



# VELS



INSTITUTE OF SCIENCE, TECHNOLOGY  
& ADVANCED STUDIES (VISTAS)

(DEEMED TO BE UNIVERSITY Estd. u/s 3 OF THE UGC ACT, 1956)

**NAAC ACCREDITED**

PALLAVARAM - CHENNAI - INDIA

## **B.E MECHATRONICS**

**Curriculum and Syllabus  
(Based on Choice Based Credit System)  
Effective from the Academic year  
2017-2018  
(First Year Only)**

**Department of Mechanical Engineering  
School of Engineering**

## **PROGRAMME OUTCOMES**

Bachelor of Mechatronics curriculum is designed to impart Knowledge, Skill and Attitude on the graduates to

1. have a successful career in Mechatronics and allied industries.
2. have a strong foundation in the areas of mechanical, electronics, control and computer engineering.
3. work efficiently in multidisciplinary teams.
4. contribute towards technological development through academic research and industrial practices.
5. practice their profession with good communication, leadership, ethics and social responsibility.

## **PROGRAMME SPECIFIC OUTCOMES**

1. An ability to apply knowledge of mathematics and engineering sciences to develop mathematical models for industrial problems.
2. Be able to design, analyze, and test intelligent products and processes that incorporate appropriate computing tools , sensors, and actuators.
3. An ability to design experiments to evaluate the performance of a mechatronics system or component with respect to specifications
4. An ability to use modern tools, software and equipment to analyze multidisciplinary problems.
5. An ability to design mechatronic systems, component, or a process to meet desired needs.
6. An ability to demonstrate on professional and ethical responsibilities.
7. An ability to communicate, write reports and express research findings in a scientific community.
8. An ability to adapt quickly to the global changes and contemporary practices.
9. An ability to adapt for new evolving technologies through life-long learning process.
10. Discuss the impact of engineering on society, safety, and environmental issues.

**B.E. - MECHATRONICS  
CURRICULUM**

**TOTAL NUMBER OF CREDITS: 46**

Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
<b>SEMESTER 1</b>						
AECC	17_____	Technical English	3	1	0	3
CORE	17_____	Mathematics – I	3	1	0	3
CORE	17_____	Engineering Physics	3	1	0	3
CORE	17_____	Fundamentals of Computing	3	1	0	3
CORE	17_____	Engineering Graphics	2	0	3	4
CORE	17_____	Engineering Practices Laboratory	0	0	3	2
CORE	17_____	Engineering Physics Lab	0	0	3	2
CORE	17_____	Computer Practice Laboratory	0	0	3	2
<b>Total</b>			<b>14</b>	<b>4</b>	<b>12</b>	<b>22</b>
<b>SEMESTER 2</b>						
Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
AECC	17_____	Communication Skills	3	0	0	3
CORE	17_____	Mathematics – II	3	1	0	3
CORE	17_____	Engineering Chemistry	3	1	0	3
CORE	17_____	Material Science	3	0	0	3
CORE	17_____	Engineering Mechanics	3	1	0	3
CORE	17_____	Basic Electrical and Electronics Engineering	3	0	0	3
CORE	17_____	Engineering Chemistry Laboratory	0	0	3	2
AECC	17_____	Language Laboratory	0	0	3	2
CORE	17_____	Computer Aided Drafting Laboratory	0	0	3	2
<b>Total</b>			<b>18</b>	<b>3</b>	<b>9</b>	<b>24</b>

# **SYLLABUS CORE COURSES**

**COURSE OBJECTIVE:**

- To develop listening skills for academic and professional purposes.
- To acquire the ability to speak effectively in English in real life situations.
- To inculcate reading habit and to develop effective reading skills.
- To improve their active and passive vocabulary.
- To write letters and reports effectively in formal and business situations.

**UNIT I INTRODUCTION TO BASIC GRAMMAR AND VOCABULARY 9**

General Vocabulary – Changing words from one form to another, Nouns- Compound nouns, Pronouns - Relative pronouns, Demonstrative pronouns, Adjectives - Comparative adjectives, Verbs- Modal verbs, Linking verbs, Adverbs, Word Links – Connectives, Sequence words, Introducing oneself, Interactive grammar exercises.

**UNIT II BASIC SKILL – LISTENING AND INTERPRETATION 9**

Listening Skills - Note Making and Note-Taking, Transformation of Sentences – Positive, Comparative, Superlative, Affirmative, Negative, Interrogative and Assertive, Formation of Questions. Information Transfer - Chart – Flow chart, Bar chart, Pie chart. Pair works, SAM sessions.

**UNIT III BASIC SKILL-WRITING SKILL AND STRUCTURES 9**

Creative thinking and speaking, Tenses – Present Tense – simple present, present continuous, present perfect, present perfect continuous, Past Tense - simple past, past continuous, past perfect, past perfect continuous, Future Tense -simple future, future continuous, future perfect, future perfect continuous, Autobiographical writing, JAM session.

**UNIT IV BASIC SKILLS: READING AND WRITING SKILL 9**

Reading Skills- Skimming and Scanning, Comprehension Passage Paragraph Writing – Descriptive paragraph, Argumentative paragraph, Persuasive paragraph, Demonstrative paragraph, Compare and contrast, Conversations.

**UNIT V BASIC SKILL: SPEAKING SKILL AND VOCABULARY 9**

Vocabulary, Prefixes and Suffixes, Cause and Effect relationship, Clauses and Phrases, Superordinates and Hyponyms, Expressing Causal Relation, Article, Prepositions, Preposition phrases, Speaking about the future plans, Reading comprehensions, Situational dialogues.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Technical English course, the student will be able to

- CO1:** Improve the language proficiency of a technical under-graduate in English with emphasis on Learn, Speak, Read and Write skills.
- CO2:** Develop listening skills for academic and professional purposes.
- CO3:** Acquire the ability to speak effectively in English in real life situations.
- CO4:** Provide learning environment to practice listening, speaking, reading and writing skills.
- CO5:** Assist and carry on the tasks and activities through guided instructions and materials.

- CO6:** Inculcate reading habit and to develop effective reading skills.
- CO7:** Improve their active and passive vocabulary.
- CO8:** Effectively integrate English language learning with employability skills and training.
- CO9:** Provide hands-on experience through case-studies, mini-projects, group and individual presentations.
- CO10:** Write letters and reports effectively in formal and business situations.
- CO11:** Variety of self-instructional modes of language learning and develop learner autonomy.

**TEXT BOOKS:**

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.

**REFERENCES:**

1. N. Lakshmana Perumal, Technical English-I, Second Edition, Hitech Publishing company PVT. Ltd, 2009.
2. Sumant. S, 'Technical English', Second Edition, McGraw-Hill Education (India) Pvt. Ltd., 2008.
3. T.M. Farhathullah, "Communication Skills for Technical Students", Orient Blackswan Private Limited., 2008.



**CO10:** Specialized in studies and research.

**CO11:** Orthogonal transformation of a symmetric matrix to diagonal form.

**TEXT BOOKS:**

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, 43<sup>rd</sup> Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 6<sup>th</sup> reprint, 2008.

**REFERENCES:**

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3<sup>rd</sup> Edition, 2012.
2. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House, 4<sup>th</sup> Edition, 2014



**COURSE OBJECTIVE:**

- To learn the basics of Ultrasonic, Lasers, Fiber optics and applications, Quantum physics and crystal physics etc., and to apply these fundamental principles to solve practical problems related to materials used for engineering applications.

**UNIT I      ULTRASONICS****9**

Introduction – Production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves– properties – Cavitations – Velocity measurement – acoustic grating – Industrial applications – drilling, welding, soldering and cleaning – Non Destructive Testing – pulse echo system through transmission and reflection modes – A, B and C scan displays- SONAR – Medical applications – Sonograms.

**UNIT II      LASERS****9**

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion, pumping - Einstein's A and B coefficients – derivation – Types of lasers – He-Ne, CO<sub>2</sub>, Nd-YAG, Semiconductor lasers homojunction and heterojunction (Qualitative) - Industrial Applications – Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction and reconstruction).

**UNIT III      FIBRE OPTICS AND APPLICATIONS****9**

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – fibre manufacturing (Double crucible technique) – Splicing, Loss in optical fibre – attenuation, dispersion, bending – Fibre optical communication system (Block diagram) – Light sources – Detectors –PIN Photo diode- Fibre optic sensors – temperature and displacement – Endoscope.

**UNIT IV      QUANTUM PHYSICS****9**

Black body radiation – Planck's radiation law (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans Law from Planck's theory – Compton effect – Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Electron microscope - Scanning electron microscope – Transmission electron microscope.

**UNIT V      CRYSTAL PHYSICS****9**

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 – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy – Crystal defects – point, line and surface defects – Burger vector.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Engineering Physics course, the student will be able to

- CO1:** Apply the fundamental principles to solve practical problems related to materials used for engineering applications.
- CO2:** Formulate general mechanics parameters and distinguish between central and non-central forces.

- CO3:** Learn the basics of Ultrasonic.
- CO4:** Understanding about the Fiber optics.
- CO5:** Explain types of waves and interference of light
- CO6:** Derive thermodynamic parameters and apply fundamental laws to solve thermodynamic problems
- CO7:** Differentiate between the terms atomic number, atomic mass, isotopes, etc. and apply various rules such as rules, octet rules, and Bohr's energy levels.
- CO8:** Know about various applications of Lasers.
- CO9:** Basic information in Quantum physics and crystal physics etc.,
- CO10:** Categorize between various environmental pollutants, study the harmful effects of pollutants, and elaborate the concepts such as global warming, BOD, COD, ozone depletion and acid rain.

**TEXT BOOKS:**

1. Gaur, R. K. and Gupta, S.C., 'Engineering Physics' DhanpatRai Publications, New Delhi 2013.
2. Avadhanulu, M.N. and Kshirsagar, P.G., 'A Text book of Engineering Physics', S.Chand and Company, Ltd., New Delhi, 2013.

**REFERENCES:**

1. Frank J. Faly, "Foundations of Engineering Accoustics", Elsevier Academic press, 2005.
2. Williams T.Silfrast, "Laser Fundamentals", Cambridge University press, 2004.
3. John Gowar, "Optical communication systems", Prentice Hall publications, 1993.
4. Murugesan R and Sivaprasath K, Modern Physics, S. Chand Ltd., 2008.

**COURSE OBJECTIVE:**

- To understand the concepts of Programming language - C and Html
- To learn the basics of C declarations, operators, expressions and html tags
- To learn on the manipulation of strings, functions and pointers

**UNIT I INTRODUCTION TO COMPUTERS 9**

Introduction – Characteristics, Classification and Evolution of Computers – Computer Generations – Basic Computer organization – Number Systems – Computer Software – Types of Software – Software Development Steps.

**UNIT II PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE 9**

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudo code – Application Software Packages – Introduction to Office Packages – Internet basics: Internet evolution, Html tags-Forms- Frames.

**UNIT III INTRODUCTION TO C 9**

Overview of C: Constants, Variables, Keywords, Data Types – Compilation and Execution – Input and Output functions – Operators – C Instructions – Control Instructions: Decision control structure, Loop Control structure, Case Control Structure.

**UNIT IV FUNCTIONS AND POINTERS 9**

Functions: Library functions, User defined functions, call by value, call by reference, recursive functions – Pointers – Arrays: one dimensional array, multi-dimensional array, arrays using pointers – Strings: library string functions – pointers in strings.

**UNIT V STRUCTURES AND FILES 9**

Structures – Unions – Storage classes – Dynamic memory allocation – Files: file Operations, Preprocessor directives – use of type def.– Command line arguments.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Fundamentals of Computing, the student will be able to

- CO1:** Understand the characteristics, classification and evolution of computers.
- CO2:** Learn the generation of computers and their architecture.
- CO3:** Be well versed in Numbers Systems and their conversions.
- CO4:** Determine the advantages and limitations of algorithm, flowchart and pseudo code.
- CO5:** Explain the features of application software packages and evolution of internet.
- CO6:** Develop programs using various control instructions and operator precedence in C programming.
- CO7:** Handle string manipulations, array and functions for various applications using C programming constructs.
- CO8:** Analyze the merits of pointers in C.

**CO9:** Understand the difference in memory allocation while using structure and union in C programming.

**CO10:** Learn the various file operations in C.

**TEXT BOOKS:**

1. Yashavant Kanetkar, "Let Us C", BPB Publications, Thirteenth Edition 2013.
2. Balagurusamy, E., "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, 2010.
3. Thomno A. Powell, "The Complete Reference HTML and CSS", fifth edition, Tata McGrawHill, 2010.

**REFERENCE:**

1. Ashok. N. Kamthane, "Computer Programming", Pearson Education (India) 2009.

**COURSE OBJECTIVE:**

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

**CONCEPTS AND CONVENTIONS (Not for Examination)**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT I PLANE CURVES AND FREE HAND SKETCHING 12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12**

Orthographic projection – principles - Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

**COMPUTER AIDED DRAFTING (Demonstration Only)**

Introduction to drafting packages and demonstration of their use.

**TOTAL: 60 Hours**

**COURSE OUTCOMES:**

After successful completion of the Engineering Graphics course, the student will be able to

**CO1:** Understand the theory of projection.

- CO2:** Able to know and understand the conventions and the methods of engineering drawing.
- CO3:** Improve their visualization skills so that they can apply these skills in developing new products.
- CO4:** Able to prepare the simple layout of factory buildings.
- CO5:** Impart and inculcate a proper understanding of the theory of projection.
- CO6:** Improve the visualization skills.
- CO7:** Understand the various concepts like dimensioning, conventioning and standards related to working drawings in order to become professionally efficient.
- CO8:** Impart the knowledge for understanding and drawing of simple residential/office buildings.
- CO9:** Ability to produce engineered drawings will improve.
- CO10:** Ability to convert sketches into engineered drawings will increase.

**TEXT BOOK:**

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2010.

**REFERENCES:**

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", NewAge International (P) Limited, 2008.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**Special points applicable to University Examinations on Engineering Graphics:**

1. There will be 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.
4. The examination will be conducted in appropriate sessions on the same day

**GROUP A – MECHANICAL AND CIVIL ENGINEERING PRACTICES****COURSE OBJECTIVE:**

- To study bench fitting drawings for making male and female fittings as per the given dimensions and Tolerances.
- To study Arc welding drawings for making common weld joints as per the given dimensions.
- To study sheet metal development drawings for making common metal parts/components as per the given dimensions.

**LIST OF EXPERIMENTS****MECHANICAL ENGINEERING PRACTICE****1. Welding**

To make single V, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.

**2. Basic Machining**

To make Simple Turning and Taper turning in the lathe.

**3. Fitting Work**

To make square, hexagonal, V joint in bench fitting as per the given dimensions and Tolerances.

**4. Sheet Metal Work**

To make simple Cubical blocks, Rectangular trays in sheet metal with the jigs as per the given dimensions.

**CIVIL ENGINEERING PRACTICE****1. Buildings**

- a. Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**2. Plumbing Works**

- a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- b. Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

**TOTAL: 45 Hours**

**COURSE OUTCOMES:**

After successful completion of the Engineering Practices Laboratory course, the student will be able to

- CO1:** Able to make various joints in the given object with the available work material.

- CO2:** Able to know how much time a joint will take for the assessment of time.
- CO3:** Familiarity with different types of woods used and tools used in wood Working technology.
- CO4:** Familiarity with different types of tools used in sheet metal working.
- CO5:** Developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.
- CO6:** Familiarity with different types of tools used in forging technology.
- CO7:** Knowledge of different types of furnaces like coal-fired, electrical furnaces etc.
- CO8:** Familiarity with different types of tools used in fitting technology.
- CO9:** Utilize the hands-on experience in various fields.
- CO10:** Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.



**COURSE OBJECTIVE:**

- To study and understand the basic physics concepts and study the young's modulus of the uniform and non uniform bending of the materials.

**LIST OF EXPERIMENTS**

1. Determination of Young's modulus of the material – Non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer – Dispersive power of a prism.
6. Determination of Young's modulus of the material – Uniform bending.
7. Torsional Pendulum – Determination of Rigidity modulus.
8. Ultrasonic Interferometer – Velocity of ultrasonic waves and compressibility of liquids.
9. Spectrometer – Grating – Wavelength of mercury spectrum.
10. Determination of wavelength of LASER and particle size using Grating.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Engineering Physics Laboratory course, the student will be able to

- CO1:** Ability to Design and Conduct experiments as well as to Analyze and Interpret Data.
- CO2:** Ability to Identify, Formulate, and Solve Engineering Problems.
- CO3:** Ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics.
- CO4:** Provide pre requisite hands-on experience for engineering laboratories.
- CO5:** Study and understand the basic physics concepts and study the Young's modulus of the uniform and nonuniform bending of the materials.
- CO6:** Develop skills to impart practical knowledge in real time solution.
- CO7:** Understand principle, concept, working, and application of new technology and comparison of results with theoretical calculations.
- CO8:** Design new instruments with practical knowledge.
- CO9:** Gain knowledge of new concept in the solution of practically oriented problems and
- CO10:** To understand more deep knowledge about the theoretical solution problems.
- CO11:** Understand measurement technology, usage of new instruments and real-time applications in engineering studies.

**COURSE OBJECTIVE:**

The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

**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**

1. Chart - Line, XY, Bar and Pie.
2. Formula - formula editor.
3. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
4. Sorting and Import / Export features.

**C) POWERPOINT**

1. Any presentation of minimum five slides.

**D) SIMPLE C PROGRAMMING \***

1. Data types, Expression Evaluation, Condition Statements.
  2. Arrays.
  3. Structures and Unions.
  4. Functions and Pointers.
  5. File Operations.
- For programming exercises Flow chart and pseudo-code are essential

**E) HTML PROGRAMMING\***

1. Create a webpage to embed an image in that page using HTML tags.
2. HTML program for Table creation.

**TOTAL: 45 Hours**

**COURSE OUTCOMES:**

After successful completion of the Computer Practice Laboratory course, the student will be able to

- CO1:** Get exposed by use of Office software.
- CO2:** Send a personalized letter or email to many different people by using mail merge option.
- CO3:** Analyze data using spreadsheet
- CO4:** Utilize the presentation and visualization tool using power point.
- CO5:** Get exposed to problem-solving techniques and flow charts.
- CO6:** Understand the basics of C programming.
- CO7:** Demonstrate major algorithms and data
- CO8:** Execution of array operations
- CO9:** Execution of binary tree functions
- CO10:** Execution of linked list functions
- CO11:** Execution of union operations

**COURSE OBJECTIVE:**

- To develop listening skills for academic and professional purposes.
- To acquire the ability to speak effectively in English in real life situations.
- To inculcate reading habit and to develop effective reading skills.
- To improve their active and passive vocabulary.
- To write letters and reports effectively in formal and business situations.

**UNIT I TECHNICAL VOCABULARY 9**

Technical Vocabulary, Punctuation, Numerical Expressions, Expanding Acronyms and Abbreviations, Concord, 'If' clauses, Infinitives. Homonyms, Homographs and Homophones, Telephone conversations, Reading, comprehensions, Making of an advertisement.

**UNIT II READING AND INTERPRETATION 9**

Reading and interpretation, Intensive reading,. Writing reviews on books and films, Descriptions, Process description, Summarizing, Instructions, Oral presentations. Debate.

**UNIT III LETTER AND NON-VERBAL COMMUNICATION DRAFTING 9**

Letters – formal, informal, Cover Letter and CV , Synonyms and Antonyms, Indefinite Adjectives, Non-verbal communication, Interactive sessions. Role Plays, Critical reading Listening and Note taking.

**UNIT IV DIALOGUE WRITING AND GROUP ACTIVITIES 9**

Active and Passive Voice, Impersonal Passive, Essay Writing, Comprehension Passage, Editing, Correction of errors, Direct and Indirect, Conversations , Dialogue writing, Discourse Markers. Group activities.

**UNIT V LISTENING AND COMPREHENDING THE CONVERSATIONS 9**

Reports – Types, structure, data collection, content, form, Definitions, extended definition, Recommendations, Memos and Checklists. Group Discussions, Listening and comprehending the conversations.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Communication Skills Laboratory course, the student will be able to

- CO1:** Formulate and practice effective reading strategy to enhance technical communication.
- CO2:** Get assess strengths in writing skills and set goals for future growth
- CO3:** Practice and perceive the full repertoire of listening strategies by using authentic listening tasks.
- CO4:** Can create learning situations to develop speaking skills based on sound educational and communication theories.

- CO5:** Discover an understanding of the process of oral communication and originate knowledgeable audience-centered speaking.
- CO6:** Formulate a significant training ground to develop the abilities in public speaking.
- CO7:** Work with multiple opportunities to practice and share their reading skills in the development.
- CO8:** Know about the improve critical thinking and analytical skills
- CO9:** Develop a milestone for leadership and group participation through communication skills
- CO10:** Speak in group discussion without any fear.

**TEXT BOOKS:**

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, "English for Engineers and Technologists" Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
3. M. AshrafRizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.

**REFERENCES:**

1. Sumant. S, 'Technical English', Second Edition, McGraw-Hill Education (India) Pvt. Ltd., 2008.
2. Dr. M. Hariprasad," Communicative English "Third Edition, Neelkamal Publications, PVT. LTD., 2007.
3. Sangeeta Sharma, Binod Mishra, 'Communication Skills for Engineers and Scientists, PHI Learning Private Limited., New Delhi, 2009.

**COURSE OBJECTIVE**

- To acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To learn the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To understand the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**UNIT I                    ORDINARY DIFFERENTIAL EQUATIONS                    12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

**UNIT II                    VECTOR CALCULUS                    12**

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopeds.

**UNIT III                    ANALYTIC FUNCTIONS                    12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping :  $w= z+c$ ,  $cz$ ,  $1/z$ , and bilinear transformation.

**UNIT IV                    COMPLEX INTEGRATION                    12**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

**UNIT V                    LAPLACE TRANSFORM                    12**

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL: 60 Hours****COURSE OUTCOMES:**

After successful completion of the Mathematics – II course, the student will be able to

- CO1:** Evaluate double integral and triple integral to compute area, volume of two dimensional and three-dimensional solid structure.
- CO2:** Know the gradient, divergence and curl, related theorems useful for engineering applications.
- CO3:** Test the analyticity and to construct the analytic function and transform complex functions from one plane to another plane graphically.

- CO4:** Evaluate real and complex integrals over suitable closed paths or contours.
- CO5:** Know the Applications of Laplace transform and its properties & to solve certain linear differential equations using Laplace transform technique
- CO6:** Understand doubles and triple integrations and enable them to find the area and volume using multiple integrals.
- CO7:** Know the basics of vector calculus comprising gradient, divergence and curl and line, surface and volume integrals.
- CO8:** Understand analytic functions of complex variables and conformal mappings.
- CO9:** Know the basics of residues, complex integration and contour integration.
- CO10:** Understand Laplace transforms and use it to represent system dynamic models and evaluate their time responses.

**TEXT BOOKS:**

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications ,Delhi,43<sup>rd</sup> Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,6<sup>th</sup> reprint, 2008.

**REFERENCES:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9<sup>th</sup> Edition, 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education , 3<sup>rd</sup> Edition, 2012.
3. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House ,4<sup>th</sup> Edition,2014

**COURSE OBJECTIVE:**

- To learn the basics of chemistry and application of water technology, principles of electrochemistry, nuclear chemistry, Nano chemistry, engineering materials, polymer and composites, corrosion and storage devices etc., and to apply these fundamental principles to solve practical problems related to materials used for engineering applications.

**UNIT I WATER TECHNOLOGY 9**

Characteristics – alkalinity – types of alkalinity and determination – hardness – types of estimation by EDTA method (problem) – Domestic water treatment – disinfection methods (Chlorination, ozonation, UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – de mineralization process – desalination and reverse osmosis.

**UNIT II ELECTROCHEMISTRY, NUCLEAR CHEMISTRY AND NANO CHEMISTRY 9**

Introduction -Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of pH - Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generator (block diagram only) – Breeder reactor, Nano materials – introduction to Nano chemistry – carbon Nano tubes and their applications.

**UNIT III ENGINEERING MATERIALS 9**

Refractories – classification – acidic, basic and neutral refractoriness – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnetite and zirconia bricks and their applications. Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrications – properties – viscosity index – flash and fire points, cloud and pour points – oiliness – solid lubricants – graphite and molybdenum disulphide.

**UNIT IV POLYMERS AND COMPOSITES 9**

Polymers – definition – polymerization – types – addition and condensation polymerization –free radical polymerization and mechanism – Plastics, classification – preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET – Rubber – vulcanization of rubber. Synthetic rubbers. Composites – definition, types, polymer matrix composites – FRP only Conducting polymers, semiconducting polymers, molecular switches—examples, mechanism and applications.

**UNIT V CORROSION, CORROSION CONTROL AND STORAGE DEVICES 9**

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating. Solar energy conversion – solar cells – wind energy – fuel cells –hydrogen – oxygen fuel cell – Batteries – alkaline batteries – lead – acid batteries – nickel – cadmium batteries and lithium batteries.

**TOTAL: 45 Hours**



**COURSE OUTCOMES:**

After successful completion of the Engineering Chemistry course, the student will be able to

- CO1:** To know about characteristics of water and estimation of hardness using EDTA Titration
- CO2:** Determine alkalinity and its types of alkalinity using neutralization reaction
- CO3:** Explain different types of Nuclear reactions, stability of Nucleus and Nuclear forces
- CO4:** Distinguish between Daniel cell, Voltaic cell, batteries etc.
- CO5:** Define refractories, abrasives, lubricants and its classifications.
- CO6:** Define polymers, Classifications of polymers and its synthetic applications.
- CO7:** Distinguish between Chemical and Electrochemical Corrosion and method of prevention.
- CO8:** Gain knowledge about different sources of energy and types of batteries
- CO9:** Understand the method of synthesis and different types of Nanotubes and its application.

**TEXT BOOKS:**

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi 2008.
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut 2001.
3. Puri and Sharma "A text book of Physical chemistry ", Chand and Co., New Delhi

**REFERENCES:**

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai publishing Company (P) Ltd., New Delhi, 2010.
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.

**COURSE OBJECTIVE:**

- To learn the basics of conducting materials, semiconducting materials, magnetic super conducting materials, Dielectric materials and Modern Engineering Materials etc., and to apply these fundamental principles to solve practical problems related to materials used for engineering applications

**UNIT I CONDUCTING MATERIALS 9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Drawbacks of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – carrier concentration in metals.

**UNIT II SEMICONDUCTING MATERIALS 9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9**

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites, applications – magnetic recording and readout, storage of magnetic data, tapes, floppy and magnetic disc drives. Superconductivity - properties – Types of superconductors – BCS theory of superconductivity(Qualitative) – High T<sub>c</sub> superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

**UNIT IV DIELECTRIC MATERIALS 9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarisation – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

**UNIT V MODERN ENGINEERING MATERIALS 9**

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties, application, advantages and disadvantages of SMA. Nano materials: synthesis – plasma arcing – chemical vapour deposition – sol-gels – electro deposition – ball milling – properties of nano particles and applications, Carbon nano tubes: fabrication.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Material Science course, the student will be able to

- CO1:** Apply general math, science and engineering skills to the solution of engineering problems.
- CO2:** Aware of the social, safety and environmental consequences of their work, and be able to engage in public debate regarding these issues.

- CO3:** Apply core concepts in Materials Science to solve engineering problems.
- CO4:** Knowledgeable of contemporary issues relevant to Materials Science and Engineering.
- CO5:** Able to select materials for design and construction.
- CO6:** Understand the importance of lifelong learning.
- CO7:** Design and conduct experiments, and to analyze data.
- CO8:** Understand the professional and ethical responsibilities of a materials scientist and engineer.
- CO9:** Communicate effectively while speaking, employing graphics and writing.
- CO10:** Possess the skills and techniques necessary for modern materials engineering practice.

**TEXT BOOKS:**

1. Rajendran, V, and Marikani A, 'Materials Science' Tata McGraw Hill publications, New Delhi 2011.
2. Vijaya, M. and Rangarajan G, 'Materials Science' Tata McGraw Hill publications, New Delhi 2006.

**REFERENCES:**

1. Charles Kittel 'Introduction to Solid State Physics', John Wiley and sons, 7<sup>th</sup> edition, Singapore 2008.
2. Kasap S.O, " Principles of Electronic Materials", 3<sup>rd</sup> edition, McGrawHill Higher Education, 2005.
3. Pradeep T, "A text book of Nanoscience and Nano technology, McGrawHill Higher Education, 2012.
4. Palanisamy P.K, 'Materials Science', Scitech publications, Chennai, 2007.

**COURSE 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.

<b>UNIT I</b>	<b>BASICS AND STATICS OF PARTICLES</b>	<b>12</b>
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Introduction – Units and Dimensions – Laws of Mechanics – Lamé's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, 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.

<b>UNIT II</b>	<b>EQUILIBRIUM OF RIGID BODIES</b>	<b>12</b>
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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

<b>UNIT III</b>	<b>PROPERTIES OF SURFACES AND SOLIDS</b>	<b>12</b>
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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.

<b>UNIT IV</b>	<b>DYNAMICS OF PARTICLES</b>	<b>12</b>
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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.

<b>UNIT V</b>	<b>FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS</b>	<b>12</b>
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Frictional force – Laws of Coulomb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

**TOTAL: 60 Hours****COURSE OUTCOMES:**

After successful completion of the Engineering Mechanics course, the students have the ability to

**CO1:** Solve engineering problems dealing with force, displacement, velocity and acceleration.

**CO2:** Solve rigid body subjected to dynamic forces.

**CO3:** Analyze the magnitude and forces in any structures.

- CO4:** Use of scalar and vector analytical techniques for analyzing the forces in statically determinate structures.
- CO5:** Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- CO6:** Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals.
- CO7:** Understanding the friction and elements of rigid body dynamics.
- CO8:** Understanding the rolling and belt friction.
- CO9:** Understanding the General Plane of motion.
- CO10:** Apply an application of established engineering methods to complex engineering problems solving.

**TEXT BOOKS:**

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.
2. Rajasekaran. S, Sankarasubramanian. G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 2000.

**REFERENCES:**

1. Hibbeler, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
2. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics and Dynamics", Tata McGraw-Hill, 2001.
3. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., 2003.
4. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., 2002.

**COURSE OBJECTIVE:**

- To provide exposure to the students of basic electrical and electronics engineering.

**UNIT I ELECTRICAL CIRCUITS AND MEASUREMENTS 12**

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

**UNIT II ELECTRICAL MACHINES 12**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, 1-Phase Transformer, 3-phase Induction Motors.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12**

Characteristics of PN Junction Diode –Half wave and Full wave Rectifiers – Zener Effect – Zener Diode and its Characteristics – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

**UNIT IV DIGITAL ELECTRONICS 12**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts).

**UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

**TOTAL: 60 Hours****COURSE OUTCOMES:**

After successful completion of the Basic Electrical and Electronics Engineering course, the student will be able to

- CO1:** Understand the basics of electrical circuits and measurements.
- CO2:** Understand the Ohm's and Kirchhoff's Laws.
- CO3:** Understand the principle and construction of DC motor and generator.
- CO4:** Understand the principle and construction of single phase and three phase induction motors.
- CO5:** Understand the basics of semiconductor devices and applications
- CO6:** Understand characteristics of PN junction diode and a Zener diode.
- CO7:** Understand and construct the Half wave and Full wave rectifiers circuits.
- CO8:** Understand Elementary Treatment of Small Signal Amplifier.
- CO9:** Understand the basics of digital electronics and applications.
- CO10:** Understand the techniques of analog to digital and digital to analog Conversion.
- CO11:** Understand the basic fundamentals of communication engineering.
- CO12:** Understand the basic Principles of Amplitude and Frequency Modulations.

**TEXT BOOKS:**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, 2006.
2. Murugesk Kumar,K., and Jaganathan, V., "Basic Electrical and Electronics Engineering", Vikas Publishing House PVT Ltd, New Delhi 2001.

**REFERENCES:**

1. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.
2. Mehta V K, "Principles of Electronics", S.Chand and Company Ltd, 1995.

**COURSE OBJECTIVE:**

- To acquire practical skills in the determination of water quality parameters through volumetric analysis.
- To determine the molecular weight of a polymer by viscometry.

**LIST OF EXPERIMENTS**

1. Determine the total, permanent and temporary hardness of the given water sample by EDTA method. A standard hard water and EDTA solutions are provided.
2. Determine the type and amount of alkalinity present in the given water sample. A standard solution of sodium hydroxide of strength 0.1N is given.
3. Estimate the amount of chloride present in the water sample by Argentometric analysis. A standard solution of strength 0.01N and sodium chloride solutions are provided
4. Determination of molecular weight of given polymer solution by Ostwald viscometer method.
5. Determine the amount of strong acid and weak acid (HCl and CH<sub>3</sub>COOH) present in 1 litre of the given mixture of acid solution by conducto-metric titration using standard NaOH of normality 0.2N.
6. Determine the amount of barium chloride present in 1 litre of the given solution by conductometric titration using standard solution of sodium sulphate of normality 0.2N.
7. Estimate the amount of ferrous ion present in the whole of the given solution. A standard solution of potassium dichromate of strength 0.1N is provided.
8. Determine the strength of the given hydrochloric acid by pH-metry with 0.2N sodium hydroxide solution.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Engineering Chemistry Laboratory course, the student will be able to

- CO1:** Estimate different types of hardness of water using complexometric titrations of given water sample.
- CO2:** Determine the amount of alkalinity of the given water sample using standard NaOH.
- CO3:** Find out the amount of chloride ion present in the given solution using argentometric method.
- CO4:** Calculate the molecular weight of the unknown polymer solution using viscosity method.



- CO5:** Determine the amount of strong acid present in the given mixture of acid solution using conductometric titrations.
- CO6:** Estimate the amount of strong and weak acid present in the mixture solution using conductometric titrations.
- CO7:** Estimate the amount of barium chloride present in the given solutions using conductometric titrations.
- CO8:** Estimate the amount of ferrous ion present in the given solution using conductometric titrations.
- CO9:** Determine the strength of the given acid by using PH-metry titrations.

**COURSE OBJECTIVE:**

- To gain effective speaking and listening skills in communication.
- To develop the soft skills and interpersonal skills to excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

**A. ENGLISH LANGUAGE LAB****18 Hours****I. PC based session (Weight age 40%)****24 Hours****1. LISTENING COMPREHENSION****6**

Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

**2. READING COMPREHENSION****6**

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

**3. SPEAKING****6**

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

**B. DISCUSSION OF AUDIO-VISUAL MATERIALS****6 Hours****(Samples are available to learn and practice)****1. RESUME / REPORT PREPARATION / LETTER WRITING (1)**

Structuring the resume / report - Letter writing / Email Communication - Samples.

**2. PRESENTATION SKILLS: (1)**

Elements of effective presentation – Structure of presentation – Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

**3. SOFT SKILLS: (2)**

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

**4. GROUP DISCUSSION: (1)**

Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD –Video samples

**5. INTERVIEW SKILLS: (1)**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report. (2)
2. Presentation Skills: Students make presentations on given topics. (8)
3. Group Discussion: Students participate in group discussions. (6)
4. Interview Skills: Students participate in Mock Interviews (8)

## **II. Practice Session (Weight age – 60%)**

**24 Hours**

### **COURSE OUTCOMES:**

After successful completion of the Language Laboratory course, the student will be able to

- CO1:** Improve the listening capability.
- CO2:** Get the writing capability through the practices.
- CO3:** Engage to improve the language capability for reading and writing.
- CO4:** Use strong vocabulary and fluently like foreigners.
- CO5:** Prepare their, own resume in professional method.
- CO6:** Understand the Structure of presentation and the tools available in the power point presentation.
- CO7:** Present the given topics or their own topic of interest.
- CO8:** Participates in group discussion without any hesitation.
- CO9:** Participate in mock interviews to remove the fear factors.
- CO10:** Get all types of training to prepare them for interview.

### **TEXT BOOKS:**

1. Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004.

### **REFERENCES:**

1. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.
2. Evans, D, Decisionmaker, Cambridge University Press, 1997.
3. Thorpe, E, and Thorpe, S, Objective English, Pearson Education, Second Edition, New Delhi, 2007.
4. Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addison Wesley.

**COURSE OBJECTIVE:**

- To develop the student's graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing CAD Packages related to technical drawings.

**List of Exercises using software capable of Drafting**

1. Importance of graphics in engineering applications – BIS conventions and specifications – Size and layout of drawing sheets – Lettering and dimensioning. Study of capabilities of CAD Packages for drafting – Coordinate systems. (Theory)
2. Creation of simple figures like polygon and general multi-line figures.
3. Construction of ellipse, Parabola and hyperbola.
4. Construction of involutes of square and polygon.
5. Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations.
6. Projection of polygonal surface and circular lamina inclined to one reference planes.
7. Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.
8. Sectioning of simple solids like prisms, pyramids, cylinder and cone in vertical position by cutting planes inclined to one reference plane and perpendicular to the other.
9. Draw the orthographic projection in the 1st angle for the objects such as step block, solid bearing block, gland as per the dimensions given.
10. Draw the isometric view or 3D model of a V – block, shaft bracket, jig plate as per the dimensions given.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

After successful completion of the Computer Aided Drafting Laboratory course, the student will be able to

- CO1:** Understand the role of CAD in mechanical component and system design by creating geometric models and engineering drawings.
- CO2:** Understand the basic mathematics fundamental to CAD software.
- CO3:** Work in teams to design a mechanical system and fabricate a prototype of their design.
- CO4:** Create the different wireframe primitives using parametric representations.
- CO5:** Create surface primitives using parametric modeling.
- CO6:** Create the different solid primitives using the different representation schemes.
- CO7:** Apply geometric transformations on the created wireframe, surface and solid models.
- CO8:** Effective user of a CAD/CAM system.
- CO9:** Contemporary computer design tools for aerospace and mechanical engineers.
- CO10:** Sketch in 2D Dimension and constrain sketch entities. Evaluate the validity of the sketch for later operations.

**TEXT BOOKS:**

1. DhananjayA.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited 2008.
2. K. Venugopal& V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited 2008.

**REFERENCES:**

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46<sup>th</sup> Edition, 2003.
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, 2007.
3. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education 2005.
4. S. Gowri and T. Jeyapoovan, "Engineering Graphics", 6<sup>th</sup> Edition, Vikas Publishing house Pvt Ltd 2011.