a passage preferably technical and answering questions choosing appropriate options (multiple choice)

Note : These listening activities can be done using a work sheet in a language laboratory or in the class room using a tape recorder.

Oral practice –developing confidence-introducing oneself-asking for or eliciting information-offering suggestions and recommendations.

Analysing problems and providing solutions- expressing opinions (agreement and disagreement) Role of idioms in Spoken Communication Pronunciation Practice- Stress intonation, accent, questions for oral discussions, describing objects, presenting information, Process description, narrating events, giving introduction, welcome speech and proposing a vote of thanks.

**Suggested Activities**

- Introducing oneself and others
- Role play activities based on real –life situations
- Discussing travel plan / industrial visit
- Giving oral instructions for performing tasks at home, at class-room and at work place  
( use of imperatives)
- Participating in a short classroom-discussion on a controversial topic ( eg. For and against reservation policy in educational institutions)
- Oral presentation on topics related to science and technology.

Face to Face conversation- Telephonic conversation- Role play activities (Students take on roles and engage in conversation) participating in an interview situational dialogues.

**Suggested Activities**

- Making either telephonic conversations or face to face conversation- making request- Asking questions-making recommendations using modal verbs- Giving instructions using imperatives – Expressing purpose and function- obligation and preference- Accepting and offering counseling .

Structure the resume/ report letter writing/ E-mail communication samples

**Presentation skills**

Elements of an effective presentation – structure of presentation- presentation tools- voice modulation- audience analysis – body language- video samples.

**Soft skills**

The management- articulation – assertiveness – psychometrics- innovation and creative – stress management and poise- video samples

**Group discussion**

Why is GD part of selection process?- Structure of GD- moderator – led and other GDs – Strategies in GD- Team spirit- Body language(gestures)- Mock GD- Video samples.

**Interview skills**

Kinds of interviews- required key skills – corporate culture – mock interview- video samples.

**LECTURE HOURS: 30      PRACTICAL HOURS: 30      TOTAL HOURS: 60**

**TEXT BOOK:**

1. Meenakshi Raman, Sangeetha Sharma: Technical Communication Principles and Practice, Oxford University Press.

**REFERENCES:**

1. Jeremy Comfort, Pamela Rogerson, Trish Stott and Derek Utley: Speaking Effectively, Cambridge University Press.
2. Jayashree Balan; Spoken English, Vijay Nicole Imprints Private Ltd., Chennai.
3. Jean Naterop and Rod Revell ( 1988) Telephoning in English ( Cambridge University Press
4. David Martur (1994), Tough Talking, University Press, Hyderabad

**LIST OF EXPERIMENTS**

1. Verification of Kirchoff's voltage and current laws, Thevenin's and Norton's Theorems.
2. Study of oscilloscope and measurement of sinusoidal voltage, frequency and power factor.
3. Measurement of time constant of series R-C electric circuits.
4. Frequency response of RC and RL circuits.
5. Resonant frequency and frequency response of a series RLC circuit.
6. Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits.
7. Study of low pass and high pass filters.
8. Measurement of real power, reactive power, power factor and impedance of RC, RL and RLC circuits using voltmeters and ammeters.
9. Power measurement in a three-phase circuit by two Wattmeter method.
10. Study of first and second order circuit transients by digital simulation.

**Total: 45**

**XEE301 MATHEMATICS III****3 1 0 4****UNIT - I PARTIAL DIFFERENTIAL EQUATION****9**

Formation – Solution of standard types of first order equations – Lagrange's equation – Linear partial differential equations of Second and higher order with constant coefficients.

**UNIT - II FOURIER SERIES****9**

Dirichlet's conditions – General Fourier series – Half range Sine and Cosine series – Parseval's identity – Harmonic Analysis

**UNIT - III BOUNDARY VALUE PROBLEMS****9**

Classification of second order Quassi Linear Partial Differential Equations – Solution of One Dimensional Wave Equation – One Dimensional Heat Equation – Steady State Solution of two Dimensional Heat Equation ( Insulated Edges Excluded) – Fourier Series solutions in Cartesian Coordinates.

**UNIT - IV FOURIER TRANSFORMS****9**

Statement of Fourier Integral theorem – Fourier transform pairs – Fourier sine and cosine transforms – Properties – Transform of simple functions – convolution theorem – Parseval's identity.

**UNIT - V Z – TRANSFORMS****9**

Z – Transform – Elementary properties – Inverse Z – Transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – Transforms.

**L :45; T:15; TOTAL:60****REFERENCES:**

1. Grewal .B.S. Higher Engineering Mathematics, Thirty eighth Edition, Khanna Publication , Delhi 2004.
2. Veerarajan. T., Engineering Mathematics (for Semester III ), 3/e (Ascent series) Tata McGraw Hill Publishing Company Ltd, New Delhi .
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K Engineering Mathematics Volume III, S. Chand & Co, New Delhi, 2005.
4. Venkataraman. M. K., Engineering Mathematics, Volume III, The National Publishing Company, Chennai, 2004.

## **XEE302 ELECTROMAGNETIC FIELD THEORY**

**3 1 0 4**

### **UNIT - I INTRODUCTION**

**8**

Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems (brief description only) - Divergence theorem – Stoke's theorem.

### **UNIT - II ELECTROSTATICS**

**10**

Coulomb's Law – Definitions-Electric charge, Electric field, flux, Properties of Flux lines, Flux density, Field intensity-Permittivity –Field due to point and continuous charges – Gauss's law and application – Electrical potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric – Dielectric polarization, Electric field in multiple dielectrics – boundary conditions, Poisson's and Laplace's equations, Example of application of Laplace equation – Capacitance, loss angle of capacitor-energy density – Dielectric strength.

### **UNIT - III MAGNETOSTATICS**

**9**

Lorentz Law of force, magnetic flux line, properties of magnetic flux lines, magnetic field intensity-permeability – Biot-savart's Law - Ampere's Law – Magnetic field due to straight conductors, circular loop, solenoid– Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization – Magnetic field in multiple media – Boundary conditions – Scalar and vector potential – Magnetic force – Torque – Self Inductance(L), Mutual Inductance(M) – Energy density – Magnetic circuits-permanent magnets.

### **UNIT - IV ELECTRODYNAMIC FIELDS**

**9**

Faraday's law of induced emf, eddy current loss- Hysteresis loss-Transformer and motional EMF, Maxwell's equations (differential and integral forms) – Conduction current, Displacement current – Relation between conduction current density and electric field intensity-Qualitative differences between field theory and circuit theory-Electro magnetic shielding.

### **UNIT - V ELECTROMAGNETIC WAVES**

**9**

Generation of electromagnetic waves– Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant, surge impedance of a line in terms of energy balance – Waves in free space, lossy and loss less dielectrics, conductors-skin depth, Poynting vector, typical applications of poynting vector – Plane wave- reflection and refraction- relation between electric field intensity and magnetic field intensity.

**L:45,t:15. Total: 60**

**TEXT BOOKS:**

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition, 1991.
2. William. H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.

**REFERENCES:**

1. D.Sathaiah-M.Anitha, 'Electro magnetic fields' First edition-2007, SCITECH publications (India) Pvt Ltd., Chennai.
2. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.
3. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
4. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
5. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 1995.

**UNIT - I BASIC CONCEPTS OF ROTATING MACHINES 8**

Principles of electromechanical energy conversion – Single and multiple excited systems – m.m.f of distributed A.C. windings – Rotating magnetic field – Generated voltage – Torque in round rotor machine.

**UNIT - II DC GENERATORS 8**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

**UNIT - III DC MOTORS 9**

PRINCIPLE OF OPERATION – BACK EMF AND TORQUE EQUATION – CHARACTERISTICS OF SERIES, SHUNT AND COMPOUND MOTORS – STARTING OF DC MOTORS – TYPES OF STARTERS – SPEED CONTROL OF DC SERIES AND SHUNT MOTORS.

**UNIT - IV TRANSFORMERS 12**

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio – Transformer on no-load – Parameters referred to HV / LV windings – Equivalent circuit – Transformer on load – Regulation – Parallel operation of single phase transformers – Auto transformer – Three phase transformers – Vector group.

**UNIT - V TESTING OF DC MACHINES AND TRANSFORMERS 8**

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

**L :45; T:15; TOTAL:60**

**TEXT BOOKS:**

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

**REFERENCES:**

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

**UNIT - I SMALL-SIGNAL AND LARGE SIGNAL AMPLIFIERS 9**

Fixed and self biasing of bjt & fet – small signal analysis of ce, cc & common source amplifiers – cascade and darlington connections, transformer coupled class a, b & ab amplifiers – push-pull amplifiers.

**UNIT - II DIFFERENTIAL AND TUNED AMPLIFIERS 9**

Differential amplifiers – common mode and differential mode analysis - dc and ac analysis - characteristics of tuned amplifiers – single & double tuned amplifier.

**UNIT - III FEEDBACK AMPLIFIER AND OSCILLATORS 9**

Characteristics of negative feedback amplifiers – voltage / current, series/shunt feedback – theory of sinusoidal oscillators – phase shift and wien bridge oscillators – colpitts, hartley and crystal oscillators.

**UNIT - IV PULSE CIRCUITS 9**

Rc wave shaping circuits – diode clampers and clippers – multivibrators – schmitt triggers – ujt based saw tooth oscillators.

**UNIT - v. RECTIFIERS AND POWER SUPPLY CIRCUITS 9**

Half wave & full wave rectifier analysis - inductor filter – capacitor filter - series voltage regulator – switched mode power supply.

**L:45; T:15 Total:60**

**TEXT BOOKS**

1. David a. Bell, 'electronic devices & circuits', prentice hall of india/pearson education, Iv edition, eighth printing, 2003.
2. Jacob millman & christos.c.halkias, 'integrated electronics: analog and digital circuits and system', tata mcgraw hill, 1991.

**REFERENCES:**

1. Robert. L. Boylestad & lo nashelsky, 'electronic devices & circuit theory', eighth edition, pearson education, third indian reprint, 2002 / phi.
2. Jacob millman & herbert taub, 'pulse, digital & switching waveforms', tata mcgraw hill, edition 2000, 24<sup>th</sup> reprint, 2003.
3. Donald I.schilling and charles belove, 'electronic circuits', 3<sup>rd</sup> edition, tata mcgraw hill, 2003.

**UNIT I HUMAN VALUES****10**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

**UNIT II ENGINEERING ETHICS****9**

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION****9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS****9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.  
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

**UNIT V GLOBAL ISSUES****8**

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

**L: 45; Total : 45**

**TEXT BOOKS:**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

**REFERENCES:**

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists

**LIST OF EXPERIMENTS**

1. Open circuit and load characteristics of D.C separately and self excited shunt generator
2. Load characteristics of D.C. compound generator with differential and cumulative connection
3. Load characteristics of D.C. shunt and compound motor
4. Load characteristics of D.C series motor
5. Swinburne's test and speed control of D.C shunt motor
6. Hopkinson's test on D.C motor – generator set
7. Load test on single-phase transformer and three phase transformer connections
8. Open circuit and short circuit tests on single phase transformer
9. Sumpner's test on transformers
10. Separation of no-load losses in single phase transformer

**Total:45**

**LIST OF EXPERIMENTS**

1. Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters.
2. Static characteristics and parameter determination of JFET.
3. Static characteristics of semiconductor diode, zener diode and study of simple voltage regulator circuits.
4. Static characteristics of UJT and its application as a relaxation oscillator.
5. Photodiode, Phototransistor characteristics and study of light activated relay circuit.
6. Static characteristics of Thermistors.
7. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
8. Phase shift oscillators and Wien bridge oscillators.
9. Frequency response of common emitter amplifiers.
10. Differential amplifiers using FET.

**Total:45**

**UNIT - I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**

Linear interpolation methods (method of false position) – Newton’s method – Statement of fixed point theorem – Fixed point iteration:  $x=g(x)$  method – Solution of linear system by Gaussian elimination and Gauss-Jordan methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method.

**UNIT - II INTERPOLATION AND APPROXIMATION 9**

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton’s forward and backward difference formulas.

**UNIT - III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons’s rules.

**UNIT - IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9**

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

**UNIT - v BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9**

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

**L = 45 T = 15 Total = 60**

**TEXT BOOKS:**

1. C.F. Gerald and P.O. Wheatley, ‘Applied Numerical Analysis’, Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. E. Balagurusamy, ‘Numerical Methods’, Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.

## REFERENCES:

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.
2. R.L. Burden and T.D. Faires, 'Numerical Analysis', Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

**UNIT - I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY****RESOURCES****12**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

**UNIT - II ECOSYSTEMS AND BIODIVERSITY****12**

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT - III ENVIRONMENTAL POLLUTION****8**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness

**UNIT - V HUMAN POPULATION AND THE ENVIRONMENT****6**

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education - HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

**TOTAL:45****TEXT BOOKS:**

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science.
4. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

**REFERENCES:**

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
3. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. S.K.Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, New Delhi, 1999.

**UNIT - I SYNCHRONOUS GENERATOR****9**

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

**UNIT - II SYNCHRONOUS MOTOR****8**

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

**UNIT - III THREE PHASE INDUCTION MOTOR****12**

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.

**UNIT - IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR****7**

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

**UNIT - V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES****9**

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

**L :45; T:15; Total:60**

**TEXT BOOKS:**

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

**REFERENCES:**

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', TataMcGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.
4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.

**UNIT - I INTRODUCTION****9**

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system. FACTS (qualitative treatment only): TCSC, SVC, STATCOM, UPFC.

**UNIT - II TRANSMISSION LINE PARAMETERS****9**

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; application of self and mutual GMD; skin and proximity effects; interference with neighbouring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

**UNIT - III MODELLING AND PERFORMANCE OF TRANSMISSION LINE****9**

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

**UNIT - IV INSULATORS AND CABLES****9**

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

**UNIT - V SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM****9**

Types of substations; bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker-and-a-half with two main buses, double bus-bar with bypass isolators.

Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids; design principles of substation grounding system; neutral grounding.

Radial and ring-main distributors; interconnectors; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

**L:45, T:15, Total:60**

**TEXT BOOKS:**

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

**REFERENCES:**

1. Luces M.Fualkenberry ,Walter Coffe, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

**UNIT - I SYSTEMS AND THEIR REPRESENTATION 9**

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

**UNIT - II TIME RESPONSE 9**

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

**UNIT - III FREQUENCY RESPONSE 9**

Frequency response – Bode plot – Polar plot – Constant M and N circles – Nichols chart – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

**UNIT - IV STABILITY OF CONTROL SYSTEM 9**

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

**UNIT - V COMPENSATOR DESIGN 9**

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

**L :45; T:15; TOTAL:60**

**TEXT BOOKS:**

1. K. Ogata, 'Modern Control Engineering', 4<sup>th</sup> edition, Pearson Education, New Delhi, 2003 / PHI.
2. I.J. Nagrath & M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

**REFERENCES:**

1. B.C. Kuo, 'Automatic Control Systems', Prentice Hall of India Ltd., New Delhi, 1995.
2. M. Gopal, 'Control Systems, Principles & Design', Tata McGraw Hill, New Delhi, 2002.
3. M.N. Bandyopadhyay, 'Control Engineering Theory and Practice', Prentice Hall of India, 2003.

Applet programming.

**UNIT - I OBJECT ORIENTED PROGRAMMING AND BASICS OF C++ 9**

Software crisis – software evolution – a look at procedure-oriented programming – object oriented programming paradigm – basic concepts of object oriented programming – benefits of oop – object-oriented languages – applications of oop - what is c++? – a simple c++ program – more c++ statements – structure of c++ program.

Tokens – Keywords – Identifiers and constants – Basic data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Manipulators – Type cast operator – Expressions and their types – Special assignment expressions – Control structures - The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments – Function overloading.

**UNIT - II CLASSES AND OBJECTS 9**

Specifying a class – Defining member functions – Private member functions – Arrays within a class – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – Objects as function arguments – Friendly functions – Returning objects.

Constructors: Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Dynamic constructors – Destructors.

**UNIT - III OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 9**

Defining operator overloading: Overloading unary, binary operators. Manipulation of strings using operators – Rules for overloading operators – Type Conversions - Defining derived classes – Single inheritance – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Abstract classes - Introduction to pointers to objects: This pointer – Pointers to derived classes – Virtual functions – Pure virtual functions.

**UNIT - IV JAVA EVOLUTION, CONSTANTS, VARIABLES, DATA TYPES, OPERATORS, CLASSES, OBJECTS, METHODS, ARRAYS AND STRINGS 9**

Java features: How Java differs from C and C++ - Simple Java program – Java program structures – Java tokens – Java statements – Implementing a Java program – Java virtual machine – Command line arguments - Constants – Variables – Data types – Scope of variables – Operators in Java.

Defining a class – Adding variables and methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Inheritance: Extending a class – Overriding methods – Final variables and methods – Final classes – Abstract methods and classes – Visibility control - Arrays – One dimensional array – Creating an array – Two-dimensional arrays – Strings – Vectors.

**UNIT - V PROGRAMMING USING INTERFACES, PACKAGES,  
MULTITHREADING, MANAGING ERRORS AND EXCEPTIONS  
AND APPLETS**

**9**

Defining interfaces – Extending interfaces – Implementing interfaces – Accessing interface variables – Java API packages – Using system packages – Creating, accessing and using a package – Adding a class to a package - Creating threads – Extending the thread class – Stopping and blocking a thread – Thread exceptions – Thread priority – Synchronization – Life cycle of a thread – Using thread methods.

Types of errors: Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging. Preparing to write applets – Applet lifecycle – Creating an executable applet – Designing a web page – Applet tag – Adding applet to HTML file – Running the Applet.

**L:45; T:15; Total:60**

**TEXT BOOKS:**

1. E.Balagurusamy, 'Object Oriented Programming with C++', Second edition, Tata McGraw Hill, 2003.
2. E.Balagurusamy, 'Programming with JAVA – A Primer', Second edition, Tata McGraw Hill, 2003.

**REFERENCES:**

1. Herbert Schildt, 'C++ - The Complete Reference', Tata McGraw Hill, 1997.
2. Bjarne Stroustrup, 'The C++ Programming Language', Addison Wesley, 2000.
3. John .R .Hubbard, 'Schaums Outline Programming with C++', Tata McGraw Hill, 2003.
4. Kris Jasma, 'Java Programming – A Complete Reference', Galgotia publication, 1994.

**LIST OF EXPERIMENTS**

1. Regulation of three phase alternator by emf and mmf methods
2. Regulation of three phase alternator by ZPF and ASA methods
3. Regulation of three phase salient pole alternator by slip test
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor test on three-phase induction motor.
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor
10. No load and blocked rotor test on single-phase induction motor.

**Total: 45**

1. String concatenation using dynamic memory allocation concept.
2. Implementation of arithmetic operations on complex numbers using constructor overloading.
3. To read a value of distance from one object and add with a value in another object using friend function.
4. Implementation of + and - operator overloading and implementation of addition operation of octal object with integer using operator overloading.
5. Implementation of addition and subtraction of two polynomial objects using operator overloading.
6. Managing bank account using inheritance concept.
7. To compute the area of triangle and rectangle using inheritance and virtual function.
8. Writing simple programs in Java.
9. Use of interfaces in Java.
10. Developing packages in Java.

**P:45; Total:45**