PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637018
(AUTONOMOUS)
REGULATIONS 2019
CHOICE BASED CREDIT SYSTEM
B.E. – MECHANICAL ENGINEERING

CURRICULUM

(Applicable to the candidates admitted during the academic year 2020-2021 onwards)

SEMESTER I

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	HS	EN20101	English Communication Skills I	3	0	0	3
2	BS	MA20101	Matrices and Calculus	3	1	0	4
3	BS	PH20101	Engineering Physics	3	0	0	3
4	BS	CH20101	Engineering Chemistry	3	0	0	3
5	ES	EE20101	Basic Electrical Engineering	3	0	0	3
6	ES	ME20101	Engineering Graphics	2	1	0	3
Practical							
7	BS	CH20102	Chemistry Laboratory	0	0	2	1
8	ES	GE20101	Engineering Practices Laboratory	0	0	4	2
			Total	**17**	**2**	**6**	**22**

SEMESTER II

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	HS	EN20201	English Communication Skills II	3	0	0	3
2	BS	MA20201	Complex Variables and Differential Equations	3	1	0	4
3	BS	PH20203	Material Science	3	0	0	3
4	ES	CS20201	Programming in Python	3	0	0	3
5	ES	ME20202	Engineering Mechanics	3	1	0	4
6	MC	MC20201	Environmental Science and Engineering	3	0	0	0
Practical							
7	ES	CS20203	Programming in Python Laboratory	0	0	2	1
8	BS	PH20205	Physics Laboratory	0	0	2	1
			Total	**18**	**2**	**4**	**19**

mech.

EN20101 **ENGLISH COMMUNICATION SKILLS I** **3 0 0 3**

(COMMON TO ALL BRANCHES)

COURSEOBJECTIVES

To enable students to

- impart knowledge about the significance of vocabulary and syntax.
- develop a strong base in the use of English language.
- enrich the reading skills of the students so as to enable them to communicate with confidence in English.
- enhance their basic speaking skills in delivering impromptu talks and participating in conversations with confidence.
- draft effective essays and emails for effective communication.

UNIT I **9**

Language focus - Word Formation, Prefix and suffix, Synonyms, Antonyms; Listening and transferring of information; Reading - Sub-skills of Reading, Skimming, Scanning, inferring; Writing –Defining, Describing gadgets, Process describing, providing examples or evidence; Speaking - Me Chart - personal information name, background, study details, areas of interest- speaking about one's hobbies, strengths and weaknesses, role model and future ambition.

UNIT II **9**

Language focus - Spelling – Homophones - Homonyms - Word used as Nouns and Verbs - Comparative Adjectives; Listening to dialogues; Reading short passages and answering multiple choice and open-ended questions; Writing - E-Mails, Letter inviting delegates, Accepting, Declining; Speaking - Simple Expressions.

UNIT III **9**

Language focus - Phrasal verbs - Acronyms - Abbreviations - Tenses; Listening to informal conversation; Reading - Note Making, Jumbled Sentences, Writing - Use of Cohesive devices and reference words - Paragraph Writing - compare and contrast; Speaking - Discourse Markers, Role play.

UNIT IV **9**

Language focus - Cause and Effect Expressions - Subject Verb Agreement - Wh questions - Yes or No questions - Listening to short talks and answering questions; Reading - developing hints, - Writing - Instructions, Minutes of meeting , Speaking - Narration of a story, Narrating an incident.

UNIT V **9**

Language focus - Articles - Sentence Structures - Single line definition; Listening - Understanding the structure of conversations; Reading - Interpreting visual information - Flow Chart, Pie Chart, Bar Chart and Tabular column; Speaking – Presentation Skills - Presentations on a given topic.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- develop vocabulary and grammar and express their ideas both in speech and writing.
- listen and comprehend classroom lectures, short talks and conversations.
- interpret and analyze a given text effectively and use cohesive devices in written English.
- communicate appropriately and present on different topics.
- write minutes, essays and letters without errors.

TEXT BOOKS

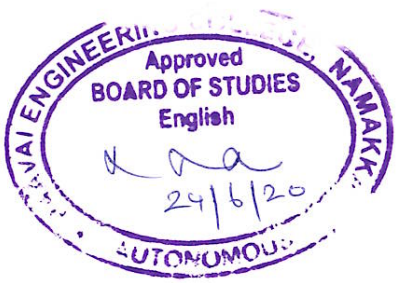
1. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi.2017
2. N P Sudharshana, C.Savitha. English Technical Communication. Cambridge University Press India Pvt.Ltd, New Delhi.2016.

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.

CO/PO Mapping
(3/2/1 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	-	1	1	-	-	3	2	-	-	-	1	2	2
CO2	-	-	2	-	2	3	-	3	2	-	-	-	2	2
CO3	-	-	-	-	-	-	-	1	-	3	-	2	-	2
CO4	-	-	3	2	1	-	3	-	-	3	-	-	2	2
CO5	-	-	-	3	2	3	-	-	1	3	2	-	2	3



MECH

MA20101 **MATRICES AND CALCULUS** **3 1 0 4**

(COMMON TO ALL BRANCHES)

OBJECTIVES

To enable the 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

UNIT I MATRICES **12**

Characteristic equation - Eigenvalues and Eigenvectors of a real matrix , Properties ; Statement and applications of Cayley-Hamilton theorem ; Diagonalisation by Similarity and Orthogonal transformation ; Quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS **12**

Limits and Continuity, properties of limit and classification of discontinuities ; Tangent problems ; Differentiation - Standard forms, Successive differentiation and Leibnitz theorem , Mean value theorem , Rolle's theorem, Maxima and Minima, Concavity.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **12**

Partial derivatives ; Euler's theorem for homogenous functions ; Total derivatives ; Differentiation of implicit functions - Jacobians , Taylor's expansion , Maxima and Minima , Method of Lagrangian multipliers.

UNIT IV INTEGRAL CALCULUS **12**

Area Problem - Indefinite and definite integrals ; Properties of integrals ; Methods of integration - Substitution method, Integration by parts, Bernoulli's formula ; Reduction formulae involving exponential and trigonometric functions.

UNIT V MULTIPLE INTEGRALS **12**

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

TOTAL PERIODS: 60

OUTCOMES

At the end of the 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.

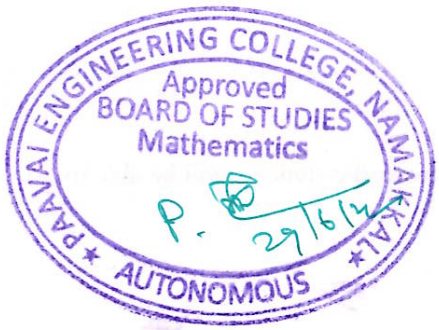
TEXT BOOKS

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

REFERENCE BOOKS

1. James Stewart, "Calculus ", 8th Edition, Cengage Learning, USA 2015 reprint.
2. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th Edition, Wiley Publications.
3. Dass, H.K., and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Ltd.,(2011).
4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,(2012).
5. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2008).

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 1 1	PO 12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	2	3



MECH

PH20101 **ENGINEERING PHYSICS** **3 0 0 3**

(COMMON TO ALL BRANCHES)

COURSE OBJECTIVES

To enable the students to

- understand the basic concepts of properties of matter.
- acquire the knowledge in the areas of ultrasonics and its applications.
- realize the dual nature of matter and applications of Schrodinger wave equation.
- categorize the types of laser and fiber optics.
- identify the different types of crystal structures and crystal growth techniques.

UNIT I PROPERTIES OF MATTER **9**

Elasticity: Hooke's Law - Stress - Strain Diagram; Young's modulus: theory and experiment (uniform and non-uniform bending) ; Twisting couple on a cylinder- Torsional pendulum - Rigidity modulus and moment of inertia.

Viscosity: Co-efficient of viscosity and its dimensions - Rate of flow of liquid in a capillary tube - Poiseuilles' formula - Experiment to determine co-efficient of viscosity of a liquid - Applications of viscosity.

UNIT II ULTRASONICS **9**

Classification of Sound waves ; Properties - Production of ultrasonic waves- Magnetostriction oscillator and piezoelectric oscillator ; Determination of velocity of sound in liquid using acoustic grating ; SONAR; Non destructive testing - Pulse echo system ; Industrial Applications -Welding, drilling and cutting ; Medical Applications - Sonogram.

UNIT III MODERN PHYSICS **9**

Black body radiation - Planck's theory (derivation) ; Compton effect (derivation) ; Matter waves - de-Broglie wavelength ; Wave function - Physical significance of the wave function ; Schrodinger's time independent and time dependent equations - Applications: particle in one dimensional box-degenerate and non-degenerate states.

UNIT IV APPLIED OPTICS **9**

Laser: Characteristics of laser - Stimulated absorption, spontaneous emission and stimulated emission - Population inversion ; Pumping methods ; Types of laser - Nd-YAG, CO_2 and semiconductor lasers (hetero junction) - Applications.

Optical fiber: Principle, propagation of light through optical fiber - expressions for numerical aperture and acceptance angle; Types of optical fibers; Fiber optical communication system (block diagram); Applications.

UNIT V CRYSTAL PHYSICS **9**

Crystalline solids and amorphous solids; Lattice - Unit cell - Crystal system - Bravais lattices; Lattice planes - Miller indices - Derivation of inter-planar spacing in cubic lattice; Calculation of number of

atoms per unit cell , atomic radius , coordination number and packing factor for SC, BCC, FCC and HCP structures ; Crystal Growth Techniques - Bridgman and Czochralski techniques.

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- understand the elastic properties of the materials.
- apply the fundamental knowledge of ultrasonics in engineering and medical field.
- predict the dual nature of matter, radiation and the application of wave nature of particles.
- associate the propagation of light concept for real time applications.
- categorize the basics of crystals, its structures and different crystal growth techniques.

TEXT BOOKS

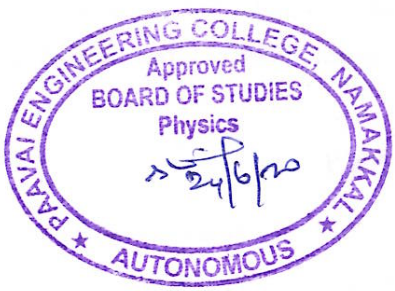
1. R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017.
2. Rajagopal, K, Engineering Physics, PHI learning Private Limited, 2015.

REFERENCE BOOKS

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physicsl. Wiley, 2020.
2. Avadhanulu M.N. & Murthy, Arun T.V.S, A Textbook of Engineering Physics, Volume-I, S.Chand and Company Limited, 2018.
3. M. Arumugam, Engineering Physics, Anuradha Publications, 2014.
4. V.Rajendran, Engineering Physics, Tata McGraw-Hill, New Delhi, 2014.
5. P K Palanisamy, Engineering Physics, 4th Edition, SciTech Publications, 2014.
6. A.Marikani, Engineering Physics, PHI, New Delhi, 2013.

CO/PO Mapping
(3/2/1 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	3	2	-	-	-	3	1	-	-	-	2	-	-
CO2	2	3	3	-	-	-	3	1	-	-	-	2	-	-
CO3	-	2	2	-	-	-	2	1	-	-	-	2	-	-
CO4	3	3	3	-	-	-	3	2	-	-	-	3	-	-
CO5	2	3	3	-	-	-	3	1	-	-	-	2	-	-



MECH

CH20101 **ENGINEERING CHEMISTRY** **3 0 0 3**

(Common to all B.E./ B.Tech Programmes)

COURSE OBJECTIVES

To enable the students to

- make students conversant with water quality requirements and treatment methods.
- understand the need of adsorption process in surface chemistry.
- acquire basic knowledge of phase rule and significance of alloys.
- relate appropriate laws of thermodynamics in heat transfer process.
- acquaint with the fundamentals of nanomaterials, preparation and its processing.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water –types –expression of hardness –units –estimation of hardness of water by EDTA–boiler troubles (scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion) –boiler feed water –Treatments-Internal treatment (phosphate and calgon conditioning) external treatment –Ion exchange process–desalination-Reverse Osmosis- Disinfection-Break point chlorination.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption –adsorption of gases on solids –adsorption of solute from solutions – adsorption isotherms –Freundlich's adsorption isotherm –Langmuir's adsorption isotherm–applications of adsorption on pollution abatement.

Catalysis: Catalyst –types of catalysis-Homogenous and Heterogeneous –autocatalysis –catalytic poisoning and catalytic promoters –enzyme catalysis–Michaelis –Menten equation.

UNIT III 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, Zn-Mg system. Alloys: Introduction – Definition – properties of Alloys- Functions - Ferrous alloys- Nichrome and Stainless Steel- Heat treatment of steel: Non Ferrous alloys; Brass and Bronze.

UNIT IV CHEMICAL THERMODYNAMICS 9

Terminology of thermodynamics-First law- Second law: Entropy- Entropy change for a reversible and irreversible process; Free energy and work function: Helmholtz and Gibbs free energy functions- Criteria of spontaneity: Derivation of - Gibbs Helmholtz Equation -Maxwell Relations- Derivation of Vant Hoff Isotherm and Isochore.

UNIT V NANOMATERIALS 9

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties.Nanoscale materials properties and uses of nanocluster, rods, tubes (CNT) and wires. Preparation of nanoparticles- thermolysis, hydrothermal, solvothermal, Preparation of Carbon nanotube by chemical vapour deposition, laser ablation; applications of nanomaterials.

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- analyze the water quality parameters and treatment methods.
- employ the concepts of surface chemistry and its application in various fields
- differentiate the various states in a equilibrium on a heterogeneous system.
- interpret the thermodynamic laws in energy calculations.
- elaborate the importance and advancements of nanomaterials.

TEXT BOOKS

1. Jain P.C. and Jain. M., Engineering Chemistry, 17/e, 2014 DhanpatRai Publishing Company, New Delhi, Reprint 2017.
2. B.K. Sharma – "Industrial Chemistry", 11th ed., (2015), Goel Publication, Meerut.

REFERENCE BOOKS

1. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry,15/e2015 ,VishalPublishing Co., Meerut, Reprint 2017.
2. Atkins, P. and de Paula, J., Atkin's Physical Chemistry, 9th ed., Oxford Univ. Press,New Delhi. 2014.
3. Dara S.S. and Umare S.S., A text book of Engineering Chemistry,12/e,2014S.Chand and CompanyLimited, New Delhi,Reprint 2016.
4. Engineering Chemistry, Wiley India Editorial Team, Wiley Eastern Pub, New Delhi 2018.

CO/PO Mapping (3/2/1 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	-	-	3	2	-	-	-	-	2	-	-
CO2	1	2	2	1	-	1	-	-	-	-	-	-	-	-
CO3	2	2	3	2	-	1	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO5	1	1	2	-	2	1	-	-	-	-	-	1	-	-

MECH

EE20101 BASIC ELECTRICAL ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- analyze the various DC circuits and find the circuit parameters.
- introduce the AC fundamentals and three phase circuits.
- familiarize the various electrical machines and measuring instruments.
- study the basics of electrical wiring.
- learn the basics of electrical safety.

UNIT I DC CIRCUITS **9**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation ; Superposition, Thevenin and Norton Theorems.

UNIT II AC CIRCUITS **9**

Representation of sinusoidal waveform- peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance; Three- phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III FUNDAMENTALS OF ELECTRICAL MACHINES AND MEASURING INSTRUMENTS **9**

Construction, principle of operation, characteristic and application - single phase transformer, single phase induction motor, and DC Motor; Types of electrical measurement, Construction and operating principles - Moving coil and moving iron instruments (ammeters and voltmeters), dynamometer type watt meters and energy meters.

UNIT IV ELECTRICAL INSTALLATIONS AND WIRING **9**

Components of LT switchgear- Switch fuse unit (SFU), MCB, ELCB, types of wires and cables, systems of distribution of electrical energy, systems of wiring, choice of wiring systems, earthing; Batteries- Lead acid, Li-Ion.

UNIT V ELECTRICAL SAFETY PRACTICES AND STANDARDS **9**

Indian electricity act and rules- general safety requirements as per IE rules, electrical safety equipment's- electrical installation, ground clearance, section clearance, earthing, specifications, earth resistance, earth pit maintenance.

TOTAL PERIODS : 45

COURSE OUTCOMES

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

- implement the basic knowledge about DC Electric circuits.
- apply the knowledge of AC fundamentals and AC circuits.
- understand the operation of electrical machines and measuring instruments and their usage
- analyze various electrical components and perform electrical wiring.
- follow the Indian electricity rules and apply in electrical installations

TEXT BOOKS

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering" , Tata McGraw Hill, 2011.
2. J.B.Gupta, "Basic Electrical Engineering", S.K.Kataria & Sons, 2015

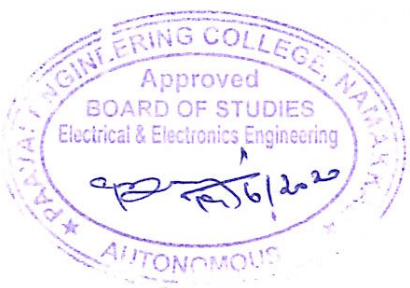
REFERENCES

1. V.K.Mehta and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand, 2014.
2. R.Muthusubramanian and S.Salivahanan, "Basic Electrical and Electronics Engineering Fundamentals", Tata McGraw Hill, 2010.
3. G.Nagarajan, " Basics of Electrical Electronics and Computer Engineering", A.R.Publications, 2001.
4. B.L.Theraja and A.K.Theraja, "Electrical Technology Volume 1", S.Chand, 2010
5. "The Electricity Rules", Universal's Law Publishing, 2011.

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

	PO's												PSO's	
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	-	-	3	3	-	-	-	3	-	3	3
CO2	3	3	3	-	3	-	-	-	3	-	3	-	3	3
CO3	3	3	3	-	3	-	-	-	3	-	3	-	3	3
CO4	3	3	3	-	3	-	-	-	3	-	3	-	3	3
CO5	3	3	3	-	-	-	-	-	3	-	3	-	3	3



MECH

ME20101 **ENGINEERING GRAPHICS** **2 1 0 3**
(COMMON TO ALL BRANCHES)

COURSE OBJECTIVES

To enable the students to

- familiarize concepts like dimensioning, conventions and standards related to Engineering drawing and imbibe knowledge on plane curves and projection of points
- understand on projection of lines and plane surfaces
- develop the visualization skills for understanding the projection of solids
- illustrate on sectioning of solids and development of surfaces for simple solids
- comprehend the orthographic projection and isometric view

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 PROJECTION OF POINTS** **8**

Basic Geometrical constructions, Curves used in Engineering Practices: Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method; Construction of cycloid; Construction of involutes of square and circle – Drawing of tangents and normal to the above curves; Introduction to Orthographic Projection - Projection of points in four quadrants.

UNIT II **PROJECTION OF LINES AND PLANES** **9**

Projection of straight lines (only First angle projections) inclined to both the HP & VP - Determination of true lengths and true inclinations by Change of Position method; Projection of Planes (Square, Pentagon, Hexagon and Circle) inclined to both the principal planes by rotating object method.

UNIT III **PROJECTION OF SOLIDS** **8**

Projection of simple solids like Square Prism, Pentagonal Prism, Hexagonal Prism, Square Pyramid, Pentagonal Pyramid, Hexagonal Pyramid, Cylinder and Cone when the axis is inclined to one of the principal planes (either horizontal or vertical plane).

UNIT IV **SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** **9**

Sectioning of Prisms (Square, Pentagon, Hexagon) and Pyramids (Square, Pentagon, Hexagon), Cylinder and Cone in simple vertical position when the cutting plane is inclined to one of the principal planes (HP & VP) and perpendicular to the other – obtaining true shape of section; Development of lateral surfaces of simple and sectioned solids mentioned above.

UNIT V **ORTHOGRAPHIC AND ISOMETRIC PROJETIONS** **9**

Representation of Three-dimensional objects – Need for importance of multiple views and their placement – First angle projection – layout views –developing visualization skills through multiple views from pictorial

views of objects; Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones; Conversion of Isometric view to orthographic projection.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- draw the basic curves and projection of points in four quadrants
- delineate the projections of straight lines and plane surfaces in given quadrant
- comprehend the projection of solids in various positions in first quadrant
- generate the sectioning of solids and development of surfaces
- interpret orthographic and isometric projection of simple solids

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", Maruthi Publishers, Chennai, 2018.

REFERENCES

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009
4. N.D. Bhatt., "Engineering Drawing", Charotar Publishing House Pvt Ltd, Fifty third edition, 2014

CO - PO Mapping

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	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	2	1	-	-	-	2	-	2	3	2
CO2	3	2	3	-	2	1	-	-	-	2	-	2	3	2
CO3	3	2	3	-	2	1	-	-	-	2	-	2	3	2
CO4	3	2	3	-	2	1	-	-	-	2	-	2	3	2
CO5	3	2	3	-	3	1	-	-	-	2	-	2	3	2

PAAVAI ENGINEERING COLLEGE
Approved
BOARD OF STUDIES
Mechanical Engineering
30/6/24
AUTONOMOUS

MECH

CH20102 **CHEMISTRY LABORATORY** **0 0 2 1**

(Common to all B.E./ B.Tech Programmes)

COURSE OBJECTIVES

To enable the students to

- acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- acquaint with the determination of molecular weight of a polymer
- explain the amount of corrosion in steel by instrumentation.
- elucidate the presence of metals in aqueous media by volumetric analysis.

LIST OF EXPERIMENTS (Any Eight Experiments)

1. Determination of DO content of water sample by Winkler's method.
2. Determination of Calcium and Magnesium in water sample by a titration method.
3. Determination of strength of given hydrochloric acid by using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Conductometric titration of strong acid Vs Strong base.
6. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
7. Estimation of copper content of the given solution by Iodometry
8. Estimation of iron content of the given solution using potentiometer.
9. Determination of molecular weight of polyvinyl alcohol using Oswald viscometer.
10. Corrosion experiment – weight loss method.

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- outfitted with hands-on experience in the quantitative analysis of water quality parameters.
- evaluate the weight loss in steel
- calculate the molecular weight of a given polymer.
- interpret the presence of metals in aqueous media

CO/PO Mapping
(3/2/1 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	3	2	2	1	-	-	-	2	-	-	-	1	2
CO2	2	3	2	2	1	-	-	-	2	-	-	-	1	2
CO3	1	2	1	2	1	-	-	-	1	-	-	-	1	1
CO4	2	1	1	1	2	-	-	-	2	-	-	-	1	2

PAAVAI ENGINEERING COLLEGE, NAMAKKAL * Approved BOARD OF STUDIES Chemistry 12/6/20 * AUTONOMOUS

GE20101 **ENGINEERING PRACTICES LABORATORY** **0 0 4 2**

(COMMON TO ALL BRANCHES)

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, carpentry components of residential, industrial buildings and 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.
  - Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY

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

II. MECHANICAL ENGINEERING PRACTICE

WELDING

- Preparation of arc welding of Butt joints, Lap joints and Tee-joints

BASIC MACHINING

- Simple Turning, Facing
- Drilling Practice

SHEET METAL WORK

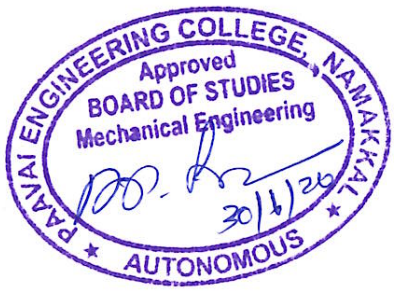
- Model making – Trays, Funnels, etc.
- Different type of joints.

FITTING

- Vee – Fitting models

DEMONSTRATION

- Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.



- Foundry operations like mould preparation for gear and step cone pulley.

TOTAL PERIODS: 30

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 and power factor in RLC Circuit.
4. Measurement of energy using single phase energy meter.
5. Earthing practices and measurement of earth resistance using megger.
6. Study of electrical equipment's 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 PERIODS: 30

COURSE OUTCOMES

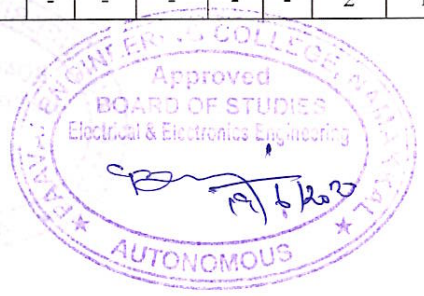
At the end of this course, students will be able to

- 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

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	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	-	-	-	-	-	-	2	1	2	2	3	2
CO2	3	1	-	-	-	-	-	-	2	1	2	2	3	2
CO3	3	1	-	-	-	-	-	-	2	1	2	2	3	2
CO4	3	1	-	-	-	-	-	-	2	1	2	2	3	2



EN20201 **ENGLISH COMMUNICATION SKILLS II (COMMON TO ALL BRANCHES)** **3 0 0 3**

COURSE OBJECTIVES

To enable students to

- enhance their ability to listen, read, write and speak English.
- comprehend and draft reports related to their branches of specialization.
- augment their ability to read and comprehend technical texts.
- equip the learners to make effective presentations on topics in engineering and technology.
- participate successfully in Group Discussions.

UNIT I **9**

Language focus - One word substitutions, Active Voice and Passive Voice; Listening to news and announcements; Reading - Developing analytical skills, Deductive and inductive reasoning; Writing - Check list, Recommendations; Speaking - Syllable, Stress, Intonation, Spot light.

UNIT II **9**

Language focus - Collocations - Fixed expressions (adhere to, on the part of etc.) - Idioms and Phrases; Listening to a telephone conversation; Reading - Extensive reading, Summarizing; Writing - Writing a job application – Resume, E-mail format; Speaking – Welcome address, Vote of thanks,.

UNIT III **9**

Language focus - Compound Nouns - Numerical Expression – Preposition; Listening to TED Talks ; Reading - critical reading, Reading articles in newspapers; Writing Technical Reports - Industrial Visit report, Accident report, Feasibility report, Survey report; Speaking - impromptu talks, Introduction of the chief guest, MC.

UNIT IV **9**

Language focus - Direct and Indirect Speech - If Conditionals - Purpose expression; Listening and viewing a model Group discussion; Reading - journals articles; Writing – writing review of a Book, film, product - Drafting project proposal, Letter writing – Business Correspondence - Calling for quotation, Placing orders, complaint ; Speaking -.Group Discussion skills - Initiating, turn taking and concluding the discussion.

UNIT V **9**

Language focus - Editing - Extended Definitions - Silent Letters; Listening to speech by Technologists; Reading - English Corner; Writing – Process description, Product description, Writing SOP, Essay writing; Speaking - Interview Techniques, mock interviews.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- converse with clarity and confidence.
- interpret and analyse a given text.
- draft comprehensive reports, job applications and e-mails.
- make effective presentations using power point.
- participate successfully in Group Discussions and interviews.

TEXT BOOKS

1. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi. 2017.
2. N P Sudharshana, C.Savitha. English Technical Communication. Cambridge University Press India Pvt.Ltd, New Delhi.2016.

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.

CO/PO Mapping
(3/2/1 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	-	-	3	2	-	-	-	2	2	-	2
CO2	-	-	-	-	-	-	1	2	-	3	1	-	-	2
CO3	2	1	1	2	2	3	1	-	2	3	-	-	3	3
CO4	3	3	2	-	-	3	2	2	3	3	1	2	3	3
CO5	1	-	3	-	2	3	-	-	-	-	1	3	-	3

MECH

MA20201 COMPLEX VARIABLES AND DIFFERENTIAL EQUATIONS 3 1 0 4

(COMMON TO ALL BRANCHES)

OBJECTIVES

To enable the students to

- gain knowledge on differentiation and integration of vector-valued functions
- understand the differential calculus of complex variables and analytic functions
- recognize the concept of complex integration applied in engineering disciplines
- develop analytical techniques to solve various higher order differential equations with constant and variable coefficients
- study Laplace Transforms of various standard functions, periodic functions and understand the techniques of solving ordinary differential equations using Laplace Transform methods.

UNIT I VECTOR CALCULUS 12

Gradient, Divergence and Curl , Directional derivative ; Irrotational and solenoidal vector fields ; Vector integration - Green's, Gauss divergence and Stokes' theorem , Statement, Verification and Simple applications.

UNIT II ANALYTIC FUNCTIONS 12

Functions of a complex variable ; Analytic functions - Statement of Cauchy-Riemann equations ; Harmonic functions and orthogonal properties , Harmonic conjugate , Construction of analytic functions ; Conformal mapping - w= z+c, cz, 1/z and Bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Complex integration - Statement and applications of Cauchy's integral theorem and Cauchy's integral formula ; Taylor and Laurent expansions ; Singular points - Residues , Residue theorem ; Contour integration - evaluation of circular and semicircular Contour.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12

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

UNIT V LAPLACE TRANSFORM 12

Laplace transform - Transform of elementary functions , Properties ; Transform of periodic functions ; Definition of Inverse Laplace transforms - Statement and applications of Convolution theorem ; Initial and Final value theorems ; Solution of linear ODE of second order with constant coefficients by Laplace transforms.

TOTAL PERIODS: 60

COURSE OUTCOMES

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

- familiarize with vector calculus concepts
- gain knowledge on the analytic functions and related concepts
- solve real definite integrals with the help of complex integration techniques
- solve higher order differential equations with constant and variable coefficients
- determine Laplace transforms of various functions and solve initial value problems using Laplace transforms.

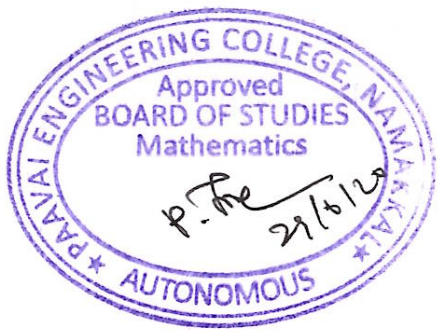
TEXT BOOKS

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

REFERENCE BOOKS

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 1 1	PO 12	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



MECH

PH20203 **MATERIAL SCIENCE** **3 0 0 3**

(COMMON TO AERO/AGRI/CIVIL/MECH/MCT)

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the conduction properties of metals.
- correlate better understanding the carrier concentration and its variations with temperature in an intrinsic semiconductor.
- familiarize the different types of magnetic materials, superconductivity materials and its applications.
- recognize properties of nanoparticles and its uses.
- learn the common characterization methods for the determination of structure of materials.

UNIT I CONDUCTING MATERIALS **9**

Conductors - Types of conducting materials ; Classical free electron theory of metals – Postulates; Derivation of electrical conductivity and thermal conductivity - Wiedemann-Franz law and its verifications - Lorentz number - Merits and demerits of classical free electron theory ; Quantum free electron theory - Fermi-Dirac distribution function - Effect of temperature on Fermi function ; Density of energy states-Carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS **9**

Types of semiconductors - elemental and compound semiconductor ; Intrinsic semiconductor: Expressions for density of electrons, holes and carrier concentration - Fermi level -Variation of Fermi level with temperature ; Electrical conductivity - Band gap determination ; Extrinsic semiconductors: n-type and p-type semiconductors (Qualitative) ; Hall effect - Determination of Hall coefficient - Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS **9**

Magnetic Materials: Domain theory of ferromagnetism; Hysteresis; Soft and hard magnetic materials; Ferrites - Applications.

Superconductivity: properties -Types of super conductors; BCS theory of superconductivity; Applications - SQUID, cryotron, magnetic levitation.

UNIT IV MODERN ENGINEERING MATERIALS **9**

Metallic glasses - preparation, properties, Applications; Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA- applications.

Nanomaterials - Classification of nanomaterials-properties of nanomaterials; Top-down and bottom up process; synthesis- Ball Milling - Co-precipitation and Electrodeposition - Applications.

UNIT V MATERIALS CHARACTERIZATION **9**

Thermogravimetric Analysis (TGA) - Differential Thermal Analysis (DTA) - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM)- Scanning Tunneling Microscope (STM).

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- select the metals required for specific applications in the field of engineering and technology.
- discuss basic idea of doping and determinations of Hall co-efficient.
- apply the knowledge of ferromagnetic materials and superconductivity properties of materials.
- illustrate the process involved in material synthesis and its real time applications.
- interpret the morphology and size distribution of the sample by electron microscopy.

TEXT BOOKS

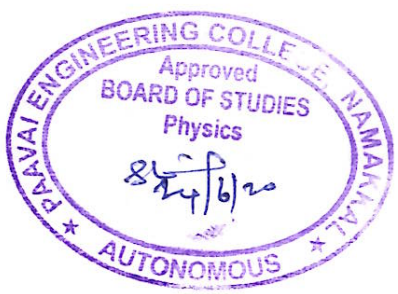
1. A.Marikani, Material Science, PHI, New Delhi, 2017.
2. Verma, N.K, Physics for Engineers, PHI learning Private Limited, 2017.

REFERENCE BOOKS

1. Gopala Rangarajan, Materials Science, Tata McGraw-Hill Publishing Private Company Limited, 2006.
2. Umesh K Mishra & Jasprit Singh, Semiconductor Device Physics and Design, Springer,2008.
3. P K Palanisamy, Engineering Physics II, SciTech Publications, 2009.
4. Charles Kittel, Paul McEuen, Introduction to Solid State Physics, John Wiley & Sons, Limited, 2018.
5. S.O.Pillai, Solid State Physics. New Academic Science, Publishers, 2018.

CO/PO Mapping
(3/2/1 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	3	2	-	-	2	3	2	-	-	-	3	-	-
CO2	2	3	1	-	-	2	3	2	-	-	-	2	-	-
CO3	2	3	2	-	-	2	3	1	-	-	-	2	-	-
CO4	2	2	-	-	-	2	2	1	-	-	-	2	-	-
CO5	2	3	-	-	-	2	2	1	-	-	-	2	-	-



CS20201 PROGRAMMING IN PYTHON 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basics of computer and basic elements of python programming.
- study various looping statements, control statements and functions in python.
- analyze different string operations and lists.
- learn how to use tuples and dictionaries in python program.
- study the exception handling mechanism and file handling.

UNIT I BASICS OF COMPUTER AND PYTHON PROGRAMMING 9

Introduction to Computer-Generation and classification of computers, basic organization of computer, number systems (binary, decimal, octal and hexadecimal);algorithm; flowchart, pseudo code; Introduction to python- python interpreter, interactive and script mode, values and types, operators, expressions, statements, precedence of operators, multiple assignments, comments.

UNIT II CONTROL STATEMENTS AND FUNCTIONS IN PYTHON 9

Conditional and looping Statements- Conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration-while, for, break, continue, pass. Functions- Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, lambda functions.

UNIT III STRINGS AND LISTS 9

Strings-String slices, immutability, string methods and operations; Lists- creating lists, list operations, list methods, mutability, aliasing, cloning lists

UNIT IV TUPLES AND DICTIONARIES 9

Tuples-Tuple assignment, operations on tuples, lists and tuples, tuple as return value. Dictionaries-operations and methods, nested dictionaries.

UNIT V FILES AND MODULES 9

Files- Text files, reading and writing files(read number of characters, lines and words in a file) , format operator , command line arguments – errors and exceptions; Modules- Python Modules ; creating own python modules.

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- classify and make use of python programming elements to solve and debug simple logical problems
- experiment various control statements, looping statements and functions in python.
- develop python programs using strings and lists.
- implement tuples and dictionaries in python program.
- create python programs to work with files and handling exceptions.

TEXT BOOKS

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education,2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016.

REFERENCES

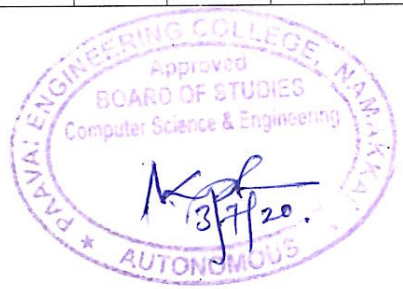
1. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
2. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.

CO - PO Mapping

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	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	2	-	1	2	1	-
CO2	2	2	2	1	1	1	-	-	2	-	-	2	2	-
CO3	3	2	2	3	1	1	-	-	2	-	-	2	2	2
CO4	3	2	2	3	1	1	-	-	2	-	-	2	2	1
CO5	3	2	2	2	1	1	-	-	2	-	-	2	2	1



MECH

ME20202 **ENGINEERING MECHANICS** **3 1 0 4**

(COMMON TO AERO/AGRI/CIVIL/MECH/MCT)

COURSE OBJECTIVES

To enable the students to

- learn the basic concepts of mechanics, resolution and Vector representation of forces.
- gain knowledge in the concepts involved in equilibrium of rigid bodies.
- impart analytical skills to solve problems in moments of surfaces and solids
- develop knowledge in the dynamics of particles due to force.
- understand the rigid body problems subjected to friction and elements.

UNIT I BASICS & STATICS OF PARTICLES **12**

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces - Resolution and Composition of forces- Vectors - Vector operations: additions, subtraction, dot product, cross product - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

Free body diagram – stable equilibrium – action and reaction forces - moment of a force about a point - Varignon's theorem- moment and couple –equivalent force couple system – equilibrium of rigid body in two dimensions - Support reactions of beams.

UNIT III PROPERTIES OF SURFACES **12**

Determination of Areas and Volumes - Centroid of sections - T section, I section, Angle section, Hollow section by using standard formula – Moment of inertia - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia.

UNIT IV DYNAMICS OF PARTICLES **12**

Displacements, Velocity and acceleration, their relationship – Rectilinear motion: horizontal motion- vertical downward and vertical upward motion –curvilinear motion: projectile motion - Newton's law - D'Alemberts principle- motion of lift – motion of inclined surfaces – motion of connected bodies.

UNIT V FRICTION **12**

Friction and its types – limiting friction – coefficient of friction and angle of friction – coulomb's laws of dry Friction –impending motion – angle of repose - friction in simple contact surfaces - friction of a body lying on an inclined plane, ladder friction.

TOTAL PERIODS: 60

COURSE OUTCOMES

At the end of the 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. Hibbeller, 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.

CO - PO Mapping

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	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	2	3	2
CO2	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	3	2
CO5	3	3	3	3	-	-	3	-	-	-	-	2	3	3

MECH

MC20201 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 0

(Common to all B.E./ B.Tech Programmes)

(Mandatory, Non credit Course)

COURSE OBJECTIVES

To enable the students to

- recognize the interdisciplinary and holistic nature of the environment.
- create awareness on ecosystem and biodiversity preserve.
- study about the integrated themes of pollution control and waste management.
- understand the significance of natural resources and environment to stimulate sustainable development.
- assess the socio-economic, political and ethical issues on population with environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment–Definition, scope, importance, need for public awareness; Forest resources–Use, over exploitation, deforestation, effects on forests and tribal people; Water resources – Use, over utilization of surface and ground water.; Mineral resources – Use, exploitation, environmental effects of extracting and using mineral resources; Food resources: Effects of modern agriculture – fertilizer, pesticide problems; Role of an individual in conservation of natural resources; **Activity**– Slogan making event on conserving natural resources or plantation of trees.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem–Structure and function of an ecosystem, producers, Consumers, decomposers, energy flow in the ecosystem; Ecological succession; Food chains - food webs and ecological pyramids; Ecosystems–Types of ecosystem, Introduction, forest ecosystem. aquatic ecosystems(lakes, rivers); Biodiversity– Introduction, definition (genetic - species –ecosystem); Diversity–Value of biodiversity, Consumptive use, productive use, social values, ethical values, aesthetic values; Hotspots of biodiversity; Conservation of biodiversity– In-situ and ex-situ; conservation of biodiversity.

UNIT III POLLUTION 9

Pollution–Définition, air pollution, water pollution, marine pollution, noise pollution, thermal pollution ; Solid waste management– Causes, effects, control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Disaster management– Floods, earthquake, cyclone, landslides; Electronic waste –Sources, causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Water conservation – rain water harvesting, watershed management; Environmental ethics– climate change, global warming and its effects on flora and fauna, acid rain, ozone layer depletion, nuclear

accidents, nuclear holocaust; Environment protection act– Air (Prevention and Control of Pollution) Act, water (Prevention and control of Pollution) act.

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

Human population– Population growth, variation among nations, population explosion; Family welfare programme; Environment and human health; Human rights; Value education; HIV/AIDS; Women and child welfare; Role of information technology in environment and human health.

TOTAL PERIODS : 45

COURSE OUTCOMES

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

- explain the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources.
- analyze the different types of ecosystem and biodiversity, its values and protecting the environment from degradation.
- investigate the existing environmental challenges related to pollution and its management.
- select suitable strategies for sustainable management of components of environment.
- correlate the impacts of population and human activities on environment.

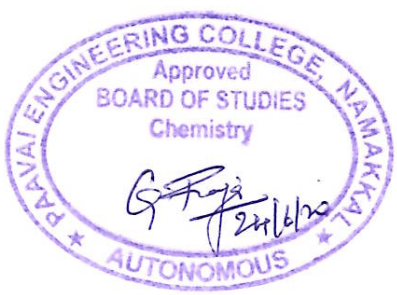
TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, Environmental Chemistry, VI edition,2015 NewAge International (P) ltd Publication, New Delhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition, New Age International (P) ltd Publication, NewDelhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	3	3	-	2	-	3	1	-
CO2	-	-	-	-	-	1	2	3	-	2	-	3	1	-
CO3	1	-	2	-	1	1	2	3	-	2	-	3	1	2
CO4	-	-	2	-	2	1	3	3	-	2	-	2	1	1
CO5	-	1	-	-	-	1	3	3	-	2	-	2	1	-



CS20203 PROGRAMMING IN PYTHON LABORATORY 0 0 2 1

COURSE OBJECTIVES

To enable the students to

- gain knowledge about basic elements of python and implementation of data structure concepts in python program.
- develop the program functions, strings and lists in python.
- design and implement the tuples and dictionaries in python.
- acquire the knowledge about the file operation.

LIST OF EXPERIMENTS

1. Implement various control statements in python.
2. Create python programs to implement looping statements.
3. Implement user defined functions using python.
4. Develop python programs to perform various string operations.
5. Develop python programs to perform operations on list.
6. Develop python programs to work with Tuples.
7. Create python program to implement dictionary.
8. Implement python program to perform file operations.
9. Implement python programs using modules.
10. Create python program to handle exceptions.

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- create python program using various looping and control statements.
- work with functions, strings and lists in python.
- implement tuples and dictionaries in python programming.
- develop python program to perform file operations and handle the exceptions.

CO - PO Mapping

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	PO 10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1	1	1	-	-	1	-	1	1	1	-
CO2	2	2	2	1	1	1	-	-	1	-	-	1	2	-
CO3	3	2	2	3	1	1	-	-	2	-	-	2	2	2
CO4	3	2	2	3	1	1	-	-	2	-	-	2	2	1

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PH20205 **PHYSICS LABORATORY** **0 0 2 1**

(COMMON TO AERO/AGRI/BM/CHEM/CIVIL/CSE/CYBER SECURITY/EEE/MCT/MECH/ME/PHARMA)

COURSE OBJECTIVES

To enable the students to

- study the maximum stress applied to the given beam by uniform and non-uniform bending method.
- learn the concept of moment of inertia and rigidity modulus using torsional pendulum.
- demonstrate various experiments and physics concepts applied in viscosity of liquid, sound, light, thermal physics and semiconductor.
- understand the use of Bragg's Law and its relation to crystal structure.

LIST OF EXPERIMENTS (Any seven)

1. Determination of Young's modulus by non- uniform bending method.
2. Determination of Young's modulus by uniform bending method.
3. Determination of rigidity modulus - Torsion pendulum.
4. Determination of coefficient of viscosity of a liquid -Poiseuille's method.
5. Determination of velocity of sound and compressibility of liquid - Ultrasonic interferometer.
6. Determination of particle size using Laser.
7. Determination of acceptance angle in an optical fiber.
8. Determination of lattice parameters using powder XRD (Interpretation and data analysis).
9. Determination of band gap of a semiconductor.
10. Determination of thermal conductivity of a bad conductor - Lee's Disc method.

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- determine the Young's modulus and rigidity modulus of the given material.
- calculate the coefficient of viscosity of a liquid and determine the velocity of ultrasonic waves, compressibility of the given liquid.
- determine the particle size in the given powder (Lycopodium), the characteristics of a given optical fibre, the thermal conductivity of a given bad conductor and band gap of a semiconductor.
- interpret the crystallographic structure, chemical composition of materials.

CO/PO Mapping
(3/2/1 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	3	3	2	2	-	2	2	-	-	-	-	2	-	-
CO2	3	3	2	2	-	2	2	-	-	-	-	2	-	-
CO3	3	3	2	2	-	2	-	-	-	-	-	2	-	-
CO4	3	2	2	2	2	2		-	-	-		2	-	-

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