

**PAAVAI ENGINEERING COLLEGE, NAMAKKAL - 637 018****(AUTONOMOUS)****B.E. BIOMEDICAL ENGINEERING****REGULATIONS 2016****(CHOICE BASED CREDIT SYSTEM)****CURRICULUM& SYLLABI****(For the candidates admitted during the Academic Year 2018-2019)****SEMESTER I**

S.No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	HS	EN16101	Technical English I	3	0	0	3
2	BS	MA16101	Matrices and Calculus	3	2	0	4
3	BS	PH16101	Engineering Physics	3	0	0	3
4	BS	CH16101	Engineering Chemistry I	3	0	0	3
5	ES	ME16101	Engineering Graphics	3	2	0	4
6	ES	CS16101	Computer Programming	3	0	0	3
<b>Practical</b>							
7	BS	PC16101	Physics and Chemistry Laboratory	0	0	4	2
8	ES	GE16101	Engineering Practices Laboratory	0	0	4	2
9	ES	CS16102	Computer Programming Laboratory	0	0	2	1
<b>TOTAL</b>				<b>18</b>	<b>4</b>	<b>10</b>	<b>25</b>
<b>Cumulative Total</b>							<b>25</b>

**SEMESTER II**

S.No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	HS	EN16201	Technical English II	3	0	0	3
2	BS	MA16201	Differential Equations and Complex Analysis	3	2	0	4
3	BS	PH16201	Solid State Physics	3	0	0	3
4	BS	CH16204	Fundamentals of Biochemistry	3	0	0	3
5	ES	ME16205	Engineering Mechanics for Biomedical Engineers	3	0	0	3
6	ES	EC16201	Electric Circuit Analysis	3	0	0	3
<b>Practical</b>							
7	HS	EN16202	English Communication Skills Laboratory	0	0	2	1
8	BS	CH16206	Biochemistry Laboratory	0	0	4	2
9	ES	EE16202	Electric Circuit Laboratory	0	0	2	1
<b>TOTAL</b>				<b>18</b>	<b>2</b>	<b>8</b>	<b>23</b>
<b>Cumulative Total</b>							<b>48</b>

**COURSE OBJECTIVES**

To enable students to

- impart knowledge about the importance of vocabulary and grammar.
- help the students of engineering and technology develop a strong base in the use of English.
- improve the reading skills of the students so as to enable them to communicate with confidence in English.
- develop their basic speaking skills in order to deliver impromptu talks, participate with confidence in conversations.
- enable students to write / draft effective essays and emails for effective communication.

**UNIT I VOCABULARY & GRAMMAR****9**

General Vocabulary - Prefixes & Suffixes - Words used as nouns and verbs - Comparative adjectives - Phrasal verbs- Acronyms - Abbreviations -Tenses - Active and Passive voice - Modal verbs and Probability - Cause and Effect expressions - Subject-verb agreement - Yes or no questions - Gerund and Infinitives - Imperative Sentences - Prepositions.

**UNIT II LISTENING****9**

Listening and transferring of information, listening to dialogues, listening to informal conversation- listening to short talks and answering questions- understanding the structure of conversations- telephone etiquettes - note taking.

**UNIT III READING****9**

Reading - Sub-Skills of reading - skimming - scanning - predicting - Reading comprehension - reading short passages in English and answering multiple choice questions / open-ended questions - Analyzing the use of language in advertisements - Interpreting Visual Information - Flow Chart, Pie Chart, (Transcoding).

**UNIT IV WRITING****9**

Informal letters - email communication - Developing hints - Writing Instructions, Recommendations – Note Making - Minutes of the Meeting - Use of cohesive devices and reference words - Essay writing - different types of essays - summary writing.

**UNIT V SPEAKING****9**

Self introduction - Personal information - Name, background, study details, areas of interest, hobbies, strengths and weaknesses, role model and future ambition -Role Play- Presentation on a given topic- Group Discussion skills- fundamentals of GD.

**TOTAL PERIODS 45**

## COURSE OUTCOMES

Upon the completion of the course, students will be able to

- use suitable vocabulary and grammar with confidence and express their ideas both in speech and writing.
- listen and comprehend classroom lectures, short talks and conversations.
- read, interpret and analyze a given text effectively, and use cohesive devices in spoken and written English.
- understand English and converse effectively.
- write flawless sentences, essays and letters.

## TEXT BOOK

1. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi. 2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai.2011.

## 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. 2001.
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi, 2001.

Mapping of Course Outcomes with Programme Outcomes														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	-	2	2	1	-	-
CO2	-	-	-	-	2	3	2	3	1	3	1	-	-	-
CO3	-	-	-	3	-	2	-	2	2	2	2	2	-	-
CO4	-	-	-	-	-	2	2	2	1	3	1	1	-	-
CO5	-	-	-	2	-	-	-	3	3	-	3	1	-	-



**OBJECTIVES**

To enable students to

- understand the concepts of Eigen values and Eigen vectors of real matrices and its applications in the process of diagonalization of real symmetric matrices.
- study applications of Rolle's and Mean Value Theorems and also to understand the concept of maxima and minima using derivatives.
- learn the concept of partial differentiation and its applications to maxima and minima of functions of two or more variables.
- develop a thorough knowledge of definite and indefinite integrals
- learn the concepts of multiple integrals and their applications

**15****UNIT I MATRICES**

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

**UNIT II DIFFERENTIAL CALCULUS****15**

Limit – Continuity, properties of limit and classification of discontinuities - Simple problems. Differentiation – Standard forms, Successive differentiation and Leibnitz theorem. Mean value theorem – Rolle's theorem – maxima, minima using first and second derivative tests.

**UNIT III FUNCTIONS OF SEVERAL VARIABLES****15**

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of Implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

**UNIT IV INTEGRAL CALCULUS****15**

Indefinite and definite integrals - Properties of integrals, Integration of simple function. Methods of Integration – Integration by parts – Reduction formulae involving exponential and trigonometric functions, Bernoulli's formula.

**UNIT V MULTIPLE INTEGRALS****15**

Double integration – Cartesian and polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

**TOTAL : 75 PERIODS**

## OUTCOMES

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

- determine eigen values and eigen vectors and diagonalize real symmetric matrices.
- classify various types of functions involved in engineering fields, their differentiation techniques and applications
- find partial derivatives and apply the same to find maxima and minima of two or more variables
- implement different methods of integration used in engineering problems
- execute suitable integration techniques to calculate surface areas and volumes.

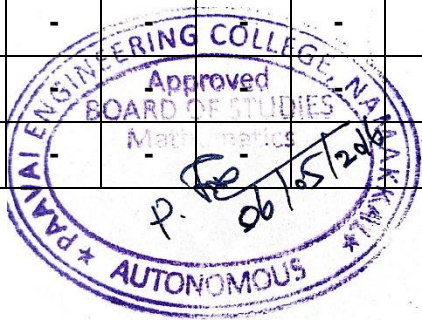
## TEXT BOOKS

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

## REFERENCES

1. Erwin Kreyszig., “Advanced Engineering Mathematics” 10th 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”, 3rd Edition, Pearson Education,(2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).

<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak</b>														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



**COURSE OBJECTIVES**

- To understand the basic concepts in properties of matter.
- To acquire the knowledge in the areas of acoustics, ultrasonics and applications.
- To describe the dual nature of matter, x-ray scattering and applications of Schrodinger wave equation.
- To categorize the basics knowledge in interference, laser and fibre optics.
- To identify the different crystal structures and crystal growth techniques.

**UNIT I            PROPERTIES OF MATTER****9**

Introduction- Elasticity–Hooke’s law – relationship between three module of elasticity (qualitative) – stress –strain diagram – Poisson’s ratio –factors affecting elasticity. Bending moment – Young’s modulus: theory and experiment (uniform and non-uniform bending) – I-shaped girders – twisting couple of a wire or cylinder -torsion pendulum –determination of rigidity modulus.

**UNIT II            ACOUSTICS AND ULTRASONICS****9****Acoustics:**

Introduction- classification of sound –characteristics of musical sound– decibel –Weber- Fechner law - absorption co-efficient– reverberation – reverberation time – Sabine’s formula: growth and decay of sound energy (qualitative) – factors affecting acoustics of buildings and their remedies.

**Ultrasonics:**

Introduction-properties-production: magnetostriction and piezoelectric methods–detection of ultrasonic waves Kundt’s tube–determination of velocity of sound in liquid (acoustic grating). Application: SONAR. Non destructive testing – pulse echo system through transmission and reflection modes.

**UNIT III            MODERN PHYSICS****9**

Black body radiation – Planck’s theory (derivation) – deduction of Wien’s displacement law and Rayleigh Jean’s law. X-ray scattering: Compton effect –derivation –experimental verification. Matter waves–de-Broglie wavelength– Schrodinger’s time independent and time dependent equations - physical significance of the wave function. Applications: particle in one dimensional box-degenerate and non-degenerate states.

**UNIT IV            APPLIED OPTICS****9**

**Interference:** Michelson interferometer: construction and working. Applications: determination of wave length and thickness. Air wedge –theory and determination of thickness of a thin wire. (Qualitative treatment only)

**Laser:** properties–pumping methods -Einstein coefficients.Types:CO<sub>2</sub>, Nd-YAG and semiconductor

lasers (hetero junction) –uses.

**Optical fiber:** Principle and propagation of light through optical fiber– expressions for numerical aperture and acceptance angle–types of optical fibers– fiber optical communication system (block diagram) – endoscope – Fiber optic sensors: temperature and displacement sensors.

## **UNIT V            CRYSTAL PHYSICS**

**9**

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 (Qualitative treatment only).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. S.Vadivel and A.Pannerselvam, Engineering Physics, Jaitech Publications, 2015 (Revised edition).
2. A.Marikani, Engineering Physics, PHI, New Delhi, 2013.

## **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.

	<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>													
COs		Programmes Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	3	-	3	-	-	2	-	-
CO2	-	-	2	-	-	2	-	-	-	-	2	2	-	-
CO3	3	-	2	3	-	2	-	-	-	-	2	2	-	-
CO4	3	3	2	-	-	2	3	-	3	-	2	2	-	-
CO5	3	3	-	-	3	-	-	-	3	-	2	-	-	-





**COURSE OBJECTIVES**

- To know the need of polymers for industrial application.
- To understand the interrelation of heat and work within the confines of the laws of thermodynamics.
- To understand the basic concepts of instrumentation, data acquisition, data processing and the principles of analytical techniques and their applications.
- To predict the number of stable phases that may exist in equilibrium for a particular 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- $\text{CaCO}_3$ 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.

**UNIT V      NANOCHEMISTRY****9**

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**

- To select a polymeric material for a specific engineering application.
- To know the basic concepts of internal energy, enthalpy, entropy, free energy and chemical potential.
- To gain practical experience with chemical process equipment as well as to analyze and interpret data.
- To classify the states in a equilibrium in a heterogeneous system. To become familiar with the types, the heat treatment and properties of alloys .
- To 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).

**REFERENCE BOOKS**

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

3. B.K. Sharma, "Engineering Chemistry", Krishna Prakasam Media (P) Ltd., Meerut (2001).
4. Bahl B.S., Tuli G.D. and ArunBahl., Essential of Physical Chemistry, S.Chand& Co. Ltd., New Delhi. (2010).
5. Geoffrey A ozin, Andre Arsonault and Ludovicacademariti. "A chemical approach to nanomaterials", Chemistry for Royal society Revised edition London, (2009).

<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	2	-	2	-	-	1	-	-
CO2	-	-	2	-	-	1	-	-	-	-	1	1	-	-
CO3	2	-	2	2	-	1	-	-	-	-	1	2	-	-
CO4	2	-	2	-	-	1	2	-	-	-	1	1	-	-
CO5	-	1	-	-	-	1	2	-	2	-	1	-	-	-



**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
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections

**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, Epicycloid 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**

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.

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

14

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                    14**

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.

## **INTRODUCTION TO INTERSECTION OF SOLIDS (Not for Examination)                    5**

Introduction to intersection of surfaces – Line of intersection – Intersection of solids

**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
- draw projections and solids and development of surfaces
- prepare isometric and perspective sections of simple solids

### **TEXT BOOKS**

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

### **REFERENCES**

1. Gopalakrishnan 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”, New Age International (P) Limited, 2008.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

### **WEBLINKS**

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 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.

## CO - PO Mapping

<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO2	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO3	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO4	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO5	3	3	3	3	3	1	-	-	-	-	1	1	2	1



**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 ofSoftware – 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 (notdetailed 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”, Tata McGraw-Hill Publishing Company Limited, (2011).
5. Dromey R.G., “How to Solve it by Computer”, Pearson Education, Fifth Reprint, 2009.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	1	2	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	1	1	3
CO5	3	1	3	-	-	2	-	-	-	-	-	3	3	2





(COMMON TO ALL BRANCHES)

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

To enable the students to

- compile various experiments to enhance the basic understanding and concepts of physics in properties of matter, sound, light, thermal physics and electricity.
- learn the concept of ultrasonic waves in liquid using ultrasonic interferometer.

**LIST OF EXPERIMENTS**

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

**COURSE OUTCOMES**

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

- apply Physics principles to evaluate mechanical, electrical, thermal and optical characteristics of materials.
- determine the velocity of ultrasonic waves, compressibility of the given liquid.

**CHEMISTRY LABORATORY-I****COURSE OBJECTIVES.**

To enable the students to

- analyze the hardness of water, impurities in water, water quality parameters and nature of chemicals in neutral medium.
- understand the concept of acids and bases, their importance in water.

**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 OUT COMES

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

- know the quality of water and chemical processes taking place in different medium.
- gain analytical skills on identification of parameters in water.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	3	-	2	-	-	-	-	-	-	-
CO2	2	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	2	-	2	-	-	-	-	-	-	-
CO4	3	2	-	-	3	-	-	-	-	-	-	-	-	-



**COURSE OBJECTIVES**

**To enable the students to**

- develop their knowledge in basic civil engineering practices such as plumbing, carpentry and its tool usages.
- practice some of mechanical basics such as welding, basic machining, sheet metal work, fitting.
- experience with basic electrical wiring circuits
- know about the electronic components, color coding signal generation, soldering practice..

**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 inhousehold 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 joiningcomponents. (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 signalparameter (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, students will be able to

- use the tools for plumbing and carpentry works
- prepare models by -welding, machining, sheet metal and fitting
- construct electrical wiring circuit and demonstrate practically
- analyse the signal generation, solder the electronic components based on the circuits

### **CO - PO Mapping**

<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>														
<b>COs</b>	<b>Programme Outcomes(POs)</b>													
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO 10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	2	2	2	2	2	-	-	-	1	-	-	1	2	3
<b>CO2</b>	2	2	2	2	2	-	-	-	1	-	-	1	2	3
<b>CO3</b>	2	2	2	2	2	-	-	-	1	-	-	1	2	3
<b>CO4</b>	2	2	2	2	2	-	-	-	1	-	-	1	2	3



**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 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 PERIODS: 30**

**Mapping of Course Outcomes with Programming Outcomes**  
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3



**COURSE OBJECTIVES****To enable students to**

- help the students of engineering and technology to enhance their ability to listen, read, write and speak English.
- comprehend and write essays and prepare short project reports related to their branches of specialization.
- enhance their ability to read and comprehend technical texts.
- make effective presentations on topics in engineering and technology.
- participate successfully in Group Discussions.

**UNIT I VOCABULARY & GRAMMAR****9**

General Vocabulary- use of articles- different forms of a word (noun, verb) - Collocations - Fixed Expressions (adhere to, on the part of etc.)- Phrasal verbs - Compound nouns - Numerical Expressions - Direct and Indirect Speech - use of discourse markers - if conditionals- Cause and Effect expressions - Editing - Wh questions - One word substitution.

**UNIT II LISTENING****9**

Listening to news and announcements, listening to telephone conversation- Listening to model interviews / TED Talks- Interview Techniques.

**UNIT III READING****9**

Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading- Reading articles in newspapers, journals, manuals- critical reading.

**UNIT IV WRITING****9**

Writing- Extended Definitions - Checklist, Recommendations -Formal letters- complaint letters, invitation letters- requisition letters - Writing a job application - Resume (Letter and Email format) - Technical Report Writing - (Industrial Visit, Accident, Feasibility & Project Reports) - Paragraph writing, Essay writing.

**UNIT V SPEAKING****9**

Syllable - Stress- Intonation- Silent Letters - Presentations on a given topic - Mini presentation in small groups- group discussions- mock interviews.



## COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Speak with clarity and confidence.
- Read, interpret and analyse a given text.
- Write comprehensive reports, job applications and draft effective e-mails.
- Make effective presentations using power point.
- Participate successfully in Group Discussions.

## TEXT BOOKS

1. Mahalakshmi.S.N. English Workbook for Engineers, V.K. Publications, Sivakasi.2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai.2011.

## 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.

Mapping of Course Outcomes with Programme Outcomes														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	-	2	2	1	-	-
CO2	-	-	2	-	-	3	2	3	1	3	-	-	-	-
CO3	-	-	-	3	-	2	-	2	2	2	2	2	-	-
CO4	-	-	-	-	-	2	2	2	1	3	-	-	-	-
CO5	-	-	-	2	-	-	-	3	3	3	3	-	-	-



**DIFFERENTIAL EQUATIONS AND COMPLEX  
MA 16201 ANALYSIS  
(Common to all branches)**

**3 2 0 4**

**OBJECTIVES**

To enable students to

- discuss a wide range of basic mathematical methods for solving different types of problems arising in the fields of Science, Mathematics and Engineering.
- acquire sound knowledge in solving ordinary differential equations that model engineering problems.
- understand the concept of vector calculus, which is applied in all engineering disciplines.
- know the standard techniques of complex variable theory.
- 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 – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic

**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 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: 75 PERIODS**

## 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).

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO4	3	2	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	3	-	-	-	-	-	-	-	3	3	3

## COURSE OBJECTIVES

To enable the students to

- gain knowledge in the conduction properties of metals.
- acquire better understanding of carrier concentration and its variation with temperature in different types of semiconductors.
- explore the different kinds of polarization mechanisms and applications of dielectric materials.
- recognize the different types of magnetic materials and uses.
- learn the different types of optical materials and data storage techniques.

## UNIT I CONDUCTING MATERIALS 9

Introduction: types of conducting materials- classical free electron theory: postulates- derivation of electrical conductivity. Thermal conductivity- derivation. Wiedemann-Franz law and its verification- merits and demerits of classical free electron theory. Quantum free electron theory: Fermi-Dirac distribution function and its variation with temperature – density of energy states –carrier concentration in metals- average energy of electrons at 0K.

## UNIT II SEMICONDUCTING MATERIALS 9

**Introduction:** direct and indirect band gap semiconductors- origin of band gap in solids (qualitative treatment only) - concept of effective mass of an electron and hole. Intrinsic semiconductor: expressions for density of electrons, holes, carrier concentration, Fermi level, electrical conductivity and band gap. **Extrinsic semiconductors:** derivations for charge carrier in n-type and p-type semiconductors – variation of Fermi level with temperature and impurity concentration. Hall effect– theory and experimental determination of Hall coefficient – Applications.

## UNIT III DIELECTRIC MATERIALS 9

Introduction: fundamental definitions in dielectrics – expressions for electronic and ionic polarization mechanisms- orientation polarization (qualitative) – space charge polarization – Langevin – Debye equation – frequency and temperature effects on polarization. Internal field – expression for internal field (cubic structure) –Clausius–Mosotti equation–significance–dielectric loss –dielectric breakdown – various breakdown mechanisms with characteristics – applications of dielectric materials.

## UNIT IV MAGNETIC MATERIALS 9

**Introduction:** basic definitions - origin of magnetic moment-Bohr magneton- magnetic materials: classification of dia, para, ferro magnetic materials. Ferro magnetic domains- energies involved in the growth of magnetic domains- hysteresis-explanation of hysteresis curve based on domain theory- soft and hard magnetic materials-ferrites - applications. Principle -Magnetoresistance (MR) and giant magnetoresistance (GMR).

## **UNIT V          OPTICAL PROPERTIES OF MATERIALS**

**9**

Classification of optical materials – absorption in metals, insulators & semiconductors -LED"s: Organic LED"s – Principle - polymer light emitting materials and plasma light emitting devices – LCD"s: properties –twisted neamatic display – dynamic scattering display - comparison between LED and LCD. Optical data storage techniques: DVD, blue –ray disc and holographic data storage.

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES**

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

- select the metals required for specific applications in the area of engineering and technology.
- distinguish between different types of semiconductor and determination of Hall co-efficient.
- classify different kinds of polarization mechanism and uses.
- identify different magnetic materials and giant magneto resistance.
- understand the different types of optical materials and applications.

### **TEXT BOOKS**

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

### **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. M.Arumugam, Materials Science. Anuradha publishers, 2010.
4. S.O.Pillai, Solid State Physics. New Age International(P) Ltd., publishers, 2009
5. T.Pradeep, "A Text Book of Nanoscience and Nanotechnology", Tata McGraw Hill, New Delhi,2012.

<b>Mapping of Course Outcomes with Programme Outcomes</b> <b>(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	-	-	2	-	-	-	-	-	-	-
CO2	3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	1	-	-	1	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	1	-	-	-	-	-	-	-	-	-	-



**COURSE OBJECTIVES**

To enable the students to

- study structural and functional properties of carbohydrates, proteins, lipids and nucleic acidsTo
- emphasize the role of the biomolecules by providing basic information on metabolic diseases and disorders.
- recognize the importance of proteins for building block elements.
- describe the functions of fats and amino acids against germ fighting.
- understand the enzymatic action against bacteria.

**UNIT I INTRODUCTION TO BIOCHEMISTRY****9**

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson - Hasselbalch equation, physiological buffers in living systems, Energy in living organism.

Properties of water and their applications in biological systems. Introduction to Biomolecules, Biological membrane, Clinical application of Electrolytes and radioisotopes.

**UNIT II CARBOHYDRATES****9**

Classification of carbohydrates - mono, di, oligo and polysaccharides. Structure, physical and chemical properties of carbohydrates Isomerism, racemisation and mutarotation. Digestion and absorption of carbohydrates. Metabolic pathways and bioenergetics–Glycolysis, glycogenesis, glycogenolysis and its hormonal regulation. TCA cycle and electron transport chain. Oxidative phosphorylation. Biochemical aspect of Diabetes mellitus and Glycogen storage Disease.

**UNIT III LIPIDS****9**

Classification of lipids- simple, compound and derived lipids. Nomenclature of fatty acid, physical and chemical properties of fat..Metabolic pathways: synthesis and degradation of fatty acid (beta oxidation), hormonal regulation of fatty acid metabolism, ketogenesis, Biosynthesis of Cholesterol. Disorders of lipid metabolism.

**UNIT IV NUCLEIC ACID & PROTEIN****9**

Structure of purines and pyrimidines, nucleoside, nucleotide, DNA act as a genetic material, chargoffs rule. Watson and crick model of DNA. Structure of RNA and its type. Metabolism and Disorder of purines and pyrimidines nucleotide Classification, structure and properties of proteins, structural organization of proteins, classification and properties of amino acids. Separation of protein, Inborn Metabolic error of amino acid metabolism

**UNIT V ENZYME AND ITS CLINICAL APPLICATION****9**

Classification of enzymes, apoenzyme, coenzyme, holoenzyme and cofactors. Kinetics of enzymes - Michaelis-Menten equation. Factors affecting enzymatic activity: temperature, pH, substrate concentration and enzyme concentration. Inhibitors of enzyme action: Competitive, non-competitive, irreversible. Enzyme: Mode of action, allosteric and covalent regulation. Clinical enzymology. Measurement of enzyme activity and interpretation of units.

**TOTAL: 45 PERIODS****OUTCOMES:****Upon Completion of the Course the students will be able to**

- explain the fundamentals of biochemistry Clinical application of Biochemistry
- recognize the importance of proteins for building block elements.
- describe the functions of fats and amino acids against germ fighting.
- understand the enzymatic action against bacteria.
- understand the enzymatic action against bacteria.

**TEXT BOOKS:**

1. RAFI MD —Text book of biochemistry for Medical Student I Second Edition, University Press, 2014.
2. David.W.Martin, Peter.A.Mayes, Victor. W.Rodwell, —Harper's Review of Biochemistry, LANGE Medical Publications, 1981.

**REFERENCES:**

1. Keith Wilson & John Walker, —Practical Biochemistry - Principles & Techniques, Oxford University Press, 2009.
2. Pamela.C.Champe & Richard.A.Harvey, —Lippincott Biochemistry Lippincott's Illustrated Reviews, Raven publishers, 1994.

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	-	3	3	3	3	3	3	3	-	3	-	3	-
CO 2	2	-	2	2	-	-	-	-	2	-	-	3	2	3
CO 3	3	-	3	3	3	3	3	3	3	-	-	3	3	-
CO 4	2	-	2	2	2	2	3	3	3	3	3	3	3	3
CO4	3	-	3	3	3	3	3	3	3	-	3	-	3	-



## **COURSE OBJECTIVES**

To enable the students to

- be exposed to the fundamental principles of mechanics
- learn the effect of force on bodies
- understand the properties of different surface areas and solids
- learn basics of fluid mechanics and relate it to bio-fluids
- understand the action of friction and motion

## **UNIT I      BASICS AND STATICS OF PARTICLES      9**

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space –Equivalent systems of forces – Principle of transmissibility.

## **UNIT II      EQUILIBRIUM OF RIGID BODIES      9**

Free body diagram – Types of supports – Action and reaction forces – Moments and Couples – Moment of a force about a point and about an axis - Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

## **UNIT III      MECHANICS OF SOLIDS      9**

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of rigid and non-rigid bodies -Centroids -Centroids of lines and areas -Rectangular, circular, triangular areas by integration – Polar moments of inertia of plane areas.

## **UNIT IV      BASICS OF MECHANICS OF FLUIDS      9**

Fluids – density – pressure – blood pressure and gravity – buoyancy – moments of force and stability – movement in water –Newton's laws of viscosity – Definitions and simple problems on Newtonian fluid, Non-Newtonian fluid, Euler equations and Navier Stoke's equations, Viscoelasticity, laminar flow and Turbulent flow.

## **UNIT V      DYNAMICS OF PARTICLES      9**

Displacements, Velocity and acceleration, their relationship – Relative motion – Newton's laws of motion Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction.

## **COURSE OUTCOMES**

Upon completion of this course the students will be able to

- use scalar and vector analytical techniques for analysing forces in statically determinate structures.
- understand the law of mechanics and various theorems. Apply the equilibrium concept to force systems of particle or solids in 2D and 3D
- apply the concepts of centroid or centre of gravity and moment of inertia for calculation.
- apply mathematical knowledge to predict the properties and characteristics of a fluid.
- solve problems using concepts of kinematics and kinetics of particles and analysis of results.

## **TEXT BOOKS**

1. Kottiswaran, N, “Engineering Mechanics – Statics and Dynamics”, Sri Balaji Publications, Erode 2010.
2. Dr. R. K. Bansal, A Text Book of Fluid Mechanics, Laxmi Publications (P) Ltd., New Delhi. 2016.

## **REFERENCES**

1. Palanichamy, M.S. and Nagan, S, “Engineering Mechanics – Statics and Dynamics”, Third Edition, Tata McGraw -Hill Publishing, New Delhi, 2004.
2. Beer, F.P and Johnston Jr. E.R., —Vector Mechanics for Engineers (In SI Units): Statics and Dynamics, 8th Edition, Tata McGraw-Hill Publishing Company, New Delhi 2004.
3. Hibbeler, R.C., “Engineering Mechanics”, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
4. A Textbook of Strength of Materials by R.K. Bansal, Laxmi Publications (P) Ltd., New Delhi 2018
5. Rajasekaran, S, Sankarasubramanian, G., “Fundamentals of Engineering Mechanics”, Vikas Publishing House Pvt. Ltd., (2000).

## **WEB LINKS**

1. <http://nptel.ac.in/courses/112103109/>
2. <http://nptel.ac.in/courses/122104015/7>
3. <https://www.youtube.com/watch?v=HEj-QIjWXgs>

### CO-PO Mapping

Mapping of Course Outcomes with Programme Outcomes(1/2/3indicatesstrengthofcorrelation) 3-Strong, 2-Medium, 1-Weak														
COs	ProgrammeOutcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO2	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	2	3



## COURSE OBJECTIVES

- To introduce electric circuits and its analysis
- To impart knowledge in solving circuits using network theorems.
- To introduce the phenomenon of resonance in coupled circuits.
- To analyze the transient response of circuits.
- To know the concepts of duality.

<b>UNIT I</b>	<b>BASIC CIRCUITS ANALYSIS</b>	<b>9</b>
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Ohm's Law – Kirchhoff's laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.

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**UNIT II      NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS** **9**

Network reduction: voltage and current division, source transformation – star delta conversion - Thevenin and Norton Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

## UNIT III      RESONANCE AND COUPLED CIRCUITS      9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits – Double tuned circuits.

## UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9

Transient response of RL, RC, RLC circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z, Y, h and ABCD parameters.

## UNIT V CONCEPTS OF DUALITY 9

Concept of duality, Dual network, Graphs of a network, Trees, twig, link and branches, Incidence matrix, Tieset matrix and cutset matrix of a graph, Inverse networks and equalizers - Applications.

**TOTAL: 45 PERIODS**

## COURSE OUTCOMES

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

- analyze electrical circuits
- apply circuit theorems
- analyze AC and DC Circuits
- design resonance circuits
- understand the concepts of Duality

## TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6<sup>th</sup> edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.
3. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2007.

## REFERENCES

1. M Russell, Mersereau and Joel R. Jackson, "Circuit Analysis- A System Approach", Pearson Education, 2007.
2. Chakrabati A, "Circuits Theory (Analysis and synthesis)", Dhanpath Rai & Sons, New Delhi, 1999.
3. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.
4. Robert L. Boylestad, "Experiments in Circuit Analysis to Accompany Introductory Circuit Analysis", Prentice Hall, 2000.

## WEB LINKS

1. <http://www.electronics-tutorials.ws/>
2. [www.electrical4u.com](http://www.electrical4u.com)
3. <http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/esc102/index.html>
4. [http://www.tina.com/1200\\_problems\\_and\\_examples](http://www.tina.com/1200_problems_and_examples)
5. [www.circuits-magic.com](http://www.circuits-magic.com)
6. [www.zen22142.zen.co.uk](http://www.zen22142.zen.co.uk)

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes(POs)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO4	3	3	3	-	-	-	-	-	-	-	3	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	3	-	3	3



**COURSE OBJECTIVES:****To enable the students to**

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

**UNIT I FORMAL & INFORMAL CONVERSATION PRACTICE****9**

Role Play conversations - with family members, neighbors, friends, relatives etc. Simple expressions - agreeing/disagreeing, persuading, wishing, consoling, advising, arguing, expressing opinion 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****9**

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****9**

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****9**

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 VI INTERVIEW SKILLS

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:

- listen and comprehend classroom lectures, short talks and conversations.
- read, interpret and analyze a given text effectively, and use cohesive devices in spoken and written English.
- understand English and converse effectively.
- write flawless sentences, Job application.

### TEXT BOOKS:

- Kalpana.V&Co.,“Communication Skills Laboratory Manual”, Vijay Nicole Imprints Pvt. Limited, Chennai.2013
- Rizvi,Ashraf. M.Effective Technical Communication.TataMcGraw-Hill, NewDelhi.2005.

### REFERENCE BOOKS:

- Anderson,P.V.“Technical Communication”,Thomson Edition,NewDelhi,2007.
- Kumar Sanjay, PushpLata,“Communication Skills (With CD)”,Oxford University Press, NewDelhi.2011

	Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	3	3	1	-	-
CO2	-	-	-	2	3	-	1	2	-	3	3	1	-	-
CO3	-	-	-	-	-	-	-	-	-	3	1	1	-	-
CO4	-	-	-	-	3	1	1	-	2	3	3	1	-	-



**COURSE OBJECTIVES:**

To enable the students to

- Estimation and quantification of biomolecules.
- Separation of macromolecules.
- Estimation and interpretation of biochemical parameter.
- Familiar with separation technology of proteins and amino acids.

**LIST OF EXPERIMENTS:**

1. General guidelines for working and functional component of biochemistry lab
2. Preparation of solutions: 1) percentage solutions, 2) molar solutions, 3) normal solutions
3. Standardization of pH meter, preparation of buffers, emulsions.
4. Spectroscopy: Determination of absorption maxima ( $\lambda_{\text{max}}$ ) of a given solution
5. General tests for carbohydrates, proteins and lipids.
6. Identification of Blood Collection Tubes and Phlebotomy equipments
7. Preparation of serum and plasma from blood.
8. Estimation of Haemoglobin 1. Estimation of blood glucose.
9. Estimation of creatinine.
10. Estimation of urea.
11. Estimation of Uric acid
12. Estimation of cholesterol 14. Assay of SGOT/SGPT.
13. ELISA test
14. Separation of proteins by SDS electrophoresis(Demo)
15. Separation of amino acids by thin layer chromatography (Demo).

**TOTAL PERIODS 60**

**COURSE OUTCOMES:**

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

- understand the Biochemistry laboratory functional components
- understand the basics principle of preparation of buffers.
- have a sound knowledge of qualitative test of different biomolecules.
- understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	-	1	3	2	2	2	1	-	-	-
CO2	2	1	-	1	2	1	2	1	1	2	2	-	-	-
CO3	1	2	-	2	1	2	1	-	-	1	2	-	-	-
CO4	2	1	2	-	1	-	2	2	1	-	2	-	-	-



CO-PO MAPPING														
Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
CO's	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	1	2
CO2	3	3	3	3	-	-	-	-	-	-	-	3	1	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	1	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	1	2