

**ANNA UNIVERSITY :: CHENNAI – 600 025**

**CURRICULUM - 2004**

**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**

**SEMESTER I**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>M</b>
<b>THEORY</b>					
HS1101	<a href="#">English – I</a>	3	1	0	100
MA1101	<a href="#">Mathematics – I</a>	3	1	0	100
PH1101	<a href="#">Physics – I</a>	3	0	0	100
CY1101	<a href="#">Chemistry – I</a>	3	0	0	100
GE1101	<a href="#">Engineering Graphics</a>	1	3	0	100
GE1102	<a href="#">Fundamentals of Computing</a>	3	0	0	100
<b>PRACTICAL</b>					
PH1102	<a href="#">Physics Laboratory</a>	0	0	2	100
CY1102	<a href="#">Chemistry Laboratory</a>	0	0	2	100
GE1103	<a href="#">Engineering Practices Lab</a>	0	0	3	100
GE1104	<a href="#">Computer Practice – I</a>	0	0	3	100

**SEMESTER II**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>M</b>
<b>THEORY</b>					
HS1151	<a href="#">English – II</a>	3	1	0	100
MA1151	<a href="#">Mathematics – II</a>	3	1	0	100
PH1151	<a href="#">Physics – II</a>	3	0	0	100
CY1151	<a href="#">Chemistry – II</a>	3	0	0	100
GE1151	<a href="#">Engineering Mechanics</a>	3	1	0	100
CE1161	<a href="#">Fluid and Solid Mechanics</a>	3	1	0	100
EE1151	<a href="#">Electric Circuit Analysis</a>	3	1	0	100
<b>PRACTICAL</b>					
GE1152	<a href="#">Computer Practice – II</a>	0	0	3	100
EE1152	<a href="#">Electric Circuits Lab</a>	0	0	3	100

**AIM**

- To encourage learners to do participative learning of the target language (English) and help them in acquiring communication skills.

**OBJECTIVES**

- To help learners improve their vocabulary and to enable them to use words appropriately in different contexts
- To familiarise learners with different rhetorical functions of Scientific English.
- To help learners develop key techniques that could be adopted while reading texts.
- To help learners develop listening skills for academic and professional purposes
- To help learners acquire the ability to speak effectively in English in real-life situations

**1. FOCUS ON LANGUAGE****10 + 3**

Word formation with prefixes and suffixes – synonyms and antonyms – expanding nominal compounds – framing of questions (wh – pattern, yes/no questions, tag questions) - subject - verb agreement – tenses (simple and compound tenses) – sentence structures – five major patterns (SV, SVC, SVO, SVO<sub>(i)</sub>O<sub>(d)</sub> and SVOC patterns) - impersonal passive voice – comparative adjectives (affirmative and negative) – use of prepositions - phrasal verbs – use of conditionals.

**Suggested activities**

Using prefixes and suffixes to change the grammatical functions of words – identifying the lexical and contextual meanings of words – role play - activities based on a given situation – correction of errors in the given sentences – providing a context for the use of the tenses/sentence structures – rewriting sentences into impersonal passive – using comparative forms of adjectives in affirmative / negative sentences – ‘if’ clauses – the three main types., probable condition, improbable condition and impossible condition.

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

**2. READING****8 + 3**

Predicting the content - skimming the text – understanding the gist – identifying the topic sentence and its role in each paragraph – scanning – inferring / identifying lexical and contextual meanings – transfer of information / note-making – understanding discourse coherence– sequencing of sentences.

**Suggested Activities**

Taking a quick glance at the text to predict the content – reading to identify main content and giving feedback in response to the teacher’s questions – making a thesis statement about the text - scanning for specific information – sequencing of jumbled sentences using linguistic clues (e.g. reference words and repetitions) and semantic

clues following propositional development – study reading – comprehending a passage and answering questions of varied kinds, relating to information, inference and prediction.

### **3. WRITING**

**10 + 3**

One-sentence definition and extended definition - description – paragraph writing (topic sentence and its role, unity, coherence and use of cohesive expressions) – process description (use of sequencing connectives eg. firstly, secondly, then, after, etc.) – comparison and contrast – classifying the data - analysing / interpreting the data - formal and informal letter writing – editing (punctuation, spelling and grammar)

#### **Suggested Activities**

Using appropriate expressions defining / describing an object / device / instrument / machine – writing a paragraph based on information provided in a tree diagram / flow chart / bar chart / pie chart / tables – formal letters – writing to officials (leave letter, seeking permission for practical training, asking for certificates, testimonials) - letter to the editor – informal letters (persuading / dissuading, thanking and congratulating friends / relatives) – sending E-mail – editing a passage (correcting the mistakes in punctuation, spelling and grammar).

### **4. LISTENING**

**8 + 3**

Extensive listening - listening for general content – listening to fill up information gaps - intensive listening – listening for specific information – note-taking – guided and unguided.

#### **Suggested Activities**

Gap filling activity while listening to a text – listening intently to identify the missing words in a given text – listening to a brief conversation and answering questions - listening to a discourse and filling up gaps in a worksheet – taking notes during the lecture class – inferential comprehension and literal comprehension tasks based on listening – post-listening quizzes.

Note : The listening activities can be done using a work sheet in the Language Laboratory or in the class room using a tape recorder.

### **5. SPEAKING**

**9 + 3**

Oral practice – developing confidence - introducing oneself - asking for or eliciting information - describing objects – offering suggestions and recommendations – analysing problems and providing solutions – expressing opinions (agreement / disagreement) - giving instructions.

#### **Suggested Activities**

Role play activities based on real-life situations – discussing travel plan / industrial visits – giving oral instructions for performing tasks at home and at work (use of imperatives) – participating in a short classroom - discussion on a controversial topic

(eg. for and against Cloning) – oral presentation (closed and open-ended topics related to science and technology).

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

**TEXT BOOK**

1. Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Vol.1, 2<sup>nd</sup> Edition, Orient Longman Ltd., 2002.

**REFERENCES**

1. Chellammal, V., Learning to Communicate: A Resource Book for Scientists and Technologists, Allied Pub. Pvt. Ltd., Chennai, 2003.
2. Sharon J. Gerson, Steven M. Gerson, Technical Writing – Process and Product, 3<sup>rd</sup> Edition, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2004.

**AIM**

The course is aimed at developing the skills of engineering students in the basics of chosen topics of Mathematics that are imperative for effective understanding of engineering subjects. It also lays the foundation for learning further topics of Mathematics in higher semesters in a graded manner. The learners will be enabled to appreciate the important role of mathematical concepts in engineering applications.

**OBJECTIVES**

On completion of the course the students are expected to

- Be capable of identifying algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases and to have acquired the technique of diagonalizing a matrix which would render the eigensolution procedure very simple.
- Have grasped the method of three dimensional analytical geometry to study the properties of lines and planes in space along with sphere as an illustrative curved surface element, providing an elegant tool for enhanced understanding of three dimensional materials which is imperative for engineers.
- Understand effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.
- Understand and handle functions of more than one variable, from the points of view of their differentiation, expansions and extreme values, along with differentiation under integral sign which are encountered in engineering studies.
- Have learnt the method of solving differential equations of certain types, including systems of differential equations that they might encounter in their studies of other subjects in the same or higher semesters.

**1. MATRICES****9 + 3**

Rank of a matrix – Consistency of linear system of equations – Eigenvalue problem – Eigenvalues and eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley –Hamilton theorem (without proof) – Similarity transformation (concept only) – Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

**2. THREE DIMENSIONAL ANALYTICAL GEOMETRY****9 + 3**

Direction cosines and ratios – Angle between two lines – Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal spheres.

**3. GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS**

**9 + 3**

Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involutives and evolutes – Envelopes – Properties of envelopes and evolutes – Evolute as envelope of normals.

**4. FUNCTIONS OF SEVERAL VARIABLES**

**9 + 3**

Functions of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and minima – Constrained maxima and minima – Lagrange's Multiplier method – Jacobians – Differentiation under integral sign.

**5. ORDINARY DIFFERENTIAL EQUATIONS**

**9 + 3**

Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients- Homogeneous equations of Euler type – Equations reducible to homogeneous form – Method of variation of parameters.

**L + T : 45 + 15 = 60**

**TEXT BOOKS**

1. Veerarajan, T., "Engineering Mathematics ( for First Year )," Second Edition , Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2002.
2. Venkataraman, M.K., "Engineering Mathematics, Volume I," Fourth Edition, The National Pub. Co., Chennai, 2003.
3. Kreyszig, E., "Advanced Engineering Mathematics", Eighth Edition, John Wiley and Sons (Asia) Ltd., Singapore, 2001.

**REFERENCES**

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics" Volume I, Fourth Revised Edition, S. Chand & Co., New Delhi, 2000.
3. Widder, D.V. "Advanced Calculus", Second Edition, Prentice Hall of India, New Delhi, 2000.



Photo elasticity – Birefringence - effect of a stressed model in a plane polariscope – Isoclinic and isochromatic fringes – Photo elastic bench

**4. QUANTUM PHYSICS 9**

Planck's quantum theory of black body radiation (Derivations), Photo electric effect - Compton effect (derivation) and Experimental verification of Compton effect – Schrödinger wave equation Time independent and time dependent equations (derivation), Physical significance of wave function, particle in a box (in one dimension) – electrons in a metal.

**5. LASER & FIBRE OPTICS 9**

Einstein's coefficients (A & B), Nd-YAG laser, He-Ne laser, CO<sub>2</sub> laser, Light emitting diode, semiconductor laser - Homo-junction and Hetero-junction (only qualitative description) - Applications – Material processing, CD-ROM & Holography (Qualitative) Optical fibre- Principle and Propagation of light in optical fibres-Numerical aperture and acceptance angle-types of optical fibres – Single and Multimode, step index & graded index fibres – Applications - Fibre optics communication system, Fibre optic sensors, Medical endoscope.

**TOTAL : 45**

**TEXT BOOKS :**

1. Rajendran V. and Marikani A., Applied Physics for Engineers, 3<sup>rd</sup> Edition, Tata McGraw–Hill Publishing Company Limited, New Delhi, 2003.
2. Arumugam M., Engineering Physics, 5<sup>th</sup> Edition, Anuradha Agencies, Kumbakonam, 2003.
3. Palanisamy P.K., Physics for Engineers, Vol.1 & Vol.2, 2<sup>nd</sup> Edition, Scitech Publications, Chennai, 2003.

**REFERENCE BOOKS:**

1. Gaur R.K. and Gupta S.L., Engineering Physics, 8<sup>th</sup> edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.
2. Uma Mukherji, Engineering Physics, Narosa Publishing House, New Delhi, 2003.

*(Common to all branches of Engineering and Technology)***AIMS**

- To develop a sound knowledge of theoretical and modern technological aspects of chemistry.
- To enable the student to correlate the theoretical principles with application oriented studies

**OBJECTIVES**

- Should be conversant with the language of thermodynamics, electrochemistry, spectroscopy, surface chemistry to solve simple problems related to different industrial processes.
- The knowledge gained will be a prerequisite for the application oriented topics to be pursued in the later semesters.

**1. ELECTRO CHEMISTRY 9**

Galvanic cells – reversible and irreversible cells – emf and its measurements - single electrode potential – standard electrodes (H<sub>2</sub> & calomel electrodes) – electrochemical series – Nernst equation – problems – metal – metal ion electrode – metal – metal insoluble salt electrode – glass electrode – determination of pH using glass electrode – application of emf measurements – problems – concentration cells – applications – problems – ion selective electrodes – Kohlrausch law of independent migration of ions – applications – conductometric titrations – polarization – overvoltage – decomposition potential.

**2. THERMODYNAMICS 9**

Thermodynamic terms – definition of system – open, closed, isolated - surroundings, properties of system - state of a system - thermodynamic equilibrium – isothermal, isobaric, isochoric and adiabatic processes - internal energy – mathematical form of first law, enthalpy – limitation of first law - statement of second law of thermodynamics – Clausius and Kelvin – definition of entropy – entropy change for a reversible process - entropy change for an isothermal expansion of an ideal gas - problems – entropy of phase transitions – problems - definition of free energy and work function – Gibbs Helmholtz equation - applications – problems – van't Hoff isotherm and isochore – applications – problems.

**3. CHEMICAL KINETICS 9**

Kinetics of second order reaction – characteristics of second order reactions – half life period – examples of second order reactions – hydrolysis of ester by sodium hydroxide – simple problems in second order kinetics – kinetics of opposing, parallel and consecutive reactions – examples for consecutive reactions – decomposition of dimethyl ether in gaseous phase – radioactive decay of polonium – examples of parallel reactions – reaction of ethyl bromide with caustic potash – example of opposing reaction – dissociation of hydrogen iodide – effect of temperature on reaction rate – theory of absolute reaction rate – steady – state principle.

**4. SURFACE CHEMISTRY AND CATALYSIS 9**

Adsorption – types of adsorption – adsorption of gases on solids – adsorption isotherm – Freundlich, Langmuir isotherms – adsorption of solutes from solutions – applications – role of adsorption in catalytic reactions – ion exchange adsorption – basic principles in adsorption chromatography - Catalysis – classification – characteristics of catalysts – auto catalysis – enzyme catalysis – Michaelis – Menton equation – acid base catalysis.

**5. SPECTROSCOPY 9**

Electromagnetic spectrum – absorption of radiation – electronic transition – vibrational transition – rotational transition – intensities of spectral lines – Beer – Lambert's Law –colorimetric analysis – estimation of concentration of a solution by colorimetry – flame photometry – theory, instrument (block diagram only) and application – visible & UV spectroscopy – principles, instrument (block diagram only) and simple applications – IR spectroscopy – simple applications only.

**TOTAL : 45**

**TEXT BOOKS :**

1. Puri B.R., Sharma L.R. and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., Jalandhar, 2000.
2. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai & Sons, New Delhi. 2001.

**REFERENCES :**

1. Bahl B.S., Tuli G.D., and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Company Ltd., New Delhi, 2004.
2. Kuriacose J.C. & Rajaram J, Chemistry in Engineering & Technology, Vol. 1, Tata McGraw-Hill publishing company, New Delhi, 1996.

**OBJECTIVE**

To develop graphic skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

**CONCEPTS AND CONVENTIONS (Not for exam) 4**

Importance of graphics in design process – visualization, communication, documentation – BIS conventions – Drafting tools – construction of curves like ellipse, parabola, cycloid and involutes.

**1. PROJECTION OF POINTS, LINES AND SURFACES 12**

General principles of presentation of technical drawings as per BIS – Naming views as per BIS – First angle projection.

Orthographic projection of points

Projections of straight lines located in first quadrant only – determination of true length and true inclination.

Projections of plane surfaces like polygonal lamina and circular lamina, located in first quadrant only.

**2. PROJECTION OF SOLIDS 8**

Projection of simple solids like prism, pyramid, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane.

**3. SECTION OF SOLIDS AND DEVELOPMENT 12**

Sectioning of simple solids like prisms, pyramids, cylinder, cone and sphere. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.

Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

**4. PICTORIAL PROJECTIONS 10**

Isometric projection – Isometric scale – Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by vanishing point method.

**5. FREE-HAND SKETCHING 10**

Free hand sketching techniques – sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.

Sketching pictorial views from given orthographic views.

Demo of computer aided drafting and dimensioning using appropriate software.

**TOTAL : 60**

**TEXT BOOKS :**

1. Nataraajan K.V, “Engineering Drawing and Graphics”, Private Publisher, Chennai, 17<sup>th</sup> Ed. 2003.
2. Venugopal K., “Engineering Graphics”, New Age International (P) Limited, 2002.

**REFERENCES:**

1. Bertoline and Wiebe, Fundamentals of Graphics Communication, Third edition, McGraw-Hill, 2002
2. Warren J. Luzadder and Jon. M.Duff, “Fundamentals of Engineering Drawing”, Prentice Hall of India Pvt., Ltd., Eleventh Edition, 2001.
3. Gopalakrishna K.R., “Engineering Drawing (Vol. I & II)”, Subhas Publications, 1998.

**STANDARDS**

1. IS 10711 - 2001 Technical Product Documentation - Sizes of drawing sheets
2. IS 9609 - 1983 Lettering on technical drawings
3. IS 10714 - 1983 General Principles of presentation of technical drawings
4. IS 11669 - 1986 General Principles of dimensioning of technical drawings

Special Points applicable to University Examination on Engineering Graphics

1. There will be five questions, of which the question No.1 will not have choice and can be from any unit of the syllabus. The other four questions will be of “Either – OR” type, from the remaining units.
2. All questions will carry equal marks of 20 each making the total of 100 marks.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit the solution with in A3 size.
4. Whenever the total number of candidates in a college exceed 150, the University Exam in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of students (approx) at a time.



2. V.Rajaraman, "Fundamentals of Computers", Prentice-Hall of India, 2002.
3. Herbert Schidt, "C Made Easy", McGraw-Hill.

**LIST OF EXPERIMENTS****UNIT -I****a) Word Processing**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

**b) Spread Sheet**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

**Unit - II Simple C Programming**

9. Data types, Expression Evaluation, Condition Statements.
10. Functions, Recursion and parameter passing mechanisms.
11. Arrays

**Unit - III**

12. Structures and Unions
13. Pointers and Functions
14. File Processing
15. Dynamic allocation & Linked List

**TOTAL : 45****HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS****Hardware**

- LAN System with 36 nodes (OR) Standalone PCs – 36 Nos.
- 1 Printer

**Software**

- OS – Windows / UNIX Clone
- Application Package – Office suite
- Compiler – C

1. Torsional Pendulum – determination of rigidity modulus of wire and moment of inertia of disc.
2. Non Uniform Bending - Young modulus determination
3. Viscosity –Determination of co-efficient of Viscosity of liquid by Poiseuilles flow
4. Lee’s disc – Determination of thermal conductivity of a bad conductor
5. Air wedge – Determination of thickness of a thin wire
6. Newton rings – Determination of Focal length of a lens
7. Spectrometer – Dispersive power of a prism
8. Spectrometer – Determination of wavelength of Hg source using Grating
9. Determination of wavelength of Laser using Grating and Particle size determination.
10. Thermo couple – Determination of Thermo emf using Potentiometer

TOTAL : 30

**List of equipments needed for Physics Laboratory  
(for a batch of 30 students)**

☞ Torsional Pendulum apparatus (with accessories)	-	6 Nos.
☞ Non uniform Bending apparatus (with accessories)	-	6 Nos.
☞ Viscosity (Poiseuilles flow) apparatus (with accessories)	-	6 Nos.
☞ Lee’s disc apparatus (with accessories)	-	6 Nos.
☞ Air Wedge apparatus (with traveling microscopes and accessories)	-	6 Nos.
☞ Newton’s Rings apparatus (with traveling microscopes and accessories)	-	6 Nos.
☞ Spectrometer (with grating, prisms and accessories)	-	6 Nos.
☞ Diode laser (2 mW power) or He-Ne laser (2mW) (with accessories and Lycopodium particles)	-	6 Nos.
☞ Thermo emf – potentiometer apparatus (with accessories)	-	6 Nos.

**AIM**

- To impart hands on experience in the use of analytical equipments

**OBJECTIVES**

- Should be conversant with the theoretical principles and experimental procedures for quantitative estimation.

**I. Weighing and preparation of standard solutions**

1. Preparation of molar and normal solutions of the following substances - oxalic acid, sodium carbonate, sodium hydroxide, hydrochloric acid.
2. Preparation of buffer solutions: borate buffer, phosphate buffer using Henderson equation.

**II. Water Analysis**

3. Determination of total hardness, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content by Winkler's method.
5. Determination of alkalinity in a water sample.
6. Determination of chloride content of water sample by argentometric method.

**III. pH**

7. To find out the strength of given hydrochloric acid by sodium hydroxide.

**IV. Conductometry**

8. Conductometric titration of mixture of acids.
9. Conductometric precipitation titration using  $\text{BaCl}_2 - \text{Na}_2\text{SO}_4$ .

**V. Potentiometry**

10. Redox titration – Iron Vs. dichromate.

**VI. Spectrophotometry**

11. To determine the iron content of an unknown solution (1,10-phenanthroline / thiocyanate method)

**VII. Flame photometry**

12. To determine sodium and potassium in water

**VIII. Viscometry**

13. Determination of molecular weight of a polymer.

**TOTAL : 30**

### REFERENCE BOOKS :

1. A Text of Quantitative Inorganic Analysis, A.I.Vogel, ELBS, London.
2. Experiments in Physical Chemistry, D.P. Shoemaker and C.W. Garland, McGraw-Hill, London.

### List of equipments needed for chemistry Laboratory (for a batch of 30 students)

☞ Electronic balance	-	1 No.
☞ pH meter	-	4 No.
☞ Conductivity Bridge	-	4 No.
☞ Potentiometer	-	4 No.
☞ Platinum electrodes	-	4 No.
☞ Calomel electrodes	-	4 No.
☞ Spectrophotometer	-	1 No.
☞ Flame photometer	-	1 No.
☞ Ostwald viscometer	-	10 No.
☞ Glass ware for a batch of 30 students		

**OBJECTIVE**

To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**Group – A (Civil & Electrical)****1. CIVIL ENGINEERING PRACTICE 12****Plumbing**

Basic pipe connections involving the fittings like valves, taps, couplings, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Study of Pipe Connection on the suction and delivery of pump layout.  
Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

**Wood Work**

Sawing, planing, making common joints: T-Joint, Dovetail joint.

**Study**

Study of joints in door panels, wooden furniture.  
Study of common industrial trusses using models.

**2. ELECTRICAL ENGINEERING PRACTICE 9**

Basic household wiring using switches, fuse, indicator-lamp, etc.,  
Preparation of wiring diagrams.

Stair case light wiring.

Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp.

**Group - B (Mechanical & Electronics)****3. MECHANICAL ENGINEERING PRACTICE 15****Welding**

Arc welding of butt joints, lap joints, tee joints.  
Gas welding Practice.

**Basic Machining**

Simple turning, and drilling operations.

**Machine assembly Practice**

Study of the following: centrifugal pump, and air-conditioners.

Demonstration on

- (a) Smithy operations like the production of hexagonal bolt.
- (b) Foundry operation like mould preparation for grooved pulley.

**4. ELECTRONIC ENGINEERING PRACTICE 9**

Soldering simple electronic circuits and checking continuity.  
Assembling electronic components on a small PCB and testing  
Study of telephone, FM radio, low-voltage power supplies.

**TOTAL : 45**

**Examination Pattern**

The Examination is to be conducted for both groups A & B, allotting 1½ for each group.

**LIST OF EQUIPMENTS AND COMPONENTS**  
For a Batch of 30 Students

For Engineering Practices Laboratory

**CIVIL**

- |    |                                                                                                                                                    |         |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1. | Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets |
| 2. | Carpentry vice (fitted to work bench)                                                                                                              | 15 Nos. |
| 3. | Standard wood working tools                                                                                                                        | 15 Sets |
| 4. | Models of industrial trusses, door joints, furniture joints                                                                                        | 5 Each  |

**MECHANICAL**

- |    |                                                                                     |           |
|----|-------------------------------------------------------------------------------------|-----------|
| 1. | Arc welding transformer with cables and holders                                     | 5 Nos.    |
| 2. | Welding booth with exhaust facility                                                 | 5 Nos.    |
| 3. | Welding accessories like welding shield, chipping hammer, wire brush, etc.<br>Sets. | 5         |
| 4. | Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.             | 2 Nos.    |
| 5. | Centre lathe                                                                        | 2 Nos.    |
| 6. | Hearth furnace, anvil and smithy tools                                              | 2 Sets.   |
| 7. | Moulding table, foundry tools                                                       | 2 Sets.   |
| 8. | Study-purpose items : centrifugal pump, air-conditioner                             | One each. |

**ELECTRICAL**

- |    |                                                                   |          |
|----|-------------------------------------------------------------------|----------|
| 1. | Assorted electrical components for household wiring               | 15 Sets  |
| 2. | Electrical measuring instruments                                  | 10 Sets  |
| 3. | Study purpose items : Iron box, fan and regulator, emergency lamp | One each |

## **ELECTRONICS**

- |    |                                                                     |         |
|----|---------------------------------------------------------------------|---------|
| 1. | Soldering guns                                                      | 10 Nos  |
| 2. | Assorted electronic components for making circuits                  | 50 Nos  |
| 3. | Small PCBs                                                          | 10 Nos  |
| 4. | Multimeters                                                         | 10 Nos  |
| 5. | Study purpose items : Telephone, FM radio, low-voltage power supply | 2 each. |

*(Common to all branches of Engineering and Technology)***AIM**

- To help learners improve their English language skills – Listening, Speaking, Reading, Writing (LSRW) and the related sub skills – through a variety of participative learning activities

**OBJECTIVES**

- To provide practice in realizing the meaning potential of a text and to make the learners become familiar with different reading strategies
- To help learners acquire interpretative and study skills, including library and Internet reference skills
- To train learners in organised academic and professional writing
- To develop aural competence and oral fluency of learners
- To help learners achieve proficiency in the effective use of language in various authentic career-related situations

**1. FOCUS ON LANGUAGE****10 + 3**

Cause and effect expressions – indicators of purpose and function – connectives – imperatives – modal verbs – infinitives and gerunds – reporting verbs – editing – varied grammatical functions of the same word - acronyms and abbreviations - rules for writing SI (Système Internationale) units

**Suggested Activities**

Giving pairs of cause and effect statements to be linked with expressions such as because, since, consequently, therefore and as a result of - rewriting pairs of sentences as one sentence using indicators of purpose and function such as to, in order to and so as to – giving situational instructions (e.g. instructions for changing a punctured tyre) – rewriting instructions as recommendations (e.g. store the cylinders in an upright position → cylinders should be stored in an upright position) – rewriting infinitive forms as gerunds (e.g. to modernize sick industries is difficult → modernizing sick industries is difficult) – completing the sentences by indicating the conditions which are necessary for something to happen – reporting a quoted speech – identifying and correcting the mistakes in spelling and grammar in a given passage - expanding acronyms which are commonly used in science and technology (e.g. LASER, LAN, LCD, ICBM, NASA) – using appropriate units of measurement.

**2. READING****8 + 3**

Reading comprehension – guided note-making – providing a suitable title – identifying main points, supporting ideas – evaluating the style (argumentative / descriptive, etc.) – cloze reading – drawing inferences – separating facts from opinions

**Suggested Activities**

Objective type comprehension questions - making notes based on a passage – filling the gaps with appropriate missing words after thoroughly comprehending the given

text – note-making using a given outline – unguided note-making tasks – reconstructing content from notes

### **3. WRITING**

**10 + 3**

Formal letter writing (letter of application, asking for clarification, calling for quotations, placing orders, letter of complaint and resume with statement of purpose and objective) – technique of formatting, drafting and revising – structure of technical reports – industrial report (reports on visits made to industries, report on an accident in the factory) – project proposals – notices – agenda – minutes – memoranda

#### **Suggested Activities**

Reports on industrial visits (purpose of visit, preparatory measures to be undertaken for the visit, industry visited, observations made etc.) – reporting events (to think of an imaginary / real industrial accident and report it using the format: introduction comprising ‘when, where, what, how’ of the accident in 2 to 3 lines, a detailed description of the actual accident, investigation conducted, recommendations / suggestions made by the reporter) – a simple project proposal relating to a problem and suggested course of action (e.g. workers in one section of the factory not following safety precautions)

### **4. LISTENING**

**8 + 3**

Listening practice – listening for global comprehension and listening for specific information - listening to speech segments (pronunciation accent & intonation) – listening to recorded telephonic conversation, TV / radio news in English (both American and British English) – listening to short and long conversations in different domains of activity - discussing new inventions, products etc.

#### **Suggested Activities**

Post-listening activities: the listening activities may be followed by writing or speaking activities. For example, the students either respond to / give the gist of / enter into a discussion on what they have listened to - listening to a discourse and retelling the content in learner’s own words – listening to instructions and drawing a geometrical figure as instructed

Note: Listening activities can be done in the language laboratory or in the class room using a tape recorder.

### **5. SPEAKING**

**9 + 3**

Oral practice activities related to professional skills (eg. Marketing, Advertising, etc.) – role play activities using different speech functions (persuasion, negotiation, giving directions and guidance) – conversational etiquette (politeness strategies, turn-taking, body language) – group discussions – mock interviews – academic skills : seminar presentation – summarizing – presenting statistics – making speeches (compering, introducing a guest to the audience, welcome address and proposing a vote of thanks)

#### **Suggested Activities**

Brief classroom discussion on a topic of current interest - conducting group discussions and mock interviews – allowing students to comper association / club / department / college functions - training students to welcome the gathering, present reports and propose a vote of thanks.

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

**TEXT BOOK :**

1. Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Vol.2, Orient Longman Ltd., 2002, 2<sup>nd</sup> Edition.

**REFERENCES :**

1. T.M. Farhathullah, Communication Skills for Technical Students, Orient Longman Ltd., 2002.
2. Andrea J. Rutherford, Basic Communication Skills for Technology, 1<sup>st</sup> Edn., Pearson Education Asia (Singapore) Pte. Ltd., Bangalore, 2001.

**AIM**

An aim of the course is to train the students in additional areas of Engineering Mathematics, necessary for grooming them into successful engineers. The topics introduced will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics, field theory and communication engineering.

**OBJECTIVES**

On completion of the course the students are expected to

- Have learnt the methods of double and triple integration, which are needed in their studies in other areas, and gained confidence to handle integrals of higher orders.
- Have studied the basics of vector calculus comprising of gradient, divergence and curl, and line, surface and volume integrals and the classical theorems involving them, which would be encountered by them in their engineering subjects in the same or higher semesters.
- Have a good grasp of analytic functions and their interesting properties which could be exploited in a few engineering areas, and be introduced to the host of conformal mappings with a few standard examples that have direct application.
- Have grasped the basics of complex integration and the concept of contour integration which is an important tool for evaluation of certain integrals encountered in practice.
- Have a sound knowledge of Laplace transform and its properties and sufficient exposure to solution of certain linear differential equations using the Laplace transform technique which have applications in other subjects of the current and higher semesters.

**1. MULTIPLE INTEGRALS****9 + 3**

Double integration – Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates – Change of variables between Cartesian and polar coordinates and between Cartesian and cylindrical / spherical polar coordinates.

**2. VECTOR CALCULUS****9 + 3**

Gradient, divergence and curl – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification of the above theorems and evaluation of integrals using them.

**3. ANALYTIC FUNCTIONS****9 + 3**

Function of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations in Cartesian coordinates – Sufficient conditions (Proof

not included) – Properties of analytic function – Determination of harmonic conjugate by Milne – Thomson method – Conformal mapping –  $w = z + a$ ,  $az$ ,  $\frac{1}{z}$ ,  $z^2$  and bilinear transformation.

**4. COMPLEX INTEGRATION 9 + 3**

Statement and application of Cauchy's theorem and Cauchy's integral formula – Taylor and Laurent expansion – Singularities – Classification – Residues – Cauchy's residue theorem – Contour integration – Unit circle and semi-circular contours (excluding poles on real axis).

**5. LAPLACE TRANSFORM 9 + 3**

Laplace Transform – Sufficient conditions – Transforms of elementary functions – Basic properties – Inverse transforms – Derivatives and integrals of transforms – Transforms of derivatives and integrals – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations up to second order with constant coefficients.

**L + T : 45 + 15 = 60**

**TEXT BOOKS**

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kreyzig, E., "Advanced Engineering Mathematics", Eighth Edition, John Wiley & Sons (Asia) Pte, Ltd., Singapore, 2001.

**REFERENCE**

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes I and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai, 2002.



materials-Application of ferroelectric materials-ferroelectric energy converter. Optical properties of semiconductor- Excitons- Traps - Colour centre –types of colour centres – Luminescence – Fluorescence and phosphorescence – Liquid crystal displays – Dynamic scattering display-Twisted nematic crystal display

## **5. NEW ENGINEERING MATERIALS**

**9**

Metallic glasses as transformer core material, Nano phase materials, shape memory alloys, Bio materials (metals & alloys, ceramics) -Non linear materials –Second harmonic generation – Optical mixing- Optical phase Conjugation – Solitons, IC packaging materials.

**TOTAL : 45**

### **TEXT BOOKS :**

1. Palanisamy, P.K., Materials Science, 2<sup>nd</sup> Edition, Scitech Pub. India, Pvt., Ltd., Chennai, 2003
2. Wahab M.A., Solid State Physics, Narosa Publishing House, New Delhi, 1999.
3. Arumugam M, Materials Science 3rd Edition, Anuradha Agencies, Kumbakonam, 2003.

### **REFERENCES :**

1. Rajendran V. and Marikani A., Applied Physics for Engineers, 3<sup>rd</sup> edition, Tata McGraw–Hill Publishing Company Limited, New Delhi, 2003.
2. Pillai S.O., Solid State Physics, 5<sup>th</sup> edition, New Age International Publication, New Delhi, 2003.
3. Ali Omar.M, Elementary Solid State Physics, Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2002.

*(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, & Instrumentation & Control Engineering)*

### AIM

- To gain a sound knowledge of latest technological applications of photochemistry polymers, corrosion, energy storing devices and electro metallurgy as required for electrical, electronics and instrumentation and instrumentation & control engineering students.

### OBJECTIVES

Students should be conversant with the

- Fundamental aspects of photochemical reactions.
- Various types of industrially important engineering plastic materials, conducting polymers and fibres used for optical communication.
- Corrosion and its control measures, accumulators and fuel cells.
- Electro metallurgy involving electro deposition, electro refining and electrochemical machining.

#### 1. PHOTO CHEMISTRY 9

Photochemical reactions – laws of photo chemistry – Grotthus – Draper Law – Stark - Einstein Law – quantum efficiency – photochemical decomposition of HI and HBr – quantum yield determination – chemical actinometer – energy transfer in photochemical reactions – photosensitization and quenching (example – photo synthesis in plants) – chemiluminescence – photophysical processes – fluorescence, phosphorescence – photo inhibitors - radiation chemistry - radiolysis – principles – radiation dosimetry (units, Fricke dosimeter)

#### 2. POLYMER CHEMISTRY 9

Preparation, properties and uses of PVC, phenol – formaldehyde and urea formaldehyde – effect of heat on polymers – polymer blends – ABS plastics – polycarbonates – polyamides – polymer alloys – ABS – PC alloy, ABS-PVC alloy – vulcanization of rubber – blending of rubber with plastics – laminates and fibre reinforced plastics – chemical structure and electronic behavior of conducting polymers – semi conducting properties of organic polymers containing metal groups such as poly ferrocenes - optical fibre - definition, principles and structure - characteristics of optical fibre – photoresist optical fibre – advantages of optical fibre.

#### 3. CORROSION AND ITS INHIBITION 9

Corrosion – causes of corrosion – principles of chemical corrosion – Pilling – Bedworth rule – principles of electrochemical corrosion – factors influencing corrosion – types of corrosion – galvanic corrosion – differential aeration corrosion – stress corrosion – soil corrosion – pitting corrosion – water line corrosion – corrosion control – cathodic protection – sacrificial anode – selection of materials and proper designing – corrosion inhibitors – anodic and cathodic inhibitors - protective coatings – electroplating – electrolessplating.

**4. ENERGY SOURCES AND ENERGY STORING DEVICES 9**

Nuclear fission process – characteristics of nuclear fission – chain reactions – nuclear energy – nuclear reactors – light water nuclear power plant - batteries – introduction – primary and secondary batteries – dry cells – alkaline batteries, lead acid storage cell, nickel – cadmium cell, lithium battery - fuel cell – hydrogen – oxygen fuel cell – photogalvanic cell.

**5. DYNAMIC ELECTRO CHEMISTRY AND ELECTRO METALLURGY 9**

Theories of electron transfer in homogeneous and heterogeneous system – voltametry - electro-chemical extraction of metals – electro winning process (extraction of aluminum – Baeyer’s process and Hoope’s process – electro refining of copper – electro-chemical machining – advantages.

**TOTAL : 45**

**TEXT BOOKS :**

1. Jain P.C. and Renuka Jain, Engineering Chemistry, Dhanpat Rai Pub., Co. (P) Ltd., New Delhi, 2002.
2. Puri B.R., Sharma C.R. and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., 2000.

**REFERENCES :**

1. Wang M.N., Polymers for electronic and photonic applications, Wiley New York, 1994.
2. Bahl B.S., Tuli G.D. and Arun Bhal, Essentials of Physical Chemistry, S. Chand & Co. Ltd., New Delhi, 2003.

**OBJECTIVE :**

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

**1. BASICS & STATICS OF PARTICLES 12**

Introduction - Units and Dimensions - Laws of Mechanics – Lame’s theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: addition, subtraction, dot product, cross product - Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space - Equilibrium of a particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force

**2. EQUILIBRIUM OF RIGID BODIES 12**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

**3. PROPERTIES OF SURFACES AND SOLIDS 12**

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia - Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

**4. DYNAMICS OF PARTICLES 12**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton’s law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

**5. FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12**

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction

**TEXT BOOK**

1. Beer, F.P and Johnson Jr. E.R, “Vector Mechanics for Engineers”, Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, 1997.

**REFERENCES**

1. Hibbeler, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
2. Ashok Gupta, Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM), Pearson Education Asia Pvt., Ltd., 2002
3. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2001.
4. Irving H. Shames, Engineering Mechanics - Statics and Dynamics, IV Edition - Pearson Education Asia Pvt. Ltd., 2003.
5. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., 2000.

*(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, & Instrumentation and Control Engineering)*

**AIM**

To expose basic circuit concepts, circuit modelling and methods of circuit analysis in time domain and frequency domain for solving simple and multi dimensional circuits including coupled circuits and three phase circuits.

**OBJECTIVE**

- i. To understand the concept of circuit elements, lumped circuits, waveforms, circuit laws and network reduction.
- ii. To analyse the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.
- iii. To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits.
- iv. To solve the electrical network using mesh and nodal analysis by applying network theorems.
- v. To know the basic concepts of coupled circuits, three phase loads and power measurement.

**1. 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

**2. 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.

**3. 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.

#### **4. 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.

#### **5. 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.



**(COMMON TO EEE, E&I and I&C)****OBJECTIVE**

At the end of this course the student is expected to have a knowledge of the concepts of Forces, Equilibrium, Stress, Strain, Shear force, Bending movement & Strain energy and should be able to apply this concepts to simple problems in beams and trusses. Further, he is also expected to gain knowledge regarding the fundamentals of fluid flow and their applications to flow through pipes and hydraulic machines. He should be able to solve application problems in these areas.

**MECHANICS OF SOLIDS****1. 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.

**2. 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.

**3. 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.

**4. 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 – Design of Buffer Springs.

**5. PLANE TRUSSES 6**

Plane trusses and frames – Types of trusses – Analysis of forces in truss members – Method of joints – Method of tension co-efficient.

**MECHANICS OF FLUIDS****6. 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.

<b>7. FLOW DYNAMICS</b>	<b>6</b>
Euler's and Bernoulli's Equations – Pressure Losses along the Flow – Categorisation into Major and Minor Losses - Flow through Circular Pipes – Poisseule's Equation – Statement of Darcy – Weisbach equation – Friction factor – Hydraulic grade line.	
<b>8. FLOW MEASUREMENT AND PIPE NETWORKS</b>	<b>6</b>
Manometer - Venturi and Orifice Meters –Flow through Weirs - Principles of open channel flow – Pipes in series and parallel – Kirchoff's Laws	
<b>9. TURBINES</b>	<b>6</b>
Introduction to and Classification of Turbines – Rotor Blade Profiles and their importance with respect to hydraulic efficiency – Specific Speed – Turbine characteristics – Speed Governance.	
<b>10. PUMPS</b>	<b>6</b>
Classification – Principles of Positive Displacement Pumps – Slip – Centrifugal Pumps – Impeller Blade Profiles – Pump Characteristics - Efficiency	

**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

**OBJECTIVE :**

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.

**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 Wattmeters.
10. Study of first and second order circuit transients by digital simulation.

**TOTAL :45****REFERENCES:**

1. Paul B.Zbar, Gordon Rockmaker and David J.Bates, 'Basic Electricity', A text – Lab Manual, McGraw-Hill, Seventh Edition- 2001.

**LIST OF EQUIPMENT**

S.No	Description	Quantity
1	Regulated Power Supply Regulated Variable 0-15 V d.c	6 Nos.
2	Digital Multimeter	6 Nos.
3	SPST Switch	5 Nos.
4	SPDT Switch	4 Nos.
5	(0-10) m.A milliammeter	2 No.
6	Ohm Meter	3 Nos.
7	(0-100) m.A dc ammeter	1 No.
8	(0-100) m.A milliammeter	3 No.
9	(0-5) m.A milliammeter	2 No.
10	(0-5) A Ammeter	1 No.
11	Oscilloscope	7 Nos.
12	Function Generator	8 Nos.
13	Electronic Analog Voltmeter or Digital Multimeter	1 No.
14	Voltmeter (0-500) V A.C	1 No.

15	Wattmeter 500 V, 15 UPF	1 No.
16	3phase loading Rheostat	1 No.
17	3 phase Induction motor Load	1 No.
18	Math Lab / Simulink	1 No.
19	Resistor: 68 $\Omega$ , 100 $\Omega$ , 330 $\Omega$ , 390 $\Omega$ , 470 $\Omega$ 560 $\Omega$ , 680 $\Omega$ , 820 $\Omega$ , 1k $\Omega$ , 1.2k $\Omega$ 1.8k $\Omega$ , 2.2k $\Omega$ , 2.7k $\Omega$ , 3.3k $\Omega$ , 4.7 k $\Omega$ , 5k $\Omega$ , 10k $\Omega$ , 1m $\Omega$ , 220 $\Omega$ , 33 $\Omega$ , 10 $\Omega$ , 2 k $\Omega$ , 22 k $\Omega$  10 k $\Omega$ 2W Potentiometer 5 k $\Omega$ 2W Potentiometer	Each 6 Nos.      2 No. 2 No.
20	Capacitor 1 $\mu$ F 25V – Electrolytic 0.001 $\mu$ F , 0.01 $\mu$ F, 0.0033 $\mu$ F 0.022 $\mu$ F  0.1 $\mu$ F	Each 6 Nos.     10 Nos
21	Inductor 10 mH coil	6 Nos.
22	Time Watch	1 No.