COURSE STRUCTURE

For

B.Tech.

Department of Mechanical Engineering

(*for 24 admitted batch*)

PRAGATI ENGINEERING COLLEGE

(An Autonomous Institution)
ADB Road, Surampalem, Kakinada District, A.P.-533 437
(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada)
(Recognized by UGC under sections 2 (f) and 12 (b) of UGC act, 1956)

COURSE STRUCTURE

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding Laboratory's, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

I YEAR – I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	24BP101T	Engineering Physics	3	0	0	3
2	BS&H	24BM101T	Linear Algebra and Calculus	3	0	0	3
3	Engineering Science	24EE101T	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	24ME101T	Engineering Graphics	1	0	4	3
5	Engineering Science	24CS101T	Introduction to programming	3	0	0	3
6	BS&H	24BP101P	Engineering Physics Laboratory	0	0	2	1
7	Engineering Science	24EE101P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
8	Engineering Science	24CS101P	Computer Programming Laboratory	0	0	3	1.5
9	Engineering Science	24IT101P	IT Workshop	0	0	2	1
10	BS&H	24MH102P	NSS/NCC/Scouts and Guides/Community Service	0	0	1	0.5
Total Credits							**20.5**

I YEAR – II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	24BE201T	Communicative English	2	0	0	2
2	BS&H	24BM201T	Differential equations and Vector Calculus	3	0	0	3
3	BS&H	24BC201T	Chemistry	3	0	0	3
4	Engineering Science	24CM201T	Basic Civil and Mechanical Engineering	3	0	0	3
5	Professional Core	24CS201T	Data Structures	3	0	0	3
6	Engineering Science	24ME203P	Engineering Workshop	0	0	3	1.5
7	BS&H	24BE201P	Communicative English Laboratory	0	0	2	1
8	Professional Core	24CS201P	Data Structures Laboratory	0	0	3	1.5
9	BS&H	24BC201P	Chemistry Laboratory	0	0	2	1
10	BS&H	24MH201P	Health and wellness, Yoga and sports	0	0	1	0.5
Total Credits							**19.5**

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

I YEAR – I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS	24BM303T	Numerical Methods and Transform Techniques	3	0	0	3
2	HSMC	24HM301T	Universal Human Values - Understanding Harmony& Ethical Human Conduct	2	1	0	3
3	Engineering Science	24ME301T	Thermodynamics	2	0	0	2
4	Professional Core	24ME302T	Mechanics of Solids	3	0	0	3
5	Professional Core	24ME303T	Material Science and Metallurgy	3	0	0	3
6	Professional Core	24ME301P	Mechanics of Solids and Materials Science Laboratory	0	0	3	1.5
7	Professional Core	24ME301P	Computer-aided Machine Drawing	0	0	3	1.5
8	Engineering Science	24AM302P	Python programming Laboratory	0	0	2	1
9	Skill Enhancement Course	24EC301S	Embedded Systems and IoT	0	1	2	2
10	Audit Course	24BC301T	Environmental Science	2	0	0	-
Total Credits							**20**

II YEAR – II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	Management Course- I	24ME401T	Industrial Management	2	0	0	2
2	Basic Science	24BM401T	Complex Variables, Probability and Statistics	3	0	0	3
3	Professional Core	24ME402T	Manufacturing Processes	3	0	0	3
4	Professional Core	24ME403T	Fluid Mechanics & Hydraulic Machines	3	0	0	3
5	Professional Core	24ME404T	Theory of Machines	3	0	0	3
6	Professional Core	24ME403P	Fluid Mechanics & Hydraulic Machines Laboratory	0	0	3	1.5
7	Professional Core	24ME402P	Manufacturing Processes Laboratory	0	0	3	1.5
8	Skill Enhancement course	24BE401S	Soft Skills	0	1	2	2
9	Engineering Science	24HM401P	Design Thinking & Innovation	1	0	2	2
Total Credits							**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

ENGINEERING PHYSICS

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Basic Sciences	**Course Code**	24BP101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization required to design instruments with higher resolution.
2	Impart the knowledge of Dielectric& Magnetic materials for engineering Applications.
3	Understand the basics of Semiconductors and their working mechanism for their utility in Engineering applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyzetheintensityvariationoflightduetopolarization,interferenceanddiffraction	K4
CO2	Familiarize with the basics of crystals and their structures.	K2
CO3	Applying the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles	K3
CO4	Apply the basics of phenomenon related to dielectric materials and Magnetic Materials to study their dependence on temperature and frequency response.	K3
CO5	Understand the Band formation, electrical conductivities in semiconductors and study the types of semiconductors using Hall Effect.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I -WAVE OPTICS

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

UNIT - II - CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X - ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT – III - DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT – IV - QUANTUM MECHANICS AND FREE ELECTRON THEORY

Quantum Mechanics: Introduction-Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Introduction-Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT - V - BAND THEORY OF SOLIDS & SEMICONDUCTOR PHYSICS

BAND THEORY OF SOLIDS

Bloch's Theorem (Qualitative) - Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron- Classification of Crystalline Solids-Concept of hole

SEMICONDUCTOR PHYSICS

Semiconductors: Introduction-Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

TEXT BOOKS

"A Text book of Engineering Physics" by M.N.Avadhanulu, P.G.Kshir sagar -S.Chand Publications,
"Engineering Physics" by Tirupati Naidu &Veeranjaneyalu, V G S Publishers
"Engineering Physics" by P.K Palanisamy,Sci Tech Publication

REFERENCE BOOKS

Kettles Introduction to Solid state Physics-Charles Kittel,Wiley India Edition
Solid State Physics ,AJ Dekker, I Edition,Macmillan Publishers India Private Limited
"Engineering Physics" by M.R.Srinivasan, New Age international publishers.
"Solid State Physics" by SO Pilai., - New age International Publishers

WEB RESOURCES

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html
Unit I:https://nptel.ac.in/courses/122/107/122107035/#
Unit II: https://nptel.ac.in/courses/113/104/113104014/
Unit III: https://nptel.ac.in/courses/113/104/113104090/
https://youtu.be/DDLljK1ODeg
Unit IV :https://study.com/academy/lesson/the-de-broglie-hypothesis-definition-significance.html
https://nptel.ac.in/courses/115/101/115101107/
https://nptel.ac.in/courses/115/105/115105122/
Unit V :https://www.electronics-tutorials.ws/diode/diode_1.html
https://nptel.ac.in/courses/115/105/115105099/
https://nptel.ac.in/courses/108/108/108108122/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

LINEAR ALGEBRA AND CALCULUS

(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	24BM101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Matrix Algebra, Limits, Continuity, Differentiability and inerrability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Developanduseofmatrixalgebratechniquesthatareneededbyengineersforpractical applications.	K3
CO2	Find the Eigen values and Eigen vectors and able to reduce the given quadratic form into canonical form by orthogonal transformation.	K3
CO3	Utilize mean value theorems to real life problems.	K3
CO4	Familiarize with functions of several variables which is useful in optimization & learn important tools of calculus in higher dimensions	K3
CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I - Matrices:

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, **System of linear equations**: Solving system of Homogeneous linear equations and solving Non-Homo generous linear equations by Gauss elimination method, Gauss Jacobi and Gauss Seidel Iteration Methods**.**

UNIT II - Eigen values, Eigenvectors and Orthogonal Transformation:

Eigen values, Eigenvectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Diagonalization of a matrix, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III - Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems. Taylor's and Maclaurin series.

UNIT IV - Partial differentiation and Applications (Multi variable calculus):

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V - Multiple Integrals (Multi variable Calculus):

Double integrals, change of order of integration, triple integrals, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K Das, Er. RajnishVerma, S. Chand Publications,2014, Third Edition (Reprint 2021)
6. Advanced Engineering Mathematics by H. K Dass, S. ChandPublications,2022, 22nd Edition(Reprint 2022).

WEB RESOURCES

1. https://en.wikipedia.org/wiki/System_of_linear_equations
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://www.math.hmc.edu/calculus/tutorials/eigenstuff/
4. https://en.wikipedia.org/wiki/Quadratic_form
5. https://en.wikipedia.org/wiki/Calculus
6. https://en.wikipedia.org/wiki/Partial_derivative
7. https://www.whitman.edu/mathematics/calculus_online/section14.03.html
8. https://en.wikipedia.org/wiki/Multiple_integral
9. http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24EE101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A:BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES
To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the fundamental laws, operating principles of motors, generators, MC and MI instruments	K2
CO2	Apply the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.	K3
CO3	Apply the mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	2	-	-	-	-	-	-
CO3	3	3	-	-	-	-	2	2	-	-	-	-

COURSE CONTENT

UNIT - I

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT - II

Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT – III

Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

PART-B :BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES	
1	To impart knowledge on semiconductor devices.
2	To introduce concepts of biasing and applications of diodes and transistors.
3	To introduce fundamentals of digital electronics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic concepts of diodes and transistors	K2
CO2	Understand the working principles of semiconductor devices and applications	K2
CO3	Understand number system, Boolean algebra, basics of combinational and sequential circuits	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	2										
CO3	2	2										

COURSE CONTENT

UNIT – I - SEMICONDUCTORDEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT -II - BASICELECTRONICCIRCUITSANDINSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Block diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT – I/I - DIGITAL ELECTRONICS

Overview of Number Systems, BCD codes, Functionality of Logic Gates– NOT,OR,AND,NOR,NAND,XOR and XNOR. Excess-3code, Graycode, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. Robert.L.Boylestad&LouisNashelsky,ElectronicDevices&CircuitTheory,PearsonEducation,2021.
2. Digital Design by Morris Mano, 3E, Prentice Hall, India, 2001

Reference Books:

1. R.S.Sedha, A Text book of Electronic Devices and Circuits, S.Chand&Co,2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Web References:

1. NPTEL- https://archive.nptel.ac.in/courses/108/108/108108122/
2. Neso Academy- https://www.nesoacademy.org/ec/05-digital-electronics

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

I Year I Semester

ENGINEERING GRAPHICS

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24ME101T
Course Type	Theory	**L-T-P-C**	1-0-4-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
2	To impart knowledge on the projection of points, lines and plane surfaces.
3	To improve the visualization skills for better understanding of projection of solids.
4	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	K2
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	K3
CO3	Understand and draw projection of solids in various positions in first quadrant.	K3
CO4	Explain principles behind development of surfaces.	K2
CO5	Prepare isometric and perspective sections of simple solids.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT - I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT - II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT - III

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT - IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT - V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, DhananjayJolhe, Tata McGraw Hill, 2017.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.cadtutor.net/tutorials/autocad/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

INTRODUCTIONTOPROGRAMMING
(Common to All Branches)

Course Category	Engineering Science	**Course Code**	24CS101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSEOBJECTIVES	
1	To introduce students to the fundamentals of computer programming.
2	To provide hands-on experience with coding and debugging.
3	To foster logical thinking and problem-solving skills using programming.
4	Tofamiliarizestudentswithprogrammingconceptssuchasdatatypes,control structures, functions and arrays.
5	To encourage collaborative e learning and team work in coding projects.

COURSEOUTCOMES		
Upon successful completion of the course, the student will be ableto :		**Cognitive Level**
CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.	K3
CO2	Analyze a problem and develop an algorithm to solve it.	K4
CO3	Implement various algorithms using the C programming language.	K5
CO4	Understand more advanced features of C language.	K3
CO5	Developproblem-solvingskillsandtheabilitytodebugandoptimizethecode.	K4

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1– Low, 2 -Medium, 3– High)

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

COURSE CONTENT

UNIT-I
Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables and Constants, Basic Input and Output, Operations, Type Conversion and Casting.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT-II
Control Structures

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue, Programming Examples.

UNIT-III
Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Arrays Applications , Introduction to Strings, String input and output functions, String handling functions.

UNIT-IV
Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT-V
Functions& File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Life time of Variables, Storage Classes, Basics of File Handling.
Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXTBOOKS

1. "The C Programming Language", Brian W.Kernighan and Dennis M.Ritchie, Prentice-Hall,2005, 2nd Edition
2. Schaum's Outline of Programming with C,Byron S Gottfried, McGraw-Hill Education,4th edition, 2018

REFERENCEBOOKS

1. Computing fundamentals and C Programming, Balaguruswamy,E., Mc Graw-Hill Education, 7th Edition, 2017
2. Programming in C, Rema Theraja, Oxford,2016,2nd edition
3. C Programming, A ProblemSolvingApproach,Forouzan,Gilberg,Prasad,CENGAGE,3rd edition, 2009

WEB RESOURCES

1. http://nptel.ac.in/courses/106104128/
2. http://students.iitk.ac.in/programmingclub/course/#notes
3. http://c-faq.com/~scs/cclass/cclass.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

ENGINEERING PHYSICS LABORATORY

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Basic Sciences	**Course Code**	24BP101P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The student will have exposure to various experimental skills which isessential for an Engineering student.
2	To gain practical knowledge by applying the experimental methods to correlate with the Theoretical Physics.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Interference, Diffraction in Physics using instruments like Spectrometer, Travelling microscope.	K2
CO2	Study the Mechanical Laws, Strength of materials, Magnetic and Dielectric constants of materials.	K3
CO3	Apply the basics of Current Electricity and Semiconductors in engineering application	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	1	-	-	-	-	-	-	-

COURSE CONTENT

(Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode).

1. Determination of radius of curvature of a given Plano-convex lens by Newton's Rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of wavelength of Laser light using diffraction grating.
5. Estimation of Planck's constant using photoelectric effect.
6. Sonometer: Verification of laws of stretched string.
7. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
8. Determination of rigidity modulus of the material of the given wire using Torsional pendulum
9. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
10. Determination of magnetic susceptibility by Kundt's tube method.
11. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
12. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
13. Determination of dielectric constant using charging and discharging method.
14. Determination of the resistivity of semiconductors by four probe methods.
15. Determination of energy gap of a semiconductor using p-n junction diode.
16. Determination of temperature coefficients of a thermistor.
17. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

TEXT BOOKS

College Customized Manual

REFERENCE BOOKS

ATextbookofPracticalPhysics-S.Balasubramanian,M.N.Srinivasan,S.Chand Publishers, 2017

WEB RESOURCES

1. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype
2. www.vlab.co.in

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

I Year I Semester

ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24EE101P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

PART-A: ELECTRICAL ENGINEERING WORKSHOP

COURSE OBJECTIVES

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the Electrical circuit design concepts; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.	K2
CO2	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.	K3
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.	K3
CO4	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.	K4
CO5	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Measurement of Three- phase power in Three-phase induction motor using two wattmeter method
5. Speed control of DC shunt motor
6. Measurement of Power and Power factor using Single-phase wattmeter
7. Measurement of Earth Resistance using Megger
8. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

PART B: ELECTRONICS ENGINEERING LABORATORY

COURSE OBJECTIVES
Toimpartknowledgeontheprinciplesofdigitalelectronicsandfundamentalsofelectrondevices& its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO6	Identify & testing of various electronic components.	K3
CO7	Understand the usage of electronic measuring instruments.	K3
CO8	Plot and discuss the characteristics of various electron devices.	K3
CO9	Explain the operation of a digital circuit.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO6	2	2		2	2							
CO7	2	2		2	2							
CO8	2	2		2	2							
CO9	2	2		2	2							

List of experiments:

1. Introduction to Active and Passive devices must be experiment-1 (includes Resistors, Capacitors, Inductors, Diodes, Transistors, Power supplies, Ammeter(s), Voltmeter(s), necessary devices)
2. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
3. Plot V– I characteristics of Zener Diode and its application as voltage Regulator.
4. Determine ripple factor of full wave rectifier.
5. Plot Input & Output characteristics of BJT in CE and CB configurations.
6. Determining CE Amplifier input and output impedance with and without bypass capacitor.
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R,J-K & D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Mult imeters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices. Multi sim /PSPICE software for Simulation.

References:

1. Robert.L.Boylestad&LouisNashelsky,ElectronicDevices&CircuitTheory,PearsonEducation, 2021.
2. R.P.Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill,2009
3. R.T.Paynter,IntroductoryElectronicDevices&Circuits– ConventionalFlowVersion,PearsonEducation,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

COMPUTER PROGRAMMING LABORATORY

(Common to All Branches)

Course Category	Engineering Science	**Course Code**	24CS101P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

The course aims to give students hands–on experience and train the month e concepts of the C-programming language.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Read, understand, and trace the execution of programs written in C language.	K3
CO2	Select the right control structure for solving the problem.	K3
CO3	Develop C programs which utilize memory efficiently using programming Constructs like pointers.	K3
CO4	Develop, Debug and Execute programs to demonstrate the Applications of arrays, functions, basic concepts of pointer sin C.	K5

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low,2 -Medium, 3– High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	1	-	-	-	-	-	-	-
CO2	3	3	3	3	1	-	-	-	-	-	-	-
CO3	3	3	3	3	1	-	-	-	-	-	-	-
CO4	3	3	3	3	1	-	-	-	-	-	-	-

COURSE CONTENT

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.
Suggested Experiments/Activities:
Tutorial 1 : Problem-solving using Computers.
Lab1: Familiarization with programming environment

i. Basic Linux environment and its editors likeVi,Vim & Emacsetc.
ii. Exposure to Turbo C, gcc
iii. Writing simple programs using printf(),scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Suggested Experiments/Activities:
Tutorial 2: Problem-solving using Algorithms and Flowcharts.
Lab 2: Converting algorithms /flowcharts into C Source code.
Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:
Lab3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

WEEK4
Objective : Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
Suggested Experiments/Activities:
Tutorial 4: Operators and the precedence and as associatively:
Lab 4: Simple computational problems using the operator' precedence and associatively

i) Evaluate the following expressions.
   a. A+B*C+(D*E)+F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J=(i++)+(++i)
ii) Find the maximum of three numbers using conditional operator
iii) Takemarksof5subjectsinintegers, and find the total, average in float

WEEK5
Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Problems involving if-then-else structures.

i) Write a C program to find them axandm in off our numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK6
Objective : Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Iterativeproblemse.g.,the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Computes in e and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

WEEK7
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-Dand more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-Darrays,explore search solution linear search.
Suggested Experiments/Activities:
Tutorial 7:1DArrays: searching.
Lab 7: 1D Array manipulation, linear search

i) Find the min and max of a1-D integer array.
ii) Perform linear search on 1 D array.
iii) There verse of a 1 D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK8
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

WEEK9
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & amp; value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C
Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a1Darrayusingmalloc()
ii) Write a C program to find the total, average of n students using structures
iii) Entern students data using calloc() and display failed students list
iv) Readstudentnameandmarksfromthecommandlineanddisplaythestudentdetailsalongwith the total.
v) Write a C program to implement realloc ()

WEEK10
Objective : Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 10: Bit fields, Self-Referential Structures, Linked lists
Lab 10: Bit fields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bit fields.
iv) Write a C program to copy one structure variable to another structure of the same type.

WEEK 11
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.
Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK13
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lower case, uppercase, digits and other characters using pointers.

WEEK14
Objective : To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.
Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file usingf read() and f write()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no.of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXT BOOKS

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum 's Outline of Programming with C, McGrawHill

REFERENCEBOOKS

1. Brian W.Kernighan and Dennis M.Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

WEB RESOURCES

1. https://www.researchgate.net/publication/322908864_C_Programming_Lab_Manual
2. https://www.javatpoint.com/c-programs

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

IT WORKSHOP

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24IT101P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS.
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning.
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform Hardware trouble shooting.	K3
CO2	Understand Hardware components and inter dependencies.	K3
CO3	Safe guard computer systems from viruses/worms.	K3
CO4	Document/ Presentation preparation.	K3
CO5	Perform calculations using spreadsheets.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

PC Hardware & **Software Installation**
Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows, Linux / BOSS on the personal computer. This computer should have windows installed. The system should be configured as dual boot (VM Ware) with both Windows and Linux / BOSS Lab instructor should verify the installation and follow it up with a Viva.

Internet & World Wide Web
Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, book marks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task3: Search Engines & Net iquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block popup, lock active x downloads to avoid viruses and/or worms.

WORD
Task 1: Word Orientation: The mentor needs to give an overview of Microsoft (MS) office or equivalent (FOSS) tool word : Importance of MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word–Accessing, over view of tool bars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using Word to create a project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Foot note, Hyperlink, Symbols, Spell Check, Track Changes.

Task4: Creating a Newsletter: Features to be covered:-Table of Content, News paper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Text boxes, Paragraphs and Mail Merge in word.

EXCEL
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel–Accessing, overview of tool bars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

POWERPOINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, WordArt, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in Power Point.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting– Back ground, textures, Design Templates, Hidden slides.

AI TOOLS –ChatGPT

Task1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are acknowledgeable AI. Please answer the following question: What is the capital of France?"

Task2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course toolkit, Vikas Gupta, WILEY Dreamtech,2--3.
2. The Complete Computer upgrade and repair book, Chery lAS chmidt, WILEY Dreamtech, 2-13, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2-12, 2nd edition.
4. PC Hardware- A Handbook, Kate J.Chase, PHI (Microsoft).
5. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme.– CISCO Press, Pearson Education,3rd edition.
6. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

Web References:

1. PC Hardware & Software Installation: Peripheral Devices: Computer Peripherals - Wikipedia
   Components in a CPU: CPU Components and Their Functions - Guru99
2. Internet & World Wide Web: TCP/IP and Networking Basics: TCP/IP Explained - Lifewire
   Internet Browsing and Configuration: How Web Browsing Works - HowStuffWorks
3. Word: Microsoft Word Tutorials: Microsoft Word Basics - GCFGlobal
4. Excel: Excel Tutorial and Functions: Excel Tutorial - Microsoft
5. AI Tools - ChatGPT: GPT-3.5 and ChatGPT Information: GPT-3.5 Guide - OpenAI

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year I Semester

NSS / NCC / SCOUTS AND GUIDES / COMMUNITY SERVICE

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Humanities	**Course Code**	24MH102P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation** **Viva Voce** **Total Marks**	90 10 100

COURSE OBJECTIVES
Theobjectiveofintroducingthiscourseistoimpartdiscipline,character,fraternity,teamwork, socialconsciousnessamongthestudentsandengagingtheminselflessservice.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of discipline, character and service motto.	
CO2	Solvesomesocietalissuesbyapplyingacquiredknowledge,facts,andtechniques.	
CO3	Explore human relationships by analyzing social problems.	
CO4	Determine to extend their help for the fellow beings and downtrodden people.	
CO5	Develop leadership skills and civic responsibilities.	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I - Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conductingtalentshowinsingingpatrioticsongs-paintings-anyothercontribution.

UNIT – II - Nature &Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT – III - Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village- are a leaders-Survey in the village, identification of problems-helping them to solve via media-authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes-Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defense, NewDelhi
3. Davis M. L. and cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M. Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit.Eachactivityshallbeevaluatedbytheconcernedteacherfor15marks, totaling to 90marks.
- Astudentshallbeevaluatedbytheconcernedteacherfor10marksbyconductingviva voce on the subject.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

COMMUNICATIVE ENGLISH

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Humanities	**Course Code**	24BE201T
Course Type	Theory	**L-T-P-C**	2-0-0-2
Prerequisites	LSRW Skills.	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students.
2	It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
3	This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.	K2
CO2	Apply grammatical structures to formulate sentences and correct word forms.	K3
CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions.	K4
CO4	Evaluate reading/listening texts and to write summaries based on glob	K5
CO5	Create a coherent paragraph, essay, and resume.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I
Lesson: HUMAN VALUES: Gift of Magi (Short Story)
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing- Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures- forming questions.
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II
Lesson: NATURE: The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices – linkers, use of articles and zero article; Prepositions.
Vocabulary: Homonyms ,Homophones, Homographs.

UNIT III
Lesson: BIOGRAPHY: ElonMusk
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing.
Grammar: Verbs-tenses; subject-verb agreement; Compound words, Collocations.
Vocabulary: Compound words, Collocations.

UNIT IV
Lesson: INSPIRATION: The Toys o f Peace by Saki
Listening : Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading : Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary : Words often confused, Jargons.

UNIT V

Lesson: MOTIVATION : The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts.

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Vocabulary : Technical Jargons.

TEXT BOOKS

1. Path finder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023. (Units1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023(Units4 &5).

REFERENCE BOOKS

1. Dubey, ShamJi & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press,2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

WEB RESOURCES

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	24BM201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration and Partial Differentiation. Differential Equations (Variable Separable)	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and multi variable calculus
2	To familiarize the students with the foundations of line, surface and volume integrals.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Solve the first order differential equations related to various engineering fields.	K3
CO2	Solve the higher order differential equations to various engineering fields.	K3
CO3	Identify solution methods for partial differential equations that model physical processes.	K3
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	K3
CO5	Estimate the work done against a field, circulation and flux using vector calculus.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I

Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. **Applications**: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II

Linear differential equations of higher order (Constant Coefficients):

Definitions, homogenous and non-homogenous differential equations, complimentary function, particular integral, general solution, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III

Partial Differential Equations:

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients

UNIT IV

Vector differentiation:

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient and applications, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V

Vector integration:

Line integral-circulation-work done by the force, Scalar potential, surface integral-flux, Green's theorem in a plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXT BOOKS

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS

1. Thomas Calculus, George B.Thomas, Maurice D.Weir and JoelHass, Pearson Publishers,2018, 14th Edition.
2. Advanced Engineering Mathematics, DennisG.Zill andWarrenS.Wright, Jones and Bartlett,2018.
3. Advanced Modern Engineering Mathematics,GlynJames, Pearson publishers, 2018,5th Edition.
4. Advanced Engineering Mathematics, R.K.Jain and S.R.K.Iyengar, Alpha Science International Ltd., 2021 5the Edition (9th reprint)
5. Higher Engineering Mathematics, B.V.Ramana,, McGraw HillEducation,2017
6. Advanced Engineering Mathematics by H. K Dass, S. ChandPublications,2022, 22nd Edition(Reprint 2022).

WEB RESOURCES

1. https://mathworld.wolfram.com/First-OrderOrdinaryDifferentialEquation.html
2. https://en.wikipedia.org/wiki/Differential_equation
3. https://en.wikipedia.org/wiki/Partial_differential_equation
4. https://en.wikipedia.org/wiki/Vector_calculus
5. https://en.wikipedia.org/wiki/Vector_calculus

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

CHEMISTRY

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Basic Sciences	**Course Code**	24BC201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To familiarize chemistry and its applications
2	To train the students on the principles and applications of electrochemistry and polymers
3	To introduce instrumental methods and to explain the Green Principles and applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To introduce the quantum mechanical concepts of measurements for physical systems	K2
CO2	Apply the principle of Band diagrams in the application of conductors and semiconductors	K2
CO3	Compare the materials of construction for battery and electrochemical sensors	K2
CO4	Explain the preparation, properties, and applications of thermoplastics & Thermosetting & elastomers conducting polymers.	K3
CO5	Summarize the concepts of Instrumental methods.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT –I

Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2.Molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbital of benzene, calculation of bond order.

UNIT - II

Modern Engineering materials

Semiconductors – Introduction, types and applications.
Super Conductors-Introduction, types and applications.
Super capacitors: Introduction, Classification–Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, Carbon Nano tubes- Arc-Discharge & Chemical Vapour deposition method and Graphines Nano particles.

UNIT - III

Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (red ox titrations), concept of conductivity, conductivity cell, conduct metric titrations (acid-base titrations).
potentiometric sensors with examples. Reference electrodes: Normal Hydrogen Electrode(NHE) and Calomel Electrode. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells- hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC)

UNIT - IV

Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation. Free radical, Cationic and Anionic Mechanisms.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of
– PVC, Teflon, Bakelite, Nylon-6,6, Urea-Formaldehyde resin. Elastomers –Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – Types, Polyacetylene, – Mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT -V

Instrumental Methods its Applications and **Non-conventional energy sources and Green Chemistry**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV Visible Spectroscopy electronic transition, Instrumentation, IR spectroscopy, fundamental modes and selection rules, Chromatography-Basic Principles,
Non-conventional energy sources: Solar energy- introduction to PV cell / Solar cell- construction, working and applications. Hydro power plant and Geo-thermal energy.
Green chemistry: Principles and applications.

TEXT BOOKS

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson,2007.
2. J.D.Lee, Concise In organic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Text book of Polymer Science, Fred W.Bill mayer Jr,3rd Edition

WEB RESOURCES

UNIT -I

Structure and BondingModels:https://archive.nptel.ac.in/courses/104/106/104106096/

UNIT - II

Modern Engineering materials :https://nptel.ac.in/courses/118104008

UNIT - III

Electrochemistry and Applications:https://archive.nptel.ac.in/courses/113/105/113105102/

UNIT – IV -

Polymer Chemistry :https://archive.nptel.ac.in/courses/104/105/104105124/

UNIT -V

Instrumental Methods & Applications:https://onlinecourses.nptel.ac.in/noc22_cy45/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24CM201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A : BASIC CIVIL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Civil Engineering sub-divisions
2	Introduce the preliminary concepts of surveying.
3	Acquire preliminary knowledge on Transportation and its importance in nation's economy.
4	Get familiarized with the importance of quality, conveyance and storage of water.
5	Introduction to basic civil engineering materials and construction techniques.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Enlist various basic characteristics and sub-divisions of Civil Engineering, pre-fabricated materials and technology to appreciate their role in ensuring better society.	K2
CO2	Illustrate the concepts of surveying and basics of Foundation Engineering.	K3
CO3	Know the significance of various domains in transportation engineering and be acquitted with types of pavements. Get an overview about Environmental Engineering and Water Resource Engineering.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	1
CO3	1	1	1	-	-	2	-	-	1	-	-	1

COURSE CONTENT

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering -Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement- Aggregate -Bricks-Stones-Sand-Cement Concrete-Steel-Timber. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying : Objectives of Surveying- Horizontal Measurements- Angular MeasurementsIntroduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.
Foundations: Types of foundations — Bearing capacity and settlement — Requirement of good foundations.

UNIT III

Transportation Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.
Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXT BOOKS

1. Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, SatheeshGopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

WEB RESOURCES

1. https://nptel.ac.in/courses/105101087
2. https://nptel.ac.in/courses/105104101
3. https://nptel.ac.in/courses/105104103

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

PART – B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2	Explain different engineering materials and different manufacturing processes.
3	Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different manufacturing processes.	K2
CO2	Explain the basics of thermal engineering and its applications.	K3
CO3	Describe the working of different mechanical power transmission systems, power plants and basics of robotics and its applications.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	2	-

COURSE CONTENT

UNIT –I -

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT - II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT - III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications.
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

Web References:

1. https://ocw.mit.edu/courses/2-000-how-and-why-machines-work-spring-2002/
2. https://ocw.mit.edu/courses/2-008-design-and-manufacturing-ii-spring-2004/
3. https://ocw.mit.edu/courses/2-12-introduction-to-robotics-fall-2005/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

DATASTRUCTURES

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Professional Core	**Course Code**	24CS201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
1	To provide the knowledge of basic data structures and their implementations.
2	To understand importance of data structures in context of writing efficient programs.
3	To develop skills to apply appropriate data structures in problem solving.

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explaintheroleoflineardatastructuresinorganizingandaccessingdataefficiently In algorithms.	K2
CO2	Design,implement,andapplylinkedlistsfordynamicdatastorage,demonstrating understanding of memory allocation	K5
CO3	Developprogramsusingstackstohandlerecursivealgorithms,manageprogram states, and solve related problems.	K3
CO4	Applyqueue-basedalgorithmsforefficienttaskschedulingandbreadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges	K3
CO5	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees, Graphs	K5

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 -Medium, 3– High)

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

COURSE CONTENT

UNIT -I

Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques : Bubble sort, Selection sort, Insertion sort, Quick and Merge sort.

UNIT -II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT -III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, back tracking, reversing list etc.

UNIT -IV

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT -V

Trees: Introduction to Trees, Binary Search Tree– Insertion, Deletion &Traversal
Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.
Graphs: Introduction, Graph Representation, Traversal techniques

TEXTBOOKS

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.2020
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2nd Edition ,2014

REFERENCEBOOKS

1. Algorithms and Data Structures : The Basic Tool box by Kurt Mehlhorn and Peter Sanders.
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D.Ullman, and JohnE. Hopcroft.
3. Problem Solving with Algorithms and Data Structures "by Brad Miller and David Ranum.
4. Introduction to Algorithms by Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest and Clifford Stein. 3rd Edition 2009
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.

WEB RESOURCES

1. https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf
2. https://www.geeksforgeeks.org/data-structures/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

ENGINEERING WORKSHOP

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Engineering Science	**Course Code**	24ME203P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify workshop tools and their operational capabilities.	K2
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.	K3
CO3	Apply knowledge in preparation of pipe joints and practice of Plumbing tools.	K3
CO4	Apply basic electrical engineering knowledge for House Wiring Practice	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

1.**Demonstration**: Safety practices and precautions to be observed in workshop.

2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tire

5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
Note: Minimum of 12 Experiments to be conducted from the above covering all the trades.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, DhanpathRai& Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. HajraChoudhury& Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. &Upadhyay P.A.; AtulPrakashan, 2021-22.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

COMMUNICATIVE ENGLISH LABORATORY

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Humanities	**Course Code**	24BE201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	LSRW Skills	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning.
2	The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.	K2
CO2	Apply communication skills through various language learning activities.	K3
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.	K4
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.	K5
CO5	Able to present ideas effectively and manage interviews confidently.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT - I
Vowels & Consonants.
Neutralization/Accent Rules.

UNIT - II
Communication Skills & JAM.
Role Play or Conversational Practice.

UNIT - III
E-mail Writing.
Resume Writing, Cover letter, SOP.

UNIT - IV
Group Discussions-methods & practice.
Debates-Methods &Practice.

UNIT - V
PPT Presentations/ Poster Presentation.
Interviews Skills.

Laboratory Manual Lab Book

1. Strengthen Your Steps: A Multi-Model Course in Communication Skills published by Maruti Publications

REFERENCE BOOKS

1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw- Hill Education India,2016
3. Hewing's, Martin. Cambridge Academic English (B2).CUP,2012.
4. J.Sethi & P.V.Dhamija. A Course in Phonetics and Spoken English,(2nd Ed),Kindle, 2013

WEB RESOURCES

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Suggested Software:

1. Walden Infotech
2. Young India Films

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

DATASTRUCTURESLABORATORY

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Professional Core	**Course Code**	24CS201P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures

COURSEOUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.	K3
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	K3
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.	K3
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.	K3
CO5	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.	K4

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low,2 -Medium, 3– High)

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

COURSE CONTENT

Exercise1:Array Manipulation

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques– Linear & Binary Search
iii) C Programs to implement Sorting Techniques–Bubble, Selection and Insertion Sort

Exercise2:Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

Exercise3:Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double- ended queue (deque) with essential operations.

Exercise4:Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand its properties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise5:Stack Operations

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a post fix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

Exercise6:Queue Operations

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

Exercise7:Stack and Queue Applications

i) Use a stack to evaluate an in fix expression and convert it to post fix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise8:Binary Search Tree

i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise9:Hashing

i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

TEXTBOOKS

1. Data Structures and algorithm analysis in C, Mark AllenWeiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

REFERENCEBOOKS

1. Algorithms and Data Structures: The Basic Tool box by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V.Aho, Jeffrey D.Ullman, and John E.Hopcroft

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

CHEMISTRY LABORATORY

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Basic Sciences	**Course Code**	24BC201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
Verify the fundamental concepts with experiments.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine the cell constant and conductance of solutions.	K3
CO2	Prepare advanced polymer Bakelite materials.	K2
CO3	Estimate the given amount of dissolved compounds in a solution by using volumetric analysis and preparation of Nano particles	K3
CO4	Analyze the IR spectra of some organic compounds.	K4
CO5	Determine the concentration of different metal ions present in water by complex metric titrations.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

List of Experiments:

1. Determination of Hardness of a groundwater sample
2. Conduct metric titration of strong acid vs. strong base
3. Conduct metric titration of weak acid vs. strong base
4. Preparation of Nano particles. (Cu/Zn)
5. Determination of Vitamin-C
6. Estimation of $KMnO_4$ by using standard oxalic acid solution
7. Preparation of Phenol-formaldehyde resin (Bakelite)
8. Determination of total alkalinity of given sample of water
9. Wave length measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nano materials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publicationsby J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

I Year II Semester

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to CSE, CSE (AIML), CE, EEE ME)

Course Category	Humanities	**Course Code**	24MH201P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation** **Viva Voce** **Total Marks**	90 10 100

COURSE OBJECTIVES
The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	UnderstandtheimportanceofyogaandsportsforPhysicalfitnessandsoundhealth.	
CO2	Demonstrate an understanding of health-related fitness components.	
CO3	Compare and contrast various activities that help enhance their health.	
CO4	Assess current personal fitness levels.	
CO5	Develop Positive Personality	

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I: Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT – II: Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asan as- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices Asana, Kriya, Mudra, Bandha, Dhyana, SuryaNamaskar

UNIT – III: Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Common wealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness,14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company,1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks,2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics,Inc.2014

General Guidelines:

1. Institutes must assign slots in the Time table for the activities of Health/Sports/Yoga.
2. Institutes must provide field /facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

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DEPARTMENT MECHANICAL ENGINEERING

II YEAR I SEMESTER

Numerical Methods and Transform Techniques

(MECH)

Course Category	Basic Sciences	**Course Code**	24BM303T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation & integration, partial fractions, Binomial Theorem.	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To elucidate the different numerical methods to solve nonlinear algebraic equations
2	To disseminate the use of different numerical techniques for carrying out numerical integration.
3	To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Evaluate the approximate roots of poly nomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.	K3
CO2	Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations.	K3
CO3	Apply the Laplace transform for solving differential equations.	K3
CO4	Find or compute the Fourier series of periodic signals.	K3
CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to arange of non-periodic wave forms.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I
Iterative Methods:
Introduction – Solutions of algebraic and transcendental equations: Bisection method–Secant method –Method of false position– Iteration method–Newton-Raphson method (simultaneous Equations)
Interpolation: Newton's forward and backward formulae for interpolation–Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT II
Numerical integration, Solution of ordinary differential equations with initial conditions:
Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge - Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

UNIT III
Laplace Transforms:
Definition of Laplace transform- Laplace transforms of standard functions- Properties of Laplace Transforms- Shifting theorems- Transforms of derivatives and integrals- Unit step function- Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) and integro differential equations using Laplace transforms.

UNIT IV
Fourier series:
Introduction–Periodic functions–Fourier series of periodic function–Dirichlet's conditions–Even and odd functions–Change of interval–Half-range sine and cosine series.

UNIT V
Fourier Transforms:
Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Infinite Fourier transforms–Sine and cosine transforms – Properties – Inverse transforms–Convolution theorem (withou tproof) – Finite Fourier transforms.

TEXT BOOKS
3. **B.S.Grewal,** Higher Engineering Mathematics,44^{th} Edition, Khanna Publishers
4. **B.V.Ramana,** Higher Engineering Mathematics, 2007 Edition,Tata Mc.Graw Hill Education.

REFERENCE BOOKS
1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10^{th} Edition,Wiley-India.
2. **Steven C.Chapra,** Applied Numerical Methods with MAT LAB for Engineering and Science,Tata Mc.Graw Hill Education.
3. **M.K.Jain, S.R.K.Iyengar and R.K.Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4. **LawrenceTuryn,** Advanced Engineering Mathematics, CRC Press.

WEB RESOURCES
1. https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving
2. https://en.wikipedia.org/wiki/Numerical_integration
3. https://mathworld.wolfram.com/LaplaceTransform.html
4. https://en.wikipedia.org/wiki/Fourier_series
5. https://mathworld.wolfram.com/FourierTransform.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT

(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	HSMC	**Course Code**	24HM301T
Course Type	Theory	**L-T-P-C**	2-1-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Blooms Taxonomy Level**
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K1
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K2
CO3	Understand the role of a human being in ensuring harmony in Family And Society.	K1
CO4	Appraise the role of a human being in ensuring harmony in Nature/Existence.	K2
CO5	Distinguish between ethical and unethical practices to actualize a harmonious environment wherever they work.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, self-exploration as the Process for Value Education, Continuous Happiness and Prosperity-the basic human aspirations, Happiness and Prosperity- Current Scenario, Method to Fulfill the Basic Human Aspirations.
Practice Sessions: PS1 Sharing about Oneself , PS2 Exploring Human Consciousness, PS3 Exploring Natural Acceptance

UNIT – II Harmony in Human Being: Understanding Human being as the Co-existence of the self and the body, Distinguishing between the Needs of the self and the body, The body as an Instrument of the self, Understanding Harmony in the self, Harmony of the self with the body, Programme to ensure self - regulation and Health
Practice Sessions: PS4 Exploring the difference of Needs of self and body, PS5 Exploring Sources of Imagination in the self, PS6 Exploring Harmony of self with the body

UNIT – III Harmony in the Family and Society: Harmony in the family - the Basic Unit of Human Interaction, 'Trust' - the Foundational Value in Relationship, 'Respect' - as the Right Evaluation, Other Feelings, Justice in Human – to - Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.
Practice Sessions: PS7 Exploring the Feeling of Trust, PS8 Exploring the Feeling of Respect,
PS9 Exploring Systems to fulfil Human Goal

UNIT – IV Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual fulfillment among the Four Orders of Nature, Realizing Existence as Co- existence at All Levels, The Holistic Perception of Harmony in Existence
Practice Sessions: PS10 Exploring the Four Orders of Nature, PS11 Exploring Co-existence in Existence

UNIT – V Implications of the Holistic Understanding - a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value- based Life and Profession.
Practice Sessions: PS12 Exploring Ethical Human Conduct, PS13 Exploring Humanistic Models in Education, PS14 Exploring Steps of Transition towards Universal Human Order

Text books and Teachers Manual

1. A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 - R R Gaur, R Asthana, G P Bagaria
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 - R R Gaur, R Asthana, G P Bagaria

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth- by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal

Web References:

1. https://fdp-si.aicte-india.org
2. https://www.youtube.com/playlist?list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz

II YEAR I SEMESTER
THERMODYNAMICS

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

(ME)

Course Category	Professional Core	**Course Code**	24ME301T
Course Type	Theory	**L-T-P-C**	2-0-0-2
Prerequisites	Exposure to Engineering Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To Understand the basic concepts of Thermodynamics, Reversibility, Irreversibility
2	To Learn first law for different thermodynamic systems and apply steady flow energy equation for various mechanical components.
3	To Understand the second law statements and concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
4	To Analyze the process of steam formation with various changes.
5	To understand fundamental concepts of Refrigeration, Psychrometry and Air conditioning.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate basic concepts of thermodynamics.	K2
CO2	Apply first law of thermodynamics for different thermodynamic systems.	K3
CO3	Analyze various concepts associated with second and third laws of thermodynamics	K4
CO4	Analyze the mixture of perfect gases using property diagram with the use of steam tables and charts.	K4
CO5	Understand various concepts of Refrigeration and Air-conditioning.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT –I

Introduction: Basic Concepts: System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility.

UNIT –II

Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroeth Law of Thermodynamics – PMM-I, Joule's Experiment – First law of Thermodynamics and applications. Limitations of the First Law – Enthalpy, Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.

UNIT –III

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT – IV

Pure Substances, P-V-T – surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimeter.

UNIT – V

Introduction to Refrigeration: working of Air, Vapor compression, VCR system Components, COP Refrigerants.

Introduction to Air Conditioning: Psychometric properties & processes – characterization of sensible and latent heat loads – load concepts of SHF.

Requirements of human comfort and concept of effective temperature – comfort chart – comfort air Conditioning, and load calculations.

Textbooks:

1. Engineering Thermodynamics, PK Nag 4th Edn, TMH.
2. Thermal Engineering – Domkundwar, Lakshmi Publishers

Reference Books:

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics: An Engineering Approach (SIE), Y.A.Cengel & M.A.Boles , 7th Edn – McGraw Hill
3. An Introduction to Thermodynamics, Y.V.C.Rao, Universities press
4. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.
5. Refrigeration and Air-conditioning, CP Arora, TMH

Online Learning Resources:

1. https://www.edx.org/learn/thermodynamics
2. https://archive.nptel.ac.in/courses/112/106/112106310
3. https://www.youtube.com/watch?v=7NI5P4KqrAs&t=1s
4. https://kp.kiit.ac.in/pdf_files/02/Study-Material_3rd-Semester_Winter_2021_Mechanical-Engg._Thermal-Engineering-1_Abhijit-Samant.pdf
5. https://www.coursera.org/learn/thermodynamics-intro

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR I SEMESTER

MECHANICS OF SOLIDS

(ME)

Course Category	Professional Core	**Course Code**	24ME302T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Exposure to Engineering Mechanics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: The objectives of the course are to	
1	Understand the behavior of basic structural members subjected to uni axial and bi axial loads.
2	Apply the concept of stress and strain to analyse and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.
3	Students will learn all the methods to analyse beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.
4	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior.
5	Design and analysis of Industrial components like pressure vessels.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain various types of stresses due to axial loading and the concept of strain energy.	K2
CO2	Develop shear force and bending moment diagrams for determinate beams subjected to different types of loads.	K3
CO3	Analyze the bending and shear stresses on different cross sections of the beams.	K4
CO4	Examine the slope and deflection of the beam by various methods subjected to point load, UDL, and uniformly varying loads and stresses due to torsion.	K4
CO5	Determine the stresses in thin and thick cylinders subjected to internal pressure and also can be able to find the stability of the columns.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses – Complex Stresses – Stresses on an inclined plane under different uniaxial and biaxial stress conditions – Principal planes and principal stresses – Mohr's circle – Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural Stresses: Theory of simple bending, Derivation of bending equation, Determination of bending stresses – section modulus of rectangular, circular, I and T sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I and T sections.

UNIT – IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, UDL and UVL. Mohr's theorem and Moment area method – application to simple cases.

Torsion: Introduction – Derivation – Torsion of Circular shafts – Pure Shear – Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

UNIT – V

Thin and Thick Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells. Wire wound thin cylinders. Lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.

Columns: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula

Textbooks:

1. Strength of materials /GH Ryder/ Mc Millan publishers India Ltd.
2. Strength of materials by B.C. Punmia – Lakshmi publications Pvt.Ltd, New Delhi.

Reference Books:

1. Mechanics of materials by Gere & Timoshenko.
2. Strength of Materials by Jindal, Umesh Publications.
3. Strength of Materials by S.Timoshenko – D. VAN NOSTRAND Company – PHI Publishers.
4. Strength of Materials by Andrew Pytel and Ferdinand L. Singer Longman – HarperCollins.
5. Solid Mechanics by Popov.
6. Mechanics of Materials/Gere and Timoshenko, CBS Publishers.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc19_ce18/preview
2. https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6
3. https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
4. https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
5. https://www.coursera.org/learn/mechanics-1
6. https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanicalbehavior-of-materials-part-1-linear-elastic-behavior
7. https://archive.nptel.ac.in/courses/112/107/112107146/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR I SEMESTER

MATERIAL SCIENCE & METALURGY

(ME)

(Course Category	Professional Core	**Course Code**	24ME303T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Engineering Chemistry, Basic Civil and Mechanical Engineering	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To know the basic fundamentals of material science, crystalline structure and also study the basic construction of equilibrium diagram with phases in different alloy systems.
2	To study the behavior of ferrous and non-ferrous metals and alloys with their applications in different domains.
3	Able to understand the effect of heat treatment and addition of alloying elements on properties of ferrous metals.
4	Able to understand the methods of making metal powders and applications of powder metallurgy.
5	Comprehend the properties and applications of ceramic, composites and other advanced methods.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.	K1
CO2	Studied the behavior of ferrous and non-ferrous metals and alloys with their applications in different domains.	K3
CO3	Understand the various heat treatment and strengthening processes.	K2
CO4	Studied the making of metal powder methods and applications in powder metallurgy.	K2
CO5	Understand the properties and applications of ceramics, composites and nano materials.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT –I

Structure of Metals and Constitution of alloys: Crystallization of metals. Packing Factor – SC, BCC, FCC & HCP – line density, plane density. Grain and grain boundaries, effect of grain boundaries – determination of grain size. Imperfections – Point and Line, Slip and Twinning.

Necessity of alloying, types of solid solutions, Hume Rothery's rules, intermediate alloy phases, and electron compounds.

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe_3C.

UNIT –II

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast iron. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

UNIT –III

Heat treatment of Steels: Effect of alloying elements on Fe-Fe_3C system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface – hardening methods, age hardening treatment, Cryogenic treatment

UNIT – IV

Powder Metallurgy: Basic processes – Methods of producing metal powders – milling atomization - Granulation – Reduction – Electrolytic Deposition. Compacting methods – Sintering – Methods of manufacturing sintered parts. Secondary operations, Applications of powder metallurgical products.

UNIT – V

Ceramic and Advanced materials: Crystalline ceramics, glasses, cermets, abrasive materials, Classification of composites, manufacturing methods, particle reinforced composites, fiber reinforced composites, PMC, MMC, CMC and CCCs. Introduction to Nanomaterials and smart materials.

Textbooks:

1. Introduction to Physical Metallurgy – Sidney H. Avener – McGraw Hill.
2. Essentials of Materials Science and Engineering – Donald R. Askeland – Cengage.

Reference Books:

1. Material Science and Metallurgy – Dr. V.D. Kodgire – Everest Publishing House.
2. Materials Science and Engineering – Callister & Bala Subrahmanyam – Wiley Publications.
3. Material science and Engineering – V. Raghavan – PHI Publishers.
4. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press.
5. Material Science and Metallurgy – A V K Suryanarayana – B S Publications.
6. Material Science and Metallurgy – U. C. Jindal – Pearson Publications.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/113/106/113106032/
2. https://www.edx.org/learn/mechanics/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-3-time-dependent-behavior.
3. https://www.youtube.com/watch?v=9Sf278j1GTU
4. https://www.coursera.org/learn/fundamentals-of-materials-science
5. https://www.coursera.org/learn/material-behavior

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

II YEAR I SEMESTER
MECHANICS OF SOLIDS & MATERIAL SCIENCE LABORATORY
(ME)

(Course Category	Professional Core	**Course Code**	24ME301P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Exposure to Mechanics of Solids Material science and Metallurgy	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
1. To study the behavior of materials under tension, compression, torsion, bending, shear and impact.
2. To study the behavior of springs under tension and compression.
3. To apply loads to various materials under different equilibrium conditions.
4. To impart the practical exposure on the microstructure of various ferrous and non- ferrous materials and their hardness evaluation

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine modulus of elasticity of bars, beams and springs subjected to various loads.	K3
CO2	Calculate deflection and stiffness of helical spring.	K3
CO3	Examine the behavior of the solid bodies subjected to various types of loading.	K4
CO4	Understand the compositions of various ferrous and non- ferrous materials.	K1
CO5	Identify the various microstructures of steels and cast irons.	K3
CO6	Evaluate the hardness of treated and untreated steels.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	3	3	-	2	3	-	-	-	-	-	-	3
CO4	3	2	1	-	1	2	-	1	-	1	-	-
CO5	2	3	1	2	1	-	-	-	-	-	-	-
CO6	2	3	-	2	2	1	1	-	-	-	-	1

COURSE CONTENT

A) MECHANICS OF SOLIDS LAB:

1. Direct Tension test on Universal testing machine
2. Compression test on wood on Universal testing machine
3. Bending test on
    a. Simply Supported Beam
    b. Cantilever Beam
4. Torsion test.
5. Hardness test
    a. Brinell'S hardness test
    b. Rockwell hardness test
    c. Vickers hardness test
6. Test on springs
7. Compression test on springs
8. Impact test
    a. Charpy test
    b. Izod Test.
9. Punch Shear Test
10. Liquid penetration test
11. Double Shear test on Universal testing machine

B) MATERIAL SCIENCE LAB:

1. Preparation and study of the Microstructure of pure metals.
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, and High carbon steels.
3. Study of the Microstructure of Cast Irons.
4. Study of the Microstructure of Non-ferrous alloys.
5. Study of the Microstructure of Heat-Treated Steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find the hardness of various Treated and Untreated Iron with its Alloy materials.
8. To find the hardness of various Treated and Untreated Aluminum with its Alloy materials.

NOTE: Any 6 experiments to be conducted from each section A and B.

Virtual lab:

1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress. (https://virtual-labs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)

2. To find the impact resistance of mild steel and cast iron. (https://sm-nitk.vlabs.ac.in/exp/izod-impact-test)

3. To find the impact resistance of mild steel. (https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/index.html)

4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel etc. (https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)

5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine. (https://sm-nitk.vlabs.ac.in/exp/vickers-hardness-test)

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

II YEAR I SEMESTER

COMPUTER-AIDED MACHINE DRAWING

(ME)

Course Category	Professional Core	**Course Code**	24ME301P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Engineering Drawing	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Introduce conventional representations of material and machine components.
2	Train to use software for 2D and 3D modeling.
3	Familiarize with thread profiles, riveted, welded and key joints.
4	Teach solid modeling of machine parts and their sections.
5	Explain creation of 2D and 3D assembly drawings.
6	Familiarize with limits, fits, and tolerances in mating components

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate the conventional representations of materials and machine components.	K3
CO2	Model riveted, welded and key joints using CAD system.	K6
CO3	Create solid models and sectional views of machine components.	K6
CO4	Generate solid models of machine parts and assemble them.	K5
CO5	Translate 3D assemblies into 2D drawings.	K6
CO6	Create manufacturing drawing with dimensional and geometric tolerances.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	1	2	-	3
CO2	3	2	2	-	-	-	-	-	1	2	-	3
CO3	3	2	2	-	-	-	-	-	1	2	-	3
CO4	3	2	2	-	3	-	-	-	1	2	-	3
CO5	3	2	2	-	3	-	-	-	1	2	-	3
CO6	3	2	2	-	3	-	-	-	1	2	-	3

COURSE CONTENT

The following are to be done by 2D software package– AutoCAD

Conventional representation of materials and components:

Detachable joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.

Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints.

Welded joints: Lap joint and T joint with fillet, butt joint with conventions.

Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key.

Couplings: Rigid – Muff, flange; flexible – bushed pin-type flange coupling, universal coupling, Oldham's coupling.

The following exercises are to be done by 3D software package – CATIA, CREO, Solid works etc.

Sectional views:

Creating solid models of complex machine parts and sectional views.

Assembly drawings: (Any four of the following using solid model software)

Lathe tool post, tool head of shaping machine, tail-stock, machine vice, gate valve, carburetor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling.

Production drawing:

Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Textbooks:

1. Machine Drawing by K.L. Narayana, P. Kannaiah and K. Venkat Reddy, New Age International Publishers, 3/e, 2014
2. Machine Drawing by N. Sideshwar, P. Kannaiah, V.V.S. Sastry, TMH Publishers. 2014.

Reference Books:

1. Cecil Jensen, Jay Helsel and Donald D. Voisinet, Computer Aided Engineering Drawing, Tata McGraw-Hill, NY, 2000.
2. James Barclay, Brain Griffiths, Engineering Drawing for Manufacture, Kogan Page Science, 2003.
3. N.D. Bhatt, Machine Drawing, Charotar Publishers, 50/e, 2014.

Online Learning Resources:

1. https://eeedocs.wordpress.com/wp-content/uploads/2014/02/machinedrawing.pdf
2. https://archive.nptel.ac.in/courses/112/105/112105294/
3. https://www.edx.org/learn/engineering/dassault-systemes-solidworks-solidworks-cadfundamentals?index=product&queryID=c90b35a82a6ef58b0d6f89679c63f6a1&position=2&linked_from=autocomplete&c=autocomplete
4. https://www.youtube.com/watch?v=0bQkS3_3Fq4

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

II YEAR I SEMETSER

PYTHON PROGRAMMING LABORATORY

(ME)

Course Category	Skill Enhancement Course	**Course Code**	**24AM302P**
Course Type		**L-T-P-C**	**0-0-0-2**
Prerequisites	**NIL**	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	

COURSE OBJECTIVES	
1	**Fundamental Understanding:** Develop a solid foundation in Python programming,covering essential syntax, semantics, and constructs.
2	**Data Manipulation:** Equip students with skills to handle and manipulate data using Python libraries like Pandas and NumPy.
3	**Problem-Solving:** Enhance problem-solving abilities by implementing various algorithms and data structures in Python.
4	**Software Development:** Foster software development skills, including version control, package management, and project documentation.
5	**Advanced Techniques:** Introduce advanced Python topics such as web scraping, API interaction, and database management.

COURSE OUTCOMES		
		Cognitive Level
CO1		
CO2		
CO3		
CO4		
CO5		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1														
CO2														
CO3														
CO4														
CO5														

Experiment 1: Introduction to Python

- Objective: Install Python and setup the development environment.
- Tasks:
  - Install Python and an IDE (e.g., PyCharm, VS Code, or Jupyter Notebook).
  - Write and run a simple "Hello, World!"program.
  - Understand and demonstrate basic Python syntax and semantics.

Experiment 2: Basic Python Programming

- Objective: Learn basic programming constructs in Python.
- Tasks:
  - Create programs using variables, data types, and operators.
  - Implement basic input and output functions.
  - Write programs using control structures (if statements, for loops, while loops).

Experiment 3:Functions and Modules

- Objective: Understand functions and module usage in Python.
- Tasks:
  - Define and call functions with different types of arguments and return values.
  - Explore and use built-in Python modules.
  - Write a script that imports and utilizes atleast two different standard library modules.

Experiment 4: Lists and Tuples

- Objective: Work with Python lists and tuples.
- Tasks:
  - Create, modify, and iterate over lists and tuples.
  - Perform list comprehensions to create new lists.
  - Demonstrate the immutability of tuples.

Experiment 5: Dictionaries and Sets

Objective: Explore dictionaries and sets in Python.

- Tasks:
  - Create and manipulate dictionaries.
  - Use dictionary comprehension.
  - Create and perform operations on sets.

Experiment 6: Strings and File I/O

- Objective: Manipulate strings and perform file I/O operations.
- Tasks:
  - Demonstrate various string methods.
  - Write programs to read from and write to textf iles.
  - Work with different file formats, including CSV and JSON.

Experiment 7:Error Handling and Exceptions

- Objective: Implement error handling in Python programs.
- Tasks:
  - Write programs using try, except, else, and finally blocks.
  - Handle specific exceptions.

    Create and raisecustom exceptions.

Experiment 8: Object-Oriented Programming(OOP)

- Objective: Understand and implement OOP concepts in Python.
- Tasks:
  - Define classes and create objects.
  - Demonstrate inheritance and polymorphism.
  - Use class and instance variables in programs.

Experiment 9: Libraries and Packages

- Objective: Utilize third – party libraries and create Python packages.
- Tasks:
  - Install and use libraries like NumPy and Pandas.
  - Create a simple Python package and distribute it.
  - Work with virtual environments to manage dependencies.

Experiment 10: Working with Data

-Objective: Perform data manipulation and visualization.

- Tasks:
  - Use Pandas to load, manipulate, and analyze data sets.
  - Create visualizations using Matplotlib and Seaborn.
  - Conduct basic data analysis tasks and summarize findings.

Experiment 11: Web Scraping and APIs

- Objective: Extract data from the web and interact with APIs.
- Tasks:
  - Access and parse data from RESTful APIs.
  - Process and analyze JSONdata from APIs.

Experiment 12: Databases

- Objective:Work with databases in Python.

-Tasks:

- Connect to a database using SQLite and SQLAlchemy.
- Perform CRUD operations on the database.
  - Write queries to manage and retrieve data.

Course Outcomes:

- https://www.udemy.com/course/python-the-complete-python-developer-course/?matchtype=e&msclkid=0584dfb54dc715f39c0bb9aaf74033be&utm_campaign=BG-Python_v.PROF_la.EN_cc.INDIA_ti.7380&utm_content=deal4584&utm_medium=udemyads&utm_source=bing&utm_term=_._ag_1220458320107116_._adkw_Python+language_._de_c_._dm._pl_ti_kwd-76278984197882%3Aloc-90_._li_116074_._p&couponCode=IND21PM
- https://www.w3schools.com/python/python_intro.asp
- https://www.youtube.com/watch?v=eWRfhZUzrAc
- https://onlinecourses.nptel.ac.in/noc20_cs83/preview
- https://www.edx.org/learn/python
- VirtualLabs-https://python-iitk.vlabs.ac.in/
- VirtualLabs-https://virtual-labs.github.io/exp-arithmetic-operations-iitk/
- VirtualLabs-https://cse02-iiith.vlabs.ac.in/
- https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/Python%20Lab%20Manual.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR I SEMESTER

EMBEDDED SYSTEMS & IoT LABORATORY

Course Category	Skill Enhancement Course	**Course Code**	24EC301S
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
1. To understand the fundamentals of embedded systems and their applications in IoT.
2. To develop skills in designing and implementing IoT solutions using embedded systems.
3. To explore the integration of sensors, actuators, and communication protocols in IoT systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Comprehend the basics of embedded systems and apply them in IoT contexts.	K2
CO2	Acquire the ability to design and implement practical IoT solutions using embedded systems.	K3
CO3	Gain proficiency in integrating sensors, actuators, and communication protocols to develop functional IoT systems.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes(1–Low,2 -Medium,3–High)

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

List of Experiments:

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. Determination of F to F a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift / Wien Bridge Oscillator
5. Hartley / Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darling ton Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required : Software:

i. Multisim / Equivalent Industrial Standard Licensed simulation software tool.

ii. Computer Systems with required specifications

Hardware Required:

1. Regulated Power supplies
2. Analog / Digital Storage Oscilloscopes
3. Analog / Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes / Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analogor Digital)
8. Voltmeters (Analogor Digital)
9. Active & Passive Electronic Components

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR I SEMESTER

ENVIRONMENTAL SCIENCE

(Common to all branches)

Course Category	BASIC SCIENCES	**Course Code**	**24BC301T**
Course Type	Theory	**L-T-P-C**	2 -0-0
prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

S.No.	Course Objectives
1	To make the students to get awareness on environment
2	To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
3	To save earth from the inventions by the engineers.

COURSE OUTCOMES		Cognitive Level
Upon successful completion of the course, the student will be able to:		
CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	K2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	K2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	K2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	K2
CO5	Illustrate the casus of population explosion, value education and welfare programmes.	K3

Contribution of Course Outcomes towards achievement of Program

Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	0	1	0	0	1	2	0	0	0	1	0
CO2	0	1	0	0	0	0	1	0	0	0	0	0
CO3	0	0	0	0	2	0	1	0	0	0	0	0
CO4	0	0	0	0	1	1	3	0	0	0	0	0
CO5	0	0	0	0	0	0	3	1	0	0	0	0

COURSE CONTENT

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources-Renewable and non-renewable resources (Biomass).

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a)Forest ecosystem, b)Grassland ecosystem, c)Desert ecosystem, e)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)(Primary Treatment)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hotspots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of: a) Air Pollution, b)Water pollution, c)Soil pollution, d)Marine pollution, e)Noise pollution, f)Thermal pollution, g)Nuclear hazards (Primary treatment)

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics (Issues and possible solutions) –Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population and The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Viral infections -Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science
- http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
- https://www.youtube.com/watch?v=5QxxaVfgQ3k

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

II YEAR II SEMESTER

INDUSTRIAL MANAGEMENT

(ME)

Course Category	Management Course – I	**Course Code**	24ME401T
Course Type	Theory	**L-T-P-C**	2-0-0-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Introduce the scope and role of industrial engineering and the techniques for optimal design of layouts.
2	Illustrate how work study is used to improve productivity.
3	Explain TQM and quality control techniques.
4	Introduce financial management aspects.
5	Discuss human resource management and value analysis.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Learn about how to design the optimal layout	K1
CO2	Demonstrate work study methods	K3
CO3	Explain Quality Control techniques	K2
CO4	Discuss the financial management aspects and	K2
CO5	Understand the human resource management methods.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

Introduction: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

Plant Layout: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and break down maintenance.

UNIT – II

Work Study: Importance, types of production, applications, work study, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs.

UNIT – III

Statistical Quality Control: Quality control, Queuing assurance and its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – $\bar{X}$ and R – charts $\bar{X}$ and S charts and their applications, numerical examples.

Total Quality Management: zero defect concept, quality circles, implementation, applications, ISO quality systems. Six Sigma – definition, basic concepts

UNIT – IV

Financial Management: Scope and nature of financial management, Sources of finance, Ratio analysis, Management of working capital, estimation of working capital requirements, stock management, Cost accounting and control, budget and budgetary control, Capital budgeting – Nature of Investment Decisions – Investment Evaluation criteria- NPV, IRR, PI, Payback Period, and ARR, numerical problems.

UNIT – V

Human Resource Management: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, meritrating, quantitative methods, wage incentive plans, and types.

Value Analysis: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

Textbooks:

1. O.P Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd, 2018.
2. Mart and Telsang, Industrial Engineering and Production Management, S.Chand & Company Ltd. New Delhi, 2006.

Reference Books:

1. Bhattacharya DK, Industrial Management, S.Chand, publishers, 2010.
2. J.G Monks, Operations Management,3/e, McGraw Hill Publishers1987.
3. T.R. Banga, S.C. Sharma, N. K. Agarwal,Industrial Engineering and Management Science, Khanna Publishers, 2008.
4. Koontz O' Donnell, Principles of Management, 4/e, McGraw Hill Publishers, 1968.
5. R.C. Gupta, Statistical Quality Control, Khanna Publishers, 1998.
6. NVS Raju, Industrial Engineering and Management,1/e, Cengage India Private Limited, 2013.

Online Learning Sources

1. https://onlinecourses.nptel.ac.in/noc21_me15/preview
2. https://onlinecourses.nptel.ac.in/noc20_mg43/preview
3. https://www.edx.org/learn/industrial-engineering
4. https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi
5. https://youtube.com/playlist?list=PLbjTnj-t5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG69hS3v2ll

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER
COMPLEX VARIABLES, PROBABILITY AND STATISTICS
(MECH)

Course Category	Basic Sciences	**Course Code**	24ME401T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation & integration, Binomial Theorem, Probability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To familiarize the complex variables
2	To familiarize the students with the foundations of probability and statistical method
3	To equip the students to solve application problems in their disciplines.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply Cauchy-Riemann equations to complex functions inorder to determine whether a given continuous function is analytic.	K3
CO2	Make use of the Cauchy residue theorem to evaluate certain integrals.	K3
CO3	Apply discrete and continuous probability distributions.	K3
CO4	Design the components of a classical hypothesistest	K3
CO5	Infer the statistical inferential methods based on smal land large sampling tests,	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I
Functions of a complex variable and Complex integration:
Introduction – Continuity – Differentiability – Analyticity – Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.
Complex integration : Line integral – Cauchy's integral theorem – Cauchy's integral formula– Generalized integral formula (all without proofs) and problems on above theorems.

UNIT II
Series expansions and Residue Theorem:
Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.
Types of Singularities : Isolated – Essential – Pole of order m–Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and $\int_{c}^{c+2\pi} f(\cos\theta,\ \sin\theta)d\theta$.

UNIT III
Probability and Distributions:
Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions–Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance–Binomial, Poisson, Uniform and Normal distributions.

UNIT IV
Sampling Theory:
Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions – Introduction to t,χ^2 and F-distributions –point and interval estimations – maximum error of estimate.

UNIT V
Tests of Hypothesis:
Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors –Level of significance – One tail and two – tail tests – Tests concerning one mean and two means (Large and Small samples) –Tests onproportions.

TEXT BOOKS
1. B.S.Grewal,HigherEngineeringMathematics,44/e,KhannaPublishers.
2. MillerandFreund's,ProbabilityandStatisticsforEngineers,7/e,Pearson,2008.
3. Complex variables and statistical methods, S.Chand publishers, Dr. T.K.V. Iyengar, 2022 Edition.

REFERENCE BOOKS
1. J.W.Brown and R.V.Churchill, Complex Variables and Applications, 9/e, Mc-Graw Hill, 2013.
2. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. Jayl.Devore, Probability and Statistics for Engineering and the Sciences, 8/e, Cengage.
4. Shron L.Myers, KeyingYe, Ronald EWalpole, Probability and Statistics Engineers and the Scientists, 8/e, Pearson 2007.
5. Sheldon, M.Ross, Introduction to probability and statistics Engineers and the Scientists, 4/e, Academic Foundation,2 011.

WEB RESOURCES
1. https://archive.nptel.ac.in/courses/111/103/111103070/
2. https://biet.ac.in/pdfs/PROBABILITY%20AND%20STATISTICS%20&%20COMPLEX%20VARIABLES.pdf
3. https://archive.nptel.ac.in/courses/111/105/111105090/
4. http://acl.digimat.in/nptel/courses/video/111102160/L23.html
5. https://onlinecourses.nptel.ac.in/noc21_ma57/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER

MANUFACTURING PROCESSES

(ME)

Course Category	Professional Core	**Course Code**	24ME402T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To impart basic knowledge and understanding about casting processes.
2	To impart basic knowledge and understanding about welding processes.
3	To impart basic knowledge and understanding about bulk forming processes.
4	To impart basic knowledge and understanding about sheet metal forming processes.
5	To impart basic knowledge and understanding about additive manufacturing processes.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design the patterns and core boxes for metal casting processes	K2
CO2	Understand the different welding processes	K2
CO3	Demonstrate the different types of bulk forming processes	K1
CO4	Understand sheet metal forming processes	K2
CO5	Learn about the different types of additive manufacturing processes	K1

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT –I

Casting: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding, different types of cores, Principles of Gating, Risers, casting design considerations. Methods of melting and types of furnaces, Solidification of castings and casting defects – causes and remedies. Basic principles and applications of special casting processes-Centrifugal casting, Die casting, Investment casting and shell molding.

UNIT –II

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy-Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG& MIG welding. Electro–slag welding.

Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, welding defects – causes and remedies.

UNIT –III

Bulk Forming: Plastic deformation in metals and alloys – recovery, recrystallization and grain growth. Hot working and Cold working – Strain hardening and Annealing. Bulk forming processes: Forging – Types of Forging, forging defects and remedies; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

UNIT – IV

Sheet Metal Forming: Blanking and piercing, Forces and power requirement in these operations, Deep drawing, stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.

High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations.

UNIT – V

Additive Manufacturing: Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM, and types of materials for AM, VAT photopolymerization AM Processes – Stereolithography Apparatus (SLA) Process, Extrusion based AM Processes – Fused Deposition Modeling (FDM) Process, Powder Bed Fusion AM Processes – Selective Laser Sintering (SLS) Process, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications

Textbooks:

1. Manufacturing Processes for Engineering Materials – Kalpak Jain S and Steven R SchmidPearson Publications, 5thEdn.
2. Manufacturing Technology – Vol I – P.N. Rao – TMH Publishers.

Reference Books:

1. Manufacturing Science – A. Ghosh & A.K. Malik – East West Press Pvt. Ltd.
2. Process and materials of manufacture – Lindberg – PHI publishers
3. Production Technology – R.K. Jain – Khanna Publishers.
4. Production Technology – P C Sharma – S. Chand Publications.
5. Manufacturing Processes – H.S. Shaun – Pearson Publishers.
6. Manufacturing Processes – J.P. Kaushish – PHI Publishers.
7. Workshop Technology – WAJ Chapman / CBS Publishers & Distributors Pvt. Ltd.
8. Production Technology – HMT – Tata McGraw Hill Publishers
9. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", 2nd Edition, Springer, 2015

Online Learning Resources:

1. https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology-fundamentals-of-manufacturing-processes
2. https://onlinecourses.nptel.ac.in/noc21_me81/preview
3. www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
4. https://archive.nptel.ac.in/courses/112/103/112103263/
5. https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-forming-technology/?v=c86ee0d9d7ed

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER

FLUID MECHANICS & HYDRAULIC MACHINES

(ME)

Course Category	Professional Core	**Course Code**	24ME403T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Engineering Mechanics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To study different fluid properties and Manometers.
2	Understand the kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations.
3	To study the concept of boundary layer theory.
4	To study different types of hydraulic turbines, draft tube theory, efficiency, and performance characteristics.
5	To study types of Pumps, work done, efficiency, performance of pumps & characteristic curves.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic concepts of fluid properties and the concepts of Buoyancy	K2
CO2	Estimate the mechanics of fluids in static and dynamic conditions	K5
CO3	Apply the Boundary layer theory, flow separation and dimensional analysis.	K4
CO4	Estimate the hydrodynamic forces of jet on vanes in different positions.	K5
CO5	Understand the working Principles and performance evaluation of hydraulic pump and turbines.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

Fluid statics: Dimensions and units: physical properties of fluids – specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers – Piezometer, U-tube, inverted and differential manometers. Pascal's & hydrostatic laws.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT – II

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line.

UNIT – III

Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Non-dimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem.

UNIT – IV

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working proportions, work done, efficiencies, hydraulic design – draft tube – theory – functions and efficiency.

UNIT – V

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems – hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Centrifugal pumps: Classification, working, work done – manometric head – losses and efficiencies specific speed – pumps in series and parallel – performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams

Textbooks:

1. Fluid Mechanics – Fundamentals and Applications, Y.A.Cengel & J.M.Cimbala, Tata McGraw hill, 2008.
2. Fluid Mechanics – Dixon, 7th Edn, Elsevier Publishers.

Reference Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery – Modi and Seth
2. Fluid Mechanics and Hydraulic Machines – RK Bansal – Laxmi Publications (P)Ltd.
3. Fluid Mechanics and Hydraulic Machines – Rajput
4. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S K Kataria & Sons.
5. Fluid Mechanics and Machinery – D. Rama Durgaiah, New Age International.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/112/105/112105206/
2. https://archive.nptel.ac.in/courses/112/104/112104118/
3. https://www.edx.org/learn/fluid-mechanics
4. https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in
5. www.coursera.org/learn/fluid-powerera

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

R23

II YEAR II SEMESTER

THEORY OF MACHINES

(ME)

Course Category	Professional Core	**Course Code**	24ME404T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	Introduce various basic mechanisms and their applications.
2	Explain importance of degree of freedom.
3	Familiarize velocity and acceleration in mechanisms.
4	Describe the cams and follower motions.
5	Explain the importance of gyroscopic couples.
6	Introduce the equation of motion for single degree of freedom system.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand different mechanisms and their inversions.	K2
CO2	Calculate velocity and acceleration of different links in a mechanism.	K3
CO3	Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.	K3
CO4	Evaluate unbalance mass in rotating machines.	K4
CO5	Analyze free and forced vibrations of single degree freedom systems.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I

Simple Mechanisms: Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, mobility – Grashof's law, kinematic inversions of four bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission angle – Description of some common mechanisms – Quick return mechanism, straight line mechanisms – Universal Joint – Rocker mechanisms.

UNIT – II

Plane and motion analysis: Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations – kinematic analysis of simple mechanisms – slider crank mechanism dynamics – Coincident points – Coriolis component of acceleration.

UNIT – III

Gyroscope: Principle of gyroscope, gyroscopic effect in an aeroplane, ship, car and two-wheeler, simple problems

Gear Profile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting – helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.

UNIT – IV

Balancing of Rotating masses: Need for balancing, balancing of single mass and several masses in different planes, using analytical and graphical methods.

Cams: Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – derivatives of follower motions – specified contour cams – circular and tangent cams – pressure angle and undercutting.

UNIT – V

Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations – under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility.

Turning Moment Diagrams and Flywheels: Turning moment diagrams for steam engine, I.C engine and Multi Cylinder Engine. Crank effort – coefficient of fluctuation of energy, coefficient of fluctuation of speed – Fly Wheel and their design, fly wheels for punching press.

Text Books:

1. S.S. Rattan, Theory of Machines, 4/e, Tata Mc-Graw Hill, 2014.
2. P.L. Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers, Delhi, 2003.

Reference Books:

1. F. Haidery, Dynamics of Machines, 5/e, Nirali Prakashan, Pune, 2003.
2. J.E. Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014.
3. G.K. Groover, Mechanical Vibrations, 8/e, Nemchand Bros, 2009.
4. Norton, R.L., Design of Machinery – An Introduction to Synthesis and Analysis of Mechanisms and Machines, 2/e, McGraw Hill, New York, 2000.
5. William T. Thomson, Theory of vibration with applications, 4/e, Englewood Cliffs, N.J.: Prentice Hall, 1993.

Online Learning Resources

1. www.mekanizmalar.com
2. https://nptel.ac.in/courses/112105236/21
3. https://nptel.ac.in/courses/112105236/34
4. https://nptel.ac.in/courses/112104121/
5. https://nptel.ac.in/courses/112106137/pdf/2_1.pdf.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER

FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY

(ME)

Course Category	Professional Core	**Course Code**	24ME403P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
To impart practical exposure on the performance evaluation methods of various flow measuring equipment, hydraulic turbines and pumps.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the fundamental principles of fluid mechanics, calculations involving basic flow measuring devices like venture meter, Orifice meter and major and minor losses of fluid flow through the pipes.	K3
CO2	Estimate the optimum efficiency of a given turbine under different load and (or) speed conditions and to analyze the trends depicted by characteristic curves obtained from the experiments.	K4
CO3	Estimate the optimum efficiency of a given pump under different load and (or) speed conditions and to analyze the trends depicted by characteristic curves obtained from the experiments.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	-	-	3	3	-	-	-	-	-
CO2	3	-	-	2	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	2	-	-	-	-	-

COURSE CONTENT

LIST OF EXPERIMENTS

1. Impact of Jets on Vanes.
2. Performance test on Pelton wheel
3. Performance test on Francis turbine
4. Performance test on Kaplan turbine
5. Performance test on Single stage centrifugal pump
6. Performance test on Multi stage centrifugal pump
7. Performance test on Reciprocating pump
8. Calibration of Venturimeter
9. Calibration of Orifice meter
10. Determination of Friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline
12. Turbine flowmeter

NOTE: Any 10 experiments can be conducted from the above

Virtual Lab:

1. To study different patterns of a flow through a pipe and correlate them with the Reynolds number of the flow.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/reynolds/introduction.html)

2. To calculate Total Energy at different points of venture meter.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/introduction.html)

3. To calculate the flow (or point) velocity at center of the given tube using different flow rates.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/pitot/introduction.html)

4. To determine the hydrostatic force on a plane surface under partial submerge and full submerge condition.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/cop/introduction.html)

5. To determine the discharge coefficient of a triangular notch.
(https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/introduction.html)

6. To determine the coefficient of impact of jet on vanes.
(https://fm-nitk.vlabs.ac.in/exp/impact-of-jet)

7. To determine friction in pipes.
(https://fm-nitk.vlabs.ac.in/exp/friction-in-pipes/index.html)

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER

MANUFACTURING PROCESSES LABORATORY

(ME)

Course Category	Professional Core	**Course Code**	23ME402P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
To impart hands-on practical exposure on manufacturing processes and equipment.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Prepare the pattern, mould and casting.	K3
CO2	Perform different welding operations and plastic parts processing operations	K3
CO3	Perform sheet metal operations and bending operations and make simple 3D printing parts	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	-	-	-	-	1	-	1	-
CO2	3	3	3	2	-	-	-	-	1	-	1	-
CO3	3	3	3	2	-	-	-	-	1	-	1	-

COURSE CONTENT

List of Experiments

1. Design and making of pattern
   i. Single piece pattern
   ii. Split pattern
2. Sand properties testing
   i. Sieve analysis (dry sand)
   ii. Clay content test
   iii. Moisture content test
   iv. Strength test (Compression test & Shear test)
   v. Permeability test
3. Mould preparation
   i. Straight pipe
   ii. Bent pipe
   iii. Dumble
   iv. Gear blank
4. Gas cutting and welding
5. Manual metal arc welding
   i. Lap joint
   ii. Butt joint
6. Injection Molding
7. Blow Molding
8. Simple models using sheet metal operations
9. Blanking & Piercing Operations
10. Study of deep drawing and extrusion operations
11. To make weldments using TIG/MIG welding
12. To weld using Spot welding machine
13. Bending and other operations
14. To join using Brazing and Soldering
15. To make simple parts on a 3D printing machine
16. Demonstration of metal casting.
17. Study of simple, compound and progressive dies

NOTE: Any 10 experiments can be conducted from the above

Virtual Lab:

1. To study and observe various stages of casting through demonstration of casting process. (https://virtual-labs.github.io/exp-sand-casting-process-dei/theory.html)
2. To weld and cut metals using an oxyacetylene welding setup. (https://virtuallabs.github.io/exp-gas-cutting-processes-iitkgp/index.html)
3. To simulate Fused deposition modelling process (FDM) (https://3dpdei.vlabs.ac.in/exp/simulation-modelling-process)
4. https://altair.com/inspire-mold/
5. https://virtual-labs.github.io/exp-simulation-cartesian-system-dei/theory.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER
SOFT SKILLS

Course Category	Humanities	**Course Code**	24BE401S
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites	LSRW Skills	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To prepare to face global competition for employment and excellence in the profession.
2	To help the students understand and build intrapersonal and interpersonal skills that will enable them to lead meaningful professional lives.

S.NO	**COURSE OUTCOME**		**Cognitive Level**
1	CO1	Assimilate and understood the meaning and importance of soft kills and learn how to develop them.	K1
2	CO2	Understand the significance of skills in the working environment for Professional excellence.	K2
3	CO3	Prepare to undergo the placement process with confidence and clarity.	K3
4	CO4	Ready to face any situation in life and equip themselves to handle them effectively.	K6
5	CO5	Understand and learn the importance of etiquette in both professional and personal life.	K2

K1- Remembering, K2- Understanding, K3-Applying, K-4 Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I
Introduction:
Introduction: Emergence of life skills, definition, Importance& need, reasons for skill gap, Analysis--Soft Skills vs. hard skills, Linkage between industry and soft skills, Challenges, Personality Developments. Soft Skills, Soft Skills vs English - Improving Techniques.

UNIT II
Intra-Personal:
Definition-Meaning–Importance- SWOT analysis, Johari windows- Goal Setting – quotient skills - Emotional Intelligence- Attitudinal skills - Right thinking- Problem Solving-Time management, stress management.

UNIT III
Inter-Personal:
Definition–Meaning–Importance-Communications skills-Teamwork, managerial skills
-Negotiation skills -Leadership skills, corporate etiquettes**.**

UNIT IV
Verbal Skills:
Definition and Meaning-Listening skills, need- types, advantages, Importance-Improving Tips for Listening, Speaking, need- types, benefits, Importance- Improving Tips, Reading- Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance-Improving Tips.

UNIT V
Non Verbal Skills & Interview skills

Definition and Meaning – Importance- Facial Expressions- Eye Contact – Proxemics- Haptics -Posture, cross cultural body language, body language in the interview room, appearance and dress code–Kinetics-Para Language-tone, pitch, pause, neutralization of accent, use of appropriate language, Interview skills, interview methods, and questions.

TEXT BOOKS

1. Sherfield, M. Robert at al, Cornerstone Developing SoftSkills,4/e, Pearson Publication, New Delhi, 2014.
2. Alka Wadkar, Life Skills for Success, 1/e, Sage Publications India Private Limited, 2016.

REFERENCE BOOKS

1. Sambaiah .M. Technical English, Wiley Publishers India. New Delhi. 2014.
2. Gangadhar Joshi, From Campus to Corporate, SAGE TEXT.
3. Alex. K, Soft Skills, 3rd ed. S. Chand Publication, New Delhi, 2014.
4. Meenakshi Raman and Sangita Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2009.
5. Shalini Varma, Body Language for Your Success Mantra, 4/e, S. Chand Publication, New Delhi, 2014.
6. Stephen Covey, Seven Habits of Highly Effective People, JMDBook, 2013.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_hs60/preview
2. http://www.youtube.com/@softskillsdevelopment6210
3. https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&si=Fs05Xh8ZrOPsR8F4
4. https://www.coursera.org/learn/people-soft-skills-assessment?language=English
5. https://www.edx.org/learn/soft-skills

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

R23

(Autonomous)

DEPARTMENT MECHANICAL ENGINEERING

II YEAR II SEMESTER

DESIGN THINKING & INNOVATION

(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	BS&H	**Course Code**	23HM401P
Course Type	Theory	**L-T-P-C**	1 -0 -2-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO 1	Define the concepts related to design thinking.	K1
CO 2	Explain the fundamentals of Design Thinking and innovation.	K2
CO 3	Apply the design thinking techniques for solving problems in various sectors.	K3
CO 4	Analyze to work in a multidisciplinary environment.	K4
CO 5	Evaluate the value of creativity.	K5

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Web Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview