

**PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018**

**(AUTONOMOUS)**

**B.E. AERONAUTICAL ENGINEERING**

**CURRICULUM**

**CBCS REGULATIONS 2016**

**SEMESTER I**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MA16101	Matrices and Calculus	3	2	0	4
EN16101	Technical English I	3	0	0	3
PH16101	Engineering Physics	3	0	0	3
CH16101	Engineering Chemistry I	3	0	0	3
ME16104	Engineering Graphics	3	2	0	4
EE16101	Basic Electrical and Electronics Engineering	3	0	0	3
PC16101	Physics and Chemistry Laboratory I	0	0	2	1
AE16101	Basic Aero modeling Laboratory	0	0	2	1
GE16101	Engineering Practices Laboratory	0	0	4	2

**SEMESTER II**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MA16201	Differential Equations and Complex Analysis	3	2	0	4
EN16201	Technical English II	3	0	0	3
PH16202	Applied Physics	3	0	0	3
CH16201	Engineering Chemistry II	3	0	0	3
CS16201	Computer Programming	3	0	0	3
ME16201	Engineering Mechanics	3	2	0	4
PC16201	Physics and Chemistry Laboratory II	0	0	2	1
CS16202	Computer Programming Laboratory	0	0	2	1
EN16202	English Communication Skills Laboratory	0	0	2	1



## **COURSE OUTCOMES**

At the end of this course, the students will be able to

- identify the solutions of the characteristic equations and to understand the technique of diagonalizing a matrix which would render the eigen solution procedure very simple.
- understand the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.
- know the 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.
- apply the methods of single, double and triple integration, which are needed in their studies in other areas and gained confidence to handle integrals of higher orders.

## **TEXT BOOKS**

1. Grewal. B.S, “Higher Engineering Mathematics”, 41<sup>st</sup> Edition, Khanna Publications, Delhi,(2011).
2. P.Jayakumar, and Dr.B.Kishokkumar “Matrices and Calculus”, Global Publishers, Chennai.,(2015).
3. T. Veerarajan., “Engineering Mathematics”, 3<sup>rd</sup> Edition, Tata McGraw Hill, (2011).

## **REFERENCES**

1. Erwin Kreyszig., “Advanced Engineering Mathematics” 10<sup>th</sup> Edition, Wiley Publications.
2. Dass, H.K., and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Ltd.,(2011).
3. Glyn James, “Advanced Modern Engineering Mathematics”, 3<sup>rd</sup> Edition, Pearson Education,(2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).

## **WEB LINKS**

1. <http://www.sosmath.com/matrix/matrix.html>
2. <http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx>
3. <http://nptel.ac.in/courses/122104017/28>



## **TEXT BOOK**

1. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi. 2015.

## **REFERENCES**

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice. Oxford University Press, New Delhi. 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi, 2001.

## **WEB LINKS**

1. <http://writing-program.uchicago.edu/resources/grammar.htm>
2. <http://www.grammarbook.com/>
3. [www.onestopenglish.com](http://www.onestopenglish.com)



Lattice – unit cell – Bravais lattices – lattice planes – Miller indices – derivation for inter-planar spacing in terms of Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number and packing factor for SC, BCC, FCC and HCP structures. X-ray diffraction: Bragg's law – diffraction methods – powder and Laue methods. Growth Techniques: Bridgman and Czochralski techniques.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES**

At the end of this course, the students will be able to

- assess the elastic properties of the materials.
- relate the fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and ultrasonics.
- know the development of modern physics and its applications.
- recognize the uses of laser and the propagation of light through fiber optics.
- distinguish the different crystal systems, structural determination and synthesis of crystals.

**TEXT BOOKS**

1. A.Marikani, Engineering Physics, PHI, New Delhi, 2013.
2. S.Vadivel&A.Pannerselvam, Engineering Physics, Jaitech Publications, 2015 (Revised edition).

**REFERENCES**

1. S.Selladurai, Engineering Physics Part-I, PHI learning private limited, New Delhi, 2010.
2. R.K. Gaur, S.L. Gupta, Engineering Physics, DhanpatRai publications, 2013
3. V.Rajendran, "Engineering Physics", Tata McGraw-Hill. New Delhi.2011
4. P.K.Palanisamy Engineering Physics. SCITECH Publications, 2011
5. A.S. Vasudeva, Modern Engineering Physics, Pub. S. Chand, New Delhi, 2013.

**WEB LINKS**

1. <http://science.howstuffworks.com/laser1.html>
2. <http://www.npatel.iitm.ac.in/courses/Webcourse-ontents/IIT%20Guwahati/engg.physics/index-cont.html>
3. <http://de.physnet.net/PhysNet/education.html>

**COURSE OBJECTIVES**

- To recognize the need of polymers for industrial and household application.
- To evaluate the interrelation between heat and work within the confines of the laws of thermodynamics.
- To understand the concepts of instrumentation, data acquisition, data processing and the principles of analytical technique.
- To predict the number of phases that exists in equilibrium for a system.
- To acquaint the students with the basics of Nano materials, their properties and applications.

**UNIT I POLYMERS****9**

Introduction: Classification of polymers – Natural and Synthetic- Functionality – Degree of polymerization: Types of polymerization and Mechanism of Addition (Free Radical, cationic and anionic); condensation and copolymerization. Effect of polymer structure and properties of polymers strength, plastic deformation, physical state and chemical resistance. Plastics-Thermoplastics and Thermosetting plastics -Preparation, properties and uses of Nylon 6:6, Teflon, epoxy resin and polycarbonate (Lexan)-Compounding of Plastics-Constituents and functions -Fabrication methods of Plastics.

**UNIT II CHEMICAL THERMODYNAMICS****9**

Terminology of thermodynamics-First law- Second law: Entropy- Entropy change for an ideal gas, reversible and irreversible process; Entropy of Phase transition: Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity: Gibbs Helmholtz Equation (problems); ClausiusClapeyron equation ; Maxwell Relations- Vant Hoff Isotherm and Isochore (problems).

**UNIT III WATER TECHNOLOGY AND SPECTROSCOPIC TECHNIQUES****9**

Water quality standards-Hardness of water-Types-expression-units-CaCO<sub>3</sub>equivalence-problems and disadvantages- Water quality parameters and their determination methods-Titremetry,ElectroUV and AAS-Spectroscopy -Types- Electromagnetic spectrum – Absorption of radiation – Beer-Lambert's law – UV-Visible spectroscopy and IR spectroscopy – principles and instrumentation (block diagram only Electronic, Vibrational and rotational transitions. Estimation of iron by colorimetry – flame photometry principles and instrumentation (block diagram only) - estimation of sodium by flame photometry –

**UNIT IV PHASE RULE AND ALLOYS****9**

Phase rule: Introduction, and explanation of terms with examples, One Component System: Water System-Reduced phase rule- Two Component Systems- Lead- Silver system, Zinc – Magnesium system. Alloys: Introduction – Definition – properties of Alloys- significance of alloying. Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless Steel- Heat treatment of steel: Non Ferrous alloys; Brass and Bronze.



Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoscale materials- particles: cluster, rods, tubes (CNT) and wires. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode deposition, chemical vapour deposition, laser ablation; Properties and applications in electronics and communication, Energy sciences and risk discussion and future perspectives.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES**

At the end of this course, the students will be able to

- select a polymeric material for a specific engineering application.
- know the basic concepts of internal energy, enthalpy, entropy, free energy and chemical potential.
- gain practical experience in chemical process equipment as well as to analyze and interpret data.
- classify the states in a equilibrium in a heterogeneous system.
- identify the particle size, and the application of Nanomaterials in various fields .

**TEXT BOOKS**

1. P.C.Jain and Monica Jain, "Engineering Chemistry", 15th ed., DhanpatRaiPub.Co, New Delhi, (2012).
2. S.S.Dara, "A Text book of Engineering Chemistry", S.Chand&Co.Ltd ., New Delhi, (2009).

**REFERENCES**

1. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).
2. R.Sivakumar and N.Sivakuamr, "Engineering Chemistry", Tata McGraw-Hill publishing company limited, New Delhi, (2009)

**COURSE OBJECTIVES**

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids and section of solids
- To develop the imaginative skills of the students required to understand Developments of surfaces and isometric projection.
- To give practice on Computer aided Drafting

**Concepts and Conventions (Not for Examination) 2**

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 14****Curves Used In Engineering Practices:**

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, Epicycloids and Hypocycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Construction of Spiral curve.

**Free Hand Sketching:**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14**

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 inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS 15**

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. 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.

**UNIT IV DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS 15**

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. Principles of isometric projection –

isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones.

## **UNIT V INTRODUCTION TO CAD**

**15**

Capabilities of software for Drafting and Modeling - Creation of simple figures like polygon and general multi-line figures - Isometric projection of simple objects - Development of prism, pyramid, cylinder, cone etc.,

**TOTAL: 75 PERIODS**

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- draw the projections of points, straight lines and plane surfaces in given quadrant
- understand the projection of solids in various positions in first quadrant and section of solids
- draw the development of surfaces and isometric projection.
- draft simple drawings with the help of drafting software.

### **TEXT BOOKS**

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Prabhakaran.S, Makesh.M, Subburam.V, “Engineering Graphics”, Sams Publishers, Chennai, 2015.

### **REFERENCES**

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
3. 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.
4. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
5. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> Edition, 2010.

### **WEB LINKS**

1. <http://www.nptel.ac.in/courses/112103019>
2. <http://www.engineeringdrawing.org/>
3. <http://www.mechanical.in/engineering-graphics/>

### **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 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
4. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**COURSE OBJECTIVES**

- To analyze the various AC and DC circuits and find the circuit parameters.
- To introduce the principles of AC & DC fundamentals.
- To familiarize the relationship between Electric and Magnetic circuits.
- To study the basics of electronic devices and its applications.
- To learn various number systems and to realize the logic functions by using various gates.

**UNIT I ELECTRICITY AND MAGNETISM 9**

Coulomb's law, Flemings law, lenz law—Properties of Magnets, Laws of Magnetism, flux, flux density, Field strength, Permeability, Reluctance, Permeance, Types of Magnetic circuits – Comparison of Magnetic and Electric Circuits. Self and Mutual Inductance – Self and mutually induced emf.

**UNIT II DC & AC CIRCUITS FUNDAMENTALS 9**

DC: Ohm's Law- Limitations of Ohm's Law, Kirchhoff's' Laws, series– parallel resistive circuits, comparison of series and parallel circuits, Star - Delta Transformation – Problems.

AC Waveforms – RMS and Average value, Form Factor, Peak Factor. Single Phase AC Circuits – RL, RC, RLC series and parallel circuits– Impedance, Power, Power factor, Series and Parallel Resonance - Problems. Introduction to three phase AC circuits.

**UNIT III MEASUREMENTS 9**

Types of electrical measurement –construction and Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters. Types of errors.

**UNIT IV SEMICONDUCTOR DEVICES 9**

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

**UNIT V DIGITAL ELECTRONICS 9**

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

**TOTAL: 45 PERIODS****COURSE OUTCOMES**

At the end of this course, the students will be able to

- get the basic knowledge about the AC & DC Electric circuits.
- understand the basic quantities in measurements
- apply concepts and theories of electrostatics
- understand the concept of Semiconductor Devices and Applications
- acquire the knowledge of various types of digital electronics technique.

## **TEXT BOOKS**

1. Muthusubramanian,R, Salivahanan,S and Muraleedharan,K.A, “Basic Electrical, Electronics and Computer Engineering” ,Tata McGraw Hill, Second Edition, 2006.
2. J.B. Gupta, “A Textbook of Basic Electrical and Electronics Engineering”, S.K. Kataria& Sons; Reprint 2013 edition ,2013.
3. M. Morris Mano, “Digital Logic and Computer Design”, Prentice Hall of India, 2002.

## **REFERENCES**

1. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press , 2005.
2. Rohit Mehta & V K Mehta, "Principles of Electronics", S.Chand& Company Ltd, 2012.
3. MahmoodNahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
4. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, 2003
5. S.Salivahanan, “Electronic Devices and Circuits”, Tata McGraw Hill, 2008.

## **WEB LINKS**

1. [www.faadooengineers.com/.../448-Basic-Electrical-Engineerin...](http://www.faadooengineers.com/.../448-Basic-Electrical-Engineerin...)
2. [zebu.uoregon.edu/~rayfrey/432/DigitalNotes.pdf](http://zebu.uoregon.edu/~rayfrey/432/DigitalNotes.pdf)

(COMMON TO ALL BRANCHES)

**PHYSICS LABORATORY I****COURSE OBJECTIVES**

- To demonstrate various experiments, to understand the basic concepts in the properties of matter, sound, light, thermal physics and electricity.

**LIST OF EXPERIMENTS**

1. Determination of wavelength and particle size using Laser.
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of Young's modulus by non- uniform bending method.

**COURSE OUTCOMES**

At the end of this course, the students will be able to apply the principles of mechanical, electrical, thermal and optical characteristics of materials.

**CHEMISTRY LABORATORY I****COURSE OBJECTIVES**

- To analyze the hardness of water, impurities in water, water quality parameters and nature of chemicals in neutral medium.

**LIST OF EXPERIMENTS**

1. Determination of DO content of water sample by winkler's method.
2. Determination of chloride content of water sample by Argentometric method.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Conductometric titration of strong acid Vs Strong base.

**TOTAL: 30 PERIODS****COURSE OUTCOMES**

At the end of this course, the students will be able to know the quality of water and chemical process taking place in different medium

**COURSE OBJECTIVES**

- To enhance practical knowledge in art of designing, building and operating miniaturized aircrafts (powered or non-powered).

**LIST OF MODELING**

1. Study about historical background of aircrafts
2. Study of Components of aircrafts and its functions
3. Construction of glider models using different materials
4. Construction of wings
5. Construction of Fuselage
6. Construction of tail plane
7. Assembly of the aircraft models
8. Construction of aircraft
9. Calculation of Endurance, Range, time and CG

**TOTAL: 30 PERIODS****COURSE OUT COMES**

At the end of this course, students will be able to design and operate the miniaturized aircrafts.

## (COMMON TO ALL BRANCHES)

**COURSE OBJECTIVES**

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

**GROUP A (CIVIL AND MECHANICAL)****I CIVIL ENGINEERING PRACTICE****BUILDINGS**

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

**PLUMBING WORKS**

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise:
- Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components. (e) Demonstration of plumbing requirements of high-rise buildings.

**CARPENTRY USING POWER TOOLS ONLY**

- a) Study of the joints in roofs, doors, windows and furniture.
- b) Hands-on-exercise:  
Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE****WELDING**

- Preparation of arc welding of butt joints, lap joints and tee joints.
- Gas welding practice

**BASIC MACHINING**

- Simple Turning, Facing, Thread cutting and Taper turning
- Drilling Practice

**SHEET METAL WORK**

- Model making – Trays, funnels, etc.
- Different type of joints.

**FITTING**

- Square fitting
- Vee – fitting models



## **DEMONSTRATION ON**

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise –  
Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.

**TOTAL: 30 PERIODS**

## **GROUP B (ELECTRICAL AND ELECTRONICS)**

### **III ELECTRICAL ENGINEERING PRACTICE**

1. Study of electrical tools and safety measures
2. Basic wiring practices - Stair-case wiring, Fluorescent lamp wiring and Residential house wiring
3. Measurement of electrical parameters such as voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Earthing Practices & Measurement of earth resistance using megger.
6. Study of electrical equipments such as iron box, induction heater.

### **IV ELECTRONICS ENGINEERING PRACTICE**

1. Study of Electronic components and equipments – Resistor, color coding measurement of AC signal parameter (Peak-Peak, RMS, Period, and Frequency) using CRO.
2. Study of logic gates AND, OR, Ex-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR.
6. Construction and verification of half adder circuit.
7. Construction and verification of half subtractor circuit.
8. Study of Telephone, F.M Radio and Cell Phone.

**TOTAL: 30 PERIODS**

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

- use tools and equipment for fitting, carpentry, sheet metal, welding, electrical wiring and plumbing
- prepare the models by fitting operation & carpentry operation.
- construct electrical wiring circuit and demonstrate practically.

## SEMESTER II

MA16201

DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

3 2 0 4

(COMMON TO ALL BRANCHES)

### COURSE OBJECTIVES

- To discuss a wide range of basic mathematical methods for solving different types of problems arising in the fields of Science, Mathematics and Engineering.
- To acquire sound knowledge of in solving ordinary differential equations that model engineering problems.
- To understand the concepts of vector calculus, which is applied in all engineering disciplines.
- To know the standard techniques of complex variable
- To learn the purpose of using transforms and to create a new domain

### UNIT I ORDINARY DIFFERENTIAL EQUATIONS 15

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 15

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – vector integration – verifications of Green's, Gauss divergence and Stokes' theorem – simple applications.

### UNIT III ANALYTIC FUNCTIONS 15

Functions of a complex variable – Analytic functions –, Cauchy – Riemann equations (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 15

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Contour integration.

### UNIT V LAPLACE TRANSFORM 15

Laplace transform – Transform of elementary functions – Basic properties – Definition of Inverse Laplace transforms – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL: 75 PERIODS**

### COURSE OUTCOMES

At the end of this course, the students will be able to

- solve differential equations.

- study the basics of vector calculus comprising of gradient, divergence and curl and line, surface and volume integrals and the classical theorems.
- know the concepts of analytic functions and its properties and apply it in conformal mapping.
- gain knowledge in the basics of complex integration and the concept of contour integration which is an important tool for evaluation of certain integrals encountered in practice.
- solve Laplace transform and its properties and give sufficient exposure to the solution of certain linear differential equations.

### **TEXT BOOKS**

1. Grewal. B.S, “Higher Engineering Mathematics”, 41<sup>st</sup> Edition, Khanna Publications, Delhi,(2011).
2. P.Jayakumar, and Dr.B.Kishokkumar, “Differential Equations and Complex Analysis”, Global Publishers, Chennai.,(2015).
3. Erwin Kreyszig., “Advanced Engineering Mathematics” 10<sup>th</sup> Edition, Wiley Publications.

### **REFERENCES**

1. Dass, H.K., and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Ltd.,(2011).
2. T. Veerarajan., “Engineering Mathematics”, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2011.
3. Peter V. O’Neil, “Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Cengage learning, (2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).

### **WEB LINKS**

1. <http://tutorial.math.lamar.edu/Classes/DE/DE.aspx>
2. <https://rutherglen.science.mq.edu.au/wchen/lnicafolder/lnica.html>
3. <http://www.nptel.ac.in/courses/111103070/>



## **REFERENCES**

1. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: Principles and Practice. Oxford University Press, New Delhi. 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi, 2001.

## **WEB LINKS**

1. <http://writing-program.uchicago.edu/resources/grammar.htm>
2. <http://www.myenglishteacher.eu/blog/english-grammar/>
3. [www.Ted Talks.com](http://www.TedTalks.com)



electron microscope (TEM) – atomic force microscope (AFM)–scanning tunneling microscope (STM) – electrostatic force mode (EFM) – magnetic force mode (MFM).

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

- select the metals required for specific applications in the area of engineering and technologies.
- distinguish between different types of semiconductor and determinations of hall co-efficient.
- classify different kinds of polarization mechanism and uses.
- identify different magnetic materials and giant magneto resistance.
- relate the different types of characterization techniques.

### **TEXT BOOKS**

1. V.Rajendran, “Materials Science”, Tata McGraw- Hill, New Delhi, 2011.
2. S.Vadivel, A.Pannerselvam, Solid State Physics, Jaitech Publications, 2015 (Revised edition).

### **REFERENCES**

1. Charles Kittel, “Introduction to Solid State Physics”, John Wiley & sons, 7<sup>th</sup> edition, Singapore (2007).
2. P.K.Palanisamy, Materials Science. SCITECH Publishers, 2011.
3. S.O.Pillai, Solid State Physics. New Age International(P) Ltd., publishers, 2009
4. T.Pradeep, “A Text Book of Nanoscience and Nanotechnology”, Tata McGraw Hill, New Delhi, 2012.
5. Sam Zhang, “Materials Characterization Techniques”, CRC Press, 2008.

### **WEB LINKS**

1. <http://www.npatel.iitm.ac.in/courses/Webcourseontents/IIT%20Guwahati/engg.physics/indexcont.html>.
2. <http://www.careercornerstone.org/matscieng/matsciengfield.htm>
3. <http://hyperphysics.phy-astr.gsu.edu/hbase/solids/intrin.html#c1>

**COURSE OBJECTIVES**

- To gain hands an experience about cells and batteries
- To understand the mechanism of corrosion and its control methods.
- To emphasize the need of renewable energy sources.
- To familiar with the usage of chemistry which exhibit engineering materials.
- To apply the information of chemicals in designing the molecule.

**UNIT I ELECTROCHEMISTRY****9**

Electrochemical cells-types- reversible and irreversible cells – EMF –measurement of emf-Single electrode potential – Nernst Equation (derivation and problem) – reference electrodes – standard hydrogen electrode – calomel electrode – Ion selective electrode – glass electrode – measurement of pH – electrochemical series – significance -potentiometric titrations (redox – Fe<sup>2+</sup> Vs dichromate).

**UNIT II CORROSION AND CORROSION CONTROL****9**

Corrosion-Causes-Types-Chemical corrosion - Pilling-Bedworth rule – electrochemical corrosion – mechanism - galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – preliminary treatment –Metallic and Non metallic coatings-Varnish-Lacquer-Hot dipping-Metal Clading-Electroplating(Au)-Galvanizing-Tinning-Electroless plating (Ni)– Paints – constituents and function .

**UNIT III NONCONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES****9**

Nuclear energy-fission and fusion reaction and light water nuclear reactor for power generation (block diagram only)-breeder reactor-solar energy conversion-solar cells-wind energy-Fuels cells-hydrogen-oxygen fuel cell-batteries-alkaline batteries-lead acid-nickel cadmium, lithium batteries and Nano batteries.

**UNIT IV ENGINEERING MATERIALS****9**

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks. Lubricants – mechanism of lubrication, liquid lubricants, - properties – viscosity index, flash and fire points, cloud and pour points, oiliness-Aniline point) – solid lubricants – graphite and molybdenum sulphide.

**UNIT V CHEMINFORMATICS****9**

Definition – coordinate –bonds –bond length – bond angles – torsional angles – chemical structure – definition - conformation – representation of structural information – linear format – SMILEYF notation – MOL format – PDB format – storage of structural data in a database - structural keys – finger print -canonical structure – similarity search –sub structure search - application of chem-informatics in drugs designing.

**TOTAL: 45 PERIODS**



## **COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the application of cells and batteries in practical field.
- know the rate of corrosion of a metal in a given environment and identify appropriate control techniques to avoid corrosion.
- recognize the energy devices produce sustainable energy.
- select the appropriate lubricant for different engineering applications.
- understand the basics concept of drug designing by chem-informatics.

## **TEXT BOOKS**

1. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).
2. B.K. Sharma, "Engineering Chemistry", Krishna Prakasam Media (P) Ltd., Meerut (2001).

## **REFERENCES**

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub. Co., New Delhi, 15<sup>th</sup> Edition, 2008(Revised Edition 2012).
2. Bahl B.S.,Tuli G.D. and ArunBahl., Essential of Physical Chemistry, S.Chand& Co. Ltd., New Delhi (2010).
3. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical chemistry, ShobanLalNagin Chand & Co., New Delhi (2008) .
4. R.Sivakumar and N.Sivakuamr, "Engineering Chemistry", Tata McGraw-Hill publishing company limited, New Delhi, (2012).
5. RajarshiGuha and Andreas Bender "Computational approaches in chem-informatics and bioinformatics" Wiley Publishers, Cambridge (2011).

## **WEB LINKS**

1. [www.worldcat.org](http://www.worldcat.org)
2. [www.book.boon.com](http://www.book.boon.com)
3. [www.chemwiki.ucdavis.edu](http://www.chemwiki.ucdavis.edu)

(COMMON TO AERO/AGRI/CIVIL/MECH/MECHATRONICS ENGINEERING)

### COURSE OBJECTIVES

- To learn the organization of a digital computer.
- To be exposed to the number systems.
- To think logically and write pseudo code or draw flow charts for problems.
- To be familiar with programming in C.
- To use arrays, strings, functions, pointers, structures and unions in C.

### UNIT I INTRODUCTION TO COMPUTERS 9

Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – Classification of Computers – Basic Computer organization – Number Systems. Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications. Problem Solving Techniques- Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudo code. Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

### UNIT II BASICS OF 'C' LANGUAGE 9

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

### UNIT III ARRAYS AND STRINGS 9

Array Concepts- Two Dimensional Array - Passing Arrays to Functions - Multi Dimensional Array. String Operations - Sorting and Searching

### UNIT IV FUNCTIONS AND POINTERS 9

Functions – Function Prototypes – Parameter Passing Methods – Recursion – Library Functions. Pointers – Pointers and Functions – Pointers and Strings – Operations on Pointers – Dynamic Memory Allocation

### UNIT V STRUCTURE, UNIONS AND FILE HANDLING 9

Structures and Union – Declaring, Accessing, Initialization, Structure assignment, Nested Structure, Array of Structure. File Handling Functions

**TOTAL: 45 PERIODS**

### COURSE OUTCOMES

At the end of this course, the students will be able to

- gain knowledge about number systems.
- work in office package.
- understand basic concepts of C programs.
- obtain knowledge about user defined function and scope of variables in C.
- acquire knowledge for handling arrays, strings, functions, pointers, structures and unions in C.

## **TEXT BOOKS**

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

## **REFERENCES**

1. Byron Gottfried, "Programming with C", 3rd Edition, (Indian Adapted Edition), TMH publications, 2010.
2. Stephen G.Kochan, "Programming in C", 5th Edition, Pearson Education India, (2011).
3. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2009).
4. E.Balagurusamy, "Computing fundamentals and C Programming", TataMcGraw-Hill Publishing Company Limited, (2011).
5. Dromey R.G., "How to Solve it by Computer", Pearson Education, Fifth Reprint, 2009.



## **COURSE OUTCOMES**

At the end of this course, the students will be able to

- apply the differential principles to solve engineering problems.
- gain in-depth knowledge in the equilibrium of rigid bodies.
- identify and calculate the various properties of surfaces and solids
- categorize the various forces analysis in structures.
- solve rigid body problems subjected to dynamic forces.

## **TEXT BOOKS**

1. Dr.N.Kottiswaran., “Engineering Mechanics”10th Edition, Sri Balaji Publications 2010.
2. Palanichamy, M.S., Nagam, S., "Engineering Mechanics - Statics & Dynamics", Tata McGraw-Hill, (2001).

## **REFERENCES**

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. Hibbeler, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd.,
3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons,1993.
5. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).

## **WEBLINKS**

1. <http://www.nptel.ac.in/courses/112103109/>
2. <https://www.coursera.org/learn/engineering-mechanics-statics/home/info>
3. <http://www.myopencourses.com/subject/engineering-mechanics-2>

**PHYSICS LABORATORY II****COURSE OBJECTIVES**

- To assess various experiments to enhance the basic concepts of Physics in the properties of matter, optics and semiconductor.

**LIST OF EXPERIMENTS**

1. Determination of Young's modulus by uniform bending method.
2. Determination of band gap of a semiconductor.
3. Determination of coefficient of viscosity of a liquid –Poiseuille's method.
4. Determination of thickness of a thin wire – Air wedge method.
5. Determination of rigidity modulus – Torsion pendulum.

**COURSE OUTCOMES**

At the end of this course, the students will be able to apply the principles of mechanical, electrical, and optical characteristics of materials.

**CHEMISTRY LABORATORY II****COURSE OBJECTIVES**

- To develop the practical knowledge through the instrumental methods of chemical analysis, role of chemistry in engineering applications and environmental impact of water.

**LIST OF EXPERIMENTS**

1. Determination of alkalinity in water sample.
2. Determination of total, temporary, and permanent hardness of water by EDTA method.
3. Estimation of copper content of the given solution by EDTA method.
4. Estimation of iron content of the given solution using potentiometer.
5. Conductometric precipitation titration using  $\text{BaCl}_2$  and  $\text{Na}_2\text{SO}_4$ .

**TOTAL: 30 PERIODS****COURSE OUTCOMES**

At the end of this course, the students will be able to know the concepts of water hardness and analyse various types of water.

**COURSE OBJECTIVES**

- To be familiar with the use of word processing software.
- To get exposure in presentation and visualization tools.
- To understand the problem solving techniques and flow charts.
- To learn the basic concepts of C programming.
- To use Arrays, strings, functions, structures and unions.

**LIST OF EXERCISES****a) Word Processing****10**

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****10**

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.

**C) Programming****10**

- 9 Data types, Expression Evaluation, Condition Statements.
- 10 Arrays
- 11 Structures and Unions
- 12 Functions
- 13 File Handling
- 14 Pointers

**COURSE OUTCOMES**

At the end of this course, the students will be able to

- execute the word processing programs.
- execute C programs for simple applications.
- develop recursive programs.
- develop recursive programs.

**TOTAL: 30 PERIODS**

## (COMMON TO ALL BRANCHES)

**COURSE OBJECTIVES**

- To instill the basic communication concepts to enhance students' communication skills through various lab sessions.
- To help students develop the ability to communicate effectively in spoken English and develop their soft skills and interpersonal skills.
- To increase employability by developing students' communication skills in English.

**UNIT I FORMAL & INFORMAL CONVERSATION PRACTICE 6**

Role Play conversations - with family members, neighbours, friends, relatives etc. Simple expressions - agreeing / disagreeing, persuading, wishing, consoling, advising, arguing, expressing opinions etc.- Professional dialogues with superiors - Conversation with different professionals in government and corporate Offices, Official Meetings, educational Institutions, (At the railway junction, malls, post office, bank) etc- every day usage of English

**UNIT II ORAL REVIEW, RADIO SHOW & NARRATIVE TECHNIQUES 6**

Oral review of books - Presentation of various radio programs like news, announcements, advertisements, entertainment programs etc. as a team activity. Understanding the basic narrative techniques - Narrating short stories. Narrating real life experiences, Oral interpretation of charts, tables, graphs.

**UNIT III RESUME / LETTER WRITING 6**

Preparation of resume - structure – Types of resume – writing the vision statement – Objectives – Types of Letter – Job Application – accepting / declining a Job offer.

**UNIT IV PRESENTATION SKILLS & GROUP DISCUSSION 6**

Elements of effective presentation – Structure of a presentation – Speech acts - effective use to presentation tools - Audience analysis – Preparing the PPT slides - Video samples- Importance of GD – in the selection process - Structure of a GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

**UNIT V INTERVIEW SKILLS 6**

Kinds of interviews – one to one, group interview, telephone interview, online interview, stress interview - Required Skills – Corporate culture – Mock interviews-Video samples.

**TOTAL: 30 PERIODS****COURSE OUTCOMES**

At the end of this course, the students will be able to

- speak effectively and confidently in English.
- attend job interviews with confidence.
- write effective job applications with resume.



### **TEXT BOOK**

1. Sobana.S, Manivannan.R and Immanuel. G, “Communication and Soft Skills”, VK Publications, Sivakasi. 2016.

### **REFERENCES**

1. Anderson, P.V. “Technical Communication”, Thomson Edition, New Delhi, 2007.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005.
3. Dutt, Kiranmai P and Geetha Rajeevan, “Basic Communication Skills”, Foundation Books, New Delhi. 2007.

### **WEB LINKS**

1. <http://writing-program.uchicago.edu/resources/grammar.htm>
2. <http://www.grammarbook.com/>
3. <http://www.myenglishteacher.eu/blog/english-grammar-9-websites-to-learn-and-practice-english-grammar/>