B. TECH. FOUR YEARS

COURSE STRUCTURE AND SYLLABUS
FOR

MECHANICAL ENGINEERING
(AR23)

(Applicable for the batches admitted from 2023-24)

DEPARTMENT OF MECHANICAL ENGINEERING

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION AFFILIATED TO JNTUGV, VIZIANAGARAM)

Approved By AICTE, New Delhi, Accredited By NBA, AICTE & NAAC, UGC, New Delhi, Listed Under 2(F) & 12(B), UGC, New Delhi, TEQIP Participated College.

K.KOTTURU, TEKKALI,- 532 201, SRIKAKULAM DIST., AP

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

DEPARTMENT OF MECHANICAL ENGINEERING

Aditya Institute of Technology and Management established the Department of Mechanical Engineering (ME) in 2004 with an initial intake of 60 students and got approval for additional intake of another 60 seats in 2011-12. A Post Graduate Program (M. Tech) in Thermal Engineering was introduced in 2011-12 with an intake of 18 seats. The Department of ME feels proud to announce that this Institution has got accredited by NAAC. The college has got TEQIP funds in phase-II under sub-component 1.1. These two important additions surely enhance the prestige of the institution and in turn help students to improve their academic standards. Both the B. Tech and M. Tech programs were duly approved by the AICTE and Govt. of A.P. and permanently affiliated to JNTUGV, Vizianagaram. The Department has its UG Mechanical Engineering Program accredited thrice by NBA in 2013, 2017 and 2021. Further the UG B.Tech. intake has been enhanced to 180 in the year 2019. The Department has JNTUGV authorized research center with five research scholars pursuing their Ph.D. The Department is further equipped with skill oriented labs including Siemens-PLM authorized training centre and Applied Robot Control lab in association with European Centre for Mechatronics & Manufacturing, Germany. The State of art laboratories such as 3DX lab from Dassault Systemes, Automobile and Refrigeration-Air conditioning labs in association with AP State Skilled Development Center stand as assets to Department of Mechanical Engineering by which the skill-sets of students are being enhanced.

VISION OF THE DEPARTMENT

To emerge as one of the most preferred departments in the Southern region to produce professionally competent mechanical engineers.

MISSION OF THE DEPARTMENT

1. Provide students with a set of necessary knowledge, skills and attitude.
2. Develop the professional potential of students through comprehensive teaching and learning processes.
3. Inculcate life-long learning among the students to serve the profession and meet intellectual, ethical and career challenges.
4. Establish vital, state-of-the-art research facilities to provide its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1: Attain successful careers in Mechanical or allied Engineering disciplines.

PEO 2: Create new methods and processes to solve contemporary mechanical engineering problems.

PEO 3: Exhibit ethical and leadership qualities in their chosen professional careers.

PROGRAM OUTCOMES

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1 : Analyze and design mechanical components as per given specifications using Engineering and Design Analysis software tools.

PSO 2 : Evaluate thermal systems including IC engines, Refrigeration & Air - Conditioning, and Power generating systems.

PSO 3 : Apply traditional and modern to manufacture and assemble mechanical components with quality assurance.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

AR23 – COURSE STRUCTURE (1st B.Tech.)

(Proposed for Mechanical)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (1st Sem)	MC	23MCS101	Induction Program	3 weeks			0
	BH	23BHT102	Linear Algebra and Calculus	2	1	0	3
	BH	23BHT104	Engineering Physics	3	0	0	3
	ES	23EST102	Basic Electrical and Electronics Engineering	3	0	0	3
	ES	23EST105	Introduction to Programming	3	0	0	3
	ES	23EST103	Engineering Graphics	1	0	4	3
	BH	23BHL102	Engineering Physics Lab	0	0	3	1.5
	ES	23ESL102	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
	ES	23ESL105	Computer Programming Lab	0	0	3	1.5
	MC	23MCS102	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
Total				**12**	**1**	**14**	**20**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (2nd Sem)	BH	23BHT101	Communicative English	3	0	0	3
	BH	23BHT103	Differential Equations and Vector Calculus	2	1	0	3
	BH	23BHT106	Engineering Chemistry	3	0	0	3
	ES	23EST104	Engineering Mechanics	3	0	0	3
	PC	23MET101	Thermodynamics	3	0	0	3
	ES	23ESL104	Engineering Workshop	0	0	3	1.5
	BH	23BHL101	Communicative English Lab	0	0	3	1.5
	BH	23BHL104	Engineering Chemistry Lab	0	0	3	1.5
	MC	23MCS103	Health and Wellness, Yoga and Sports	0	0	1	0.5
Total				**14**	**1**	**10**	**20**

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

INDUCTION PROGRAMME
(Common to All Branches of Engineering)

Subject Code: 23MCS101

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	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 labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematicalskills	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

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

LINEAR ALGEBRA & CALCULUS
(Common to All Branches of Engineering)

Subject Code: 23BHT102

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows.

- Develop proficiency in fundamental algebraic techniques. Apply algebraic concepts to solve engineering problems and practical applications.
- Understand the principles of linear transformations. Explore the concept of orthogonal transformations. Apply these transformations in engineering contexts and problem-solving.
- Gain a deep understanding of calculus concepts. Apply calculus to analyze and solve real-world problems. Explore the applications of calculus in engineering and related fields.
- Understand the concept of functions with multiple variables. Explore optimization techniques using functions of several variables. Apply these concepts in engineering optimization problems
- Learn the concepts of double integrals in two dimensions. Understand triple integrals in three dimensions. Apply integration techniques for calculating areas and volumes in engineering applications.

COURSE OUTCOMES:

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

CO 1: Develop matrix algebra techniques that is needed by engineers for practical applications.

CO 2: To find the eigen values and eigen vectors and solve the problems by using linear transformation

CO 3: Learn important tools of calculus in higher dimensions.

CO 4: Familiarize with functions of several variables which is useful in optimization.

CO 5: Familiarize with double and triple integrals of functions of several variables in two and three dimensions.

UNIT - I: Matrices:

Rank of a matrix by echelon form, normal form. Inverse of Non- singular matrices by Gauss-Jordan method. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT- II: Linear Transformation and Orthogonal Transformation:

Eigen values, Eigen vectors and their properties(without Proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadraticform 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.

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

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – V : Multiple Integrals (Multi variable Calculus):

Duble integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text books:

1. B.S.Grewal,HigherEngineeringMathematics,44/e, Khanna Publishers,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.

Reference Books:

1.R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 5/e, Alpha ScienceInternational Ltd.,2021 (9th reprint).

2.George B. Thomas, Maurice D.Weir and Joel Hass, Thomas Calculus,14/e, PearsonPublishers, 2018.

3.Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.

4.Michael Greenberg, Advanced Engineering Mathematics, 9thedition, Pearson edn

5.H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand,2021.

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

ENGINEERING PHYSICS
(Common to All Branches of Engineering)

Subject Code: 23BHT104

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
- To identify the importance of the optical phenomenon. interference, diffraction and polarization related to its Engineering applications
- Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
- To Understand the Physics of Semiconductors and their working mechanism, Concept utilization of transport phenomenon of charge carriers in semiconductors.

COURSE OUTCOMES

CO 1: Explain the need of coherent sources and the conditions for sustained interference (L2). **Identify** the applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2).

CO 2:Classify various crystal systems (L2). **Identify** different planes in the crystal structure (L3).**Analyze** the crystalline structure by Bragg's X-ray diffracto meter (L4).

CO 3:Explain the concept of dielectric constant and polarization in dielectric materials (L2).**Summarize** various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2).

CO 4: Describe the dual nature of matter (L1). **Explain** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3).

CO5:Classify the crystalline solids (L2).**Outline** the properties of charge carriers in semiconductors (L2).**Identify** the type of semiconductor using Hall effect (L2). **Apply** the concept of effective mass of electron (L3).

UNIT-I: Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors 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 & Diffraction Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II: Crystallography

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. Bragg's law - X-ray Diffractometer – crystal structure determination by Laue method and Powder method.

UNIT-III: Dielectric And Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius-Mossotti equation.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, Para, Ferro, Anti ferro & Ferri magnetic materials - Domain concept for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV: Quantum Mechanics and Free electron theory

Quantum Mechanics: 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: 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 and its temperature dependence.

UNIT – V: Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

Text Books

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar& TVS ArunMurthy,S.Chand Publications, 11th Edition 2019.
2. "EngineeringPhysics"-D.K.Bhattacharyaand PoonamTandon,Oxford press(2015).
3. "EngineeringPhysics"-P.K.Palanisamy SciTechpublications.

Reference Books

1. “Fundamentals of Physics” - Halliday, Resnick and Walker, John Wiley &Sons.
2. “Engineering Physics” - M.R. Srinivasan, New Age international publishers (2009).
3. “Engineering Physics” - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. “Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. “Semiconductor physics and devices:Basic principle” - A. Donald, Neamen, Mc GrawHill.
6. “Engineering Physics” - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. “Solid state physics” – A.J.Dekker ,Pan Macmillan publishers
8. “Introduction to Solid State Physics” -Charles Kittel ,Wiley

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common for CSE-IT-CSM-CSD-MECH-CE)

Subject Code: 23EST102

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic knowledge of electric circuits
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To understand the working, characteristics of PN Junction diode, Zener diode
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET and MOSFET.

COURSE OUTCOMES:

CO 1: Able to summarize different electrical circuits.
CO 2: Able to outline the basics of AC circuits.
CO 3: Able to examine DC Generator & DC Motor.
CO 4: Able Describe the working principle of PN Junction diode, Zener diode
CO 5: Able to Describe the working and behavior of transistor (BJT) in different configurations, JFET and MOSFET.

UNIT –I: Introduction to Electric Circuits

Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, Faraday's laws of electromagnetic induction, Lenz's law, simple problems.

UNIT-II: AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

UNIT-III: DC Machines

DC Generator: Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

DC Motor: Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

UNIT-IV: Diode Characteristics

Formation of PN junction diode, V-I Characteristics of Diode, Diode as a switch, Zener Diode Characteristics, Zener Diode as Voltage Regulator.

UNIT-V: Transistor Characteristics

Bipolar Junction Transistors (BJT) - input & output Characteristics of transistor in CB, CE, CC configurations, Relationship between α, β and γ. Field effect transistors (FET) -Characteristics of JFET, MOSFET (Enhancement and depletion)

TEXT BOOKS

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill,2009.

REFERENCE BOOKS

1. Basic Electrical Engineering Dr.K.B.Madhu Sahu scitech publications (india) pvt.ltd.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashel sky, Pearson/Prentice Hall, 9thEdition, 2006.
3. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill,2010.

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

INTRODUCTION TO PROGRAMMING
(Common to All Branches of Engineering)

Subject Code: 23EST105

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.

COURSE OUTCOMES
On completion of this course, the student will be able to:

CO 1: Understand the fundamentals of Computers and C programming

CO 2: Develop programs using control structures and Arrays to store and manipulate data

CO 3: Design modular programs using functions and storage classes

CO 4: Use structures and pointers to manipulate record based data

CO 5: Implement and manipulate files on secondary storage media

UNIT – I
Introduction to Programming: Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Data Types, Operator precedence and associativitiy, Structure of C program, simple programs using Basic I/O statements.

UNIT – II
Control Structures: Decision statements: if, if-else, nested if, if-else-if ladder, and switch
Iterative statements: while loop, do-while loop, for loop, nested loops
Branching: Break, continue
Arrays: Definition, Types: Single Dimensional arrays, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.

UNIT – III
Functions: Definition, Declaration, Types of Functions, Parameter passing, Call by value and call by reference, Passing Arrays to functions, Recursion, Scope and lifetime of variables, Command line arguments, Storage classes.
Pointers: Definition, Declaration, Initialization, Pointer arithmetic, functions and pointers, Pointer to pointer, Uses of Pointers, arrays and pointers.

UNIT – IV
Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, Self referential structure, passing structure to function, nested structures and unions, Dynamic memory allocation.

UNIT – V

File Handling: Introduction, Types of files, Defining and Opening a File, Closing a File, Input/Output operations on Files, Error Handling during I/O operations, Random Access to Files.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. Behrouz A. Forouzan, "A Structured Approach Using C" Richard F. Gilberg 3rd Edition

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web Links:

1. https://www.tutorialspoint.com › C programming › C – Home
2. https://www.programiz.com/c-programming

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

ENGINEERING GRAPHICS
(Common for ME/CE)

Subject Code: 23EST103

L	T	P	C
1	0	4	3

COURSE OBJECTIVES:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines, planes, and solids
- To develop the imaginative skills of the students required to understand the development of surfaces
- To improve the visualization skills for better understanding of conversion of orthographic to isometric views and vice-versa

COURSE OUTCOMES:

On completion of course, students should be able to

CO 1 : Understand the principles of engineering drawing, including engineering curves, conics, cycloid and Involutes.

CO 2 : Draw projection of points, straight lines and planes in first angle projection.

CO 3 : Understand and draw projection of solids in various positions in first quadrant.

CO 4 : Draw and explain the principles behind development of surfaces.

CO 5 : Convert orthographic views into isometric projections and vice-versa.

UNIT I

Drawing Instruments and their uses, Types of Lines and Dimensioning, Line bisecting, Angle bisecting, Line divided into equal number of parts, Construction of Regular Polygons (Pentagon and Hexagon).

Construction of Conics: General method**,** Oblong method and Concentric circles method.

Construction of Cycloid and Involutes.

UNIT II

Introduction to Orthographic Projections (First Angle Projection only).

Projections of Points: A point situated in I,II,III & IV quadrants.

Projections of Straight Lines: Line parallel to one or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other.

Projections of Planes: Types of planes, Traces of planes, planes parallel to one of the planes, and plane inclined to one reference plane.

UNIT III

Projections of Solids (Polyhedra): Types of Solids, Projections of Solids in simple positions, Projections of Solids axis inclined to the VP and parallel to the HP. Projections of Solids axis inclined to the HP and parallel to the VP.

Projections of Solids (Solids of revolution): Projections of Solids axis inclined to the VP and parallel to the HP. Projections of Solids axis inclined to the HP and parallel to the VP.

UNIT IV

Development of Surfaces:

Parallel line method of development, Developments of lateral surfaces of right Solids i.e., Cube, Prisms, Cylinders.

Radial line method of development, Triangulation method. Development of lateral surfaces of right Solids i.e., Pyramids, Cones.

UNIT V

Orthographic Projections: Conversion of pictorial view (Isometric views) into orthographic views.

Isometric Projections: Isometric axes, lines & planes. Isometric scale, Isometric drawing, Isometric drawing of plane figures, prisms and pyramids. Conversion of orthographic views into Isometric views.

TEXT BOOKS:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

REFERENCE BOOKS:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

ENGINEERING PHYSICS LAB
(Common to All Branches of Engineering)

Subject Code: 23BHL102

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:
To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES: The students will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wave lengths of different colors using diffraction grating.
CO3: Discuss the magnetic, electrical and electronic properties of materials.
CO4: Analyze the mechanical and thermal properties of materials.
CO5: Calculate the band gap of a given semiconductor.

List of Experiments

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. Determination of width of a slit using diffraction phenomenon.
4. Determination of wavelength of Laser light using diffraction grating.
5. Estimation of Planck's constant using photo cell.
6. To study V-I characteristics of a PN junction diode in forward and reverse biasing conditions.
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
8. Determination of Hall voltage and Hall coefficient of a given semi-conductor using Hall effect.
9. Determination of temperature coefficients of a thermistor.
10. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
11. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
12. Sonometer: Verification of laws of stretched string.
13. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
14. Determination of energy band gap of a given semiconductor
15. Determination of thickness of a thin object using wedge shaped film.
16. Determination of crystal structure and lattice parameter of a given crystal using powder diffraction data.
17. Determination of Young's modulus of the given beam by non-uniform bending.
18. Determination of dielectric constant using resonance method.

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

References:

- A Textbook of Practical Physics - S. Balasubramanian, .N. Srinivasan, S.Chand Publishers, 2017.

Web Resources

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

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB
(Common for CSE-IT-CSM-CSD-MECH-CE)

Subject Code: 23ESL102

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVE:

To introduce the student to study different electrical & electronics components and to verify the basic laws related to electrical engineering, analyze the V-I characteristics of P-N diode and transistor characteristics.

COURSE OUTCOMES: Students will be able to

CO1: Label various types of electrical & electronics components.
CO2: Demonstrate various basic electrical laws.
CO3: Determine resistance of the series and parallel connected circuits.
CO4: Analyze the V-I characteristics of P-N diode.
CO5: Analyze the Transistor characteristics.

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify Kirchhoff's current law
4. To verify Kirchhoff's voltage law.
5. To verify the total resistance of the series and parallel connected circuits.
6. Study of electronics components.
7. PN Junction diode forward and reverse bias characteristics
8. Zener diode characteristics.
9. Transistor CB characteristics (Input and Output)
10. Transistor CE characteristics (Input and Output)

Additional Experiments:

11. Half wave rectifier
12. To find voltage current relationship for series RL circuit and determine power & power factor.

R23 - B. Tech. - ME **I Year B. Tech. I Semester**

COMPUTER PROGRAMMING LAB

(Common to All Branches of Engineering)

Subject Code: 23ESL105

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

COURSE OUTCOMES: At the end of the course students will be able to

CO 1: Solve the given problem using the syntactical structures of C language.
CO 2: Design programs involving decision structures and loops.
CO 3: Apply programming to solve different operations on arrays and strings.
CO 4: Develop modularity concept using functions and write programs for allocating memory dynamically.
CO 5: Construct C program that uses structures and unions and implement file operations on given application.

List of Experiments

1. Write the C programs to calculate the following

a) Area of triangle when sides are given.
b) Program for Type Casting.
c) Interchanging values of two variables.

2. Write the C programs to perform the following

a) Conversion of Fahrenheit to Celsius and vice versa
b) Simple interest calculation
c) Square root of a given number

3. Write the C programs to perform the following

a) Read lower case character and convert into upper case.
b) Find maximum of 3 values using conditional operator.
c) Calculate area and perimeter of circle.

4. Write C programs for the following using decision making statements

a) Find roots of quadratic equation.
b) Find the max and min of three numbers using if-else.
c) Calculate the grades of a student.
d) Find the given year is a leap year or not.

5. Write the C programs to perform the following

a) Arithmetical operations using switch-case.

b) Read a number and display in reverse.

c) Check for Armstrong number property

6. Write the C programs to perform the following

a) Find factorial of given number

b) Check a number is palindrome property

c) Generate Fibonacci series.

d) Generate Prime numbers between two numbers.

7. Implement the following using arrays

a) Largest and smallest from a list of elements.

b) Program for Linear Search.

c) Program for Bubble Sort.

8. Implement the following using arrays

a) Matrix addition.

b) Matrix Multiplication.

c) Transpose of a matrix.

d) Program using string handling functions.

9. Write the C programs to perform the following

a) Factorial using recursion and non recursion.

b) GCD using recursion and non recursion.

10. Write the C programs to perform the following

a) Find the sum and average of list of elements using DMA Functions

b) Implementation of call by value and call by reference.

11. Write the C programs to perform the following

a) Implementation of array of structure.

b) Demonstration of Union.

12. Write the C programs to perform the following

a) Write a C program to write and read text into a binary file using fread() and fwrite()

b) Copy the contents of one file into another.

c) Count the number of characters, words and lines in a file.

Text Books:

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2 nd Edition, PHI.
2. Behrouz A. Forouzan, “A Structured Approach Using C” Richard F. Gilberg 3rd Edition

References:

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web Links:

1. https://www.tutorialspoint.com › C programming › C – Home
2. https://www.programiz.com/c-programming

NSS/NCC/Scouts & Guides/Community Service
(Common to All Branches of Engineering)

Subject Code: 23MCS102

Course Objectives:
The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes: After completion of the course the students will be able to
CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
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.

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) Conducting talent show in singing patriotic songs-paintings- any other contribution.

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-area 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 Defence, New Delhi

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. 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.

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

Subject Code: 23BHT101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To enable students to build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students to acquire appropriate and adequate letter writing skills
- To get students enhance their essay writing skills and develop reading skills

COURSE OUTCOMES

CO 1: Students will be able to comprehend printed texts of different genres easily and they will be able to make appropriate word choice for writing.
CO 2: Students will be able to write short texts efficiently.
CO 3: Students will be able to construct grammatically correct sentences.
CO 4: Students will be able to communicate through letters effectively.
CO 5: Students will be able to write essays and comprehend unfamiliar passages.

UNIT–I: A Power of a Plate of Rice by Ifeoma Okoye Skimming and Scanning — Capital letters and Punctuation — Spellings — Parts of speech — Root words — Prefixes and Suffixes — Synonyms and Antonyms.
UNIT–II: *Night of the Scorpion* by Nissim Ezekiel Sequencing — Paragraph writing — Cohesive devices — Articles — Prepositions Homonyms, Homographs, homophones

UNIT–III: *Biography of Steve Jobs* Drawing inferences — Paraphrasing, Summarizing, Note-making — Verbs and Tenses, Subject-verb agreement — Compound words — Collocations

UNIT–IV: *The Toys of Peace* by Saki Data interpretation — Official letters and Résumé — Direct and Indirect speech — Academic reporting verbs — Active and passive voice — Words often confused — Jargon

UNIT–V: *The Power of Intrapersonal Communication* (An Essay) Reading comprehension — Essay writing — Correcting errors — Technical Jargon

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient BlackSwan, 2023 (Units 1, 2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & 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:

GRAMMAR

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

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Subject Code: 23BHT103

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows

- To furnish the learners in the concept of first order and first degree differential equations and multivariable calculus.
- To enlighten the learners in the concept of higher order differential equations with constant coefficients.
- To furnish the learners with solution methods for partial differential equations that model physical processes
- To equip knowledge with basic concepts and techniques to interpret the physical meaning of different operators such as gradient, curl and divergence by handling various real-world applications
- To furnish the learners with basic concepts and techniques the work done against a field, circulation and flux using vector calculus by handling various real-world applications.

COURSE OUTCOMES: At the end of the course, the student will be able to:

CO 1: Solve the differential equations related to various engineering fields.
CO 2: Model engineering problems as higher order differential equations and solve analytically.
CO 3: Identify solution methods for partial differential equations that model physical processes.
CO 4: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO 5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT- I : Differential equations of first order and first degree

Exact equations and equations reducible to exact form. Linear differential equations – Bernoulli's equations. 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, complimentary function, general particular integral, method of variation of parameters. L-C-R Circuit problems.

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,del applied to vector point functions - Divergence and Curl, Vector identities.

UNIT –V : Vector integration

Line integral- circulation- work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and problems on these theorems.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.
2. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna publishers,2017.

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones andBartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, PearsonPublishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

ENGINEERING CHEMISTRY
(Common for CE/ME)

Subject Code: 23BHT106

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES: At the end of the course, the students will be able to

CO1: Demonstrate the importance of water for society and industrial needs.
CO2: Summarize the concepts of Instrumental methods and distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO3: Demonstrate the corrosion prevention methods and factors affecting corrosion.
CO4: Demonstrate the preparation, properties, and applications of polymer materials and fuels.
CO5: Demonstrate the importance of modern engineering materials like cement, refractories, composites, and lubricants.

UNIT I: Water Technology

Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT II: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, Instrumentation, electronic transition, Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts, IR spectroscopies, Instrumentation fundamental modes and Fingerprint Region. NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift-Splitting – Coupling Constant.

UNIT III: Electrochemistry and Applications

Electrodes –electrochemical cell, Nernst equation, cell potential calculations(emf formula). Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithiumion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry and electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic (sacrificial anodic protection and impressed current cathodic protection) and anodic protection (working principle), electroplating and electro less plating (Nickel and Copper).

UNIT IV: Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization. Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC, Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers

Fuels – Types of fuels, calorific value of fuels (HCV, LCV and Theoretical calculations of calorific value), numerical problems based on calorific value;Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octaneand Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT V: Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

Textbooks:

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. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.

2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.

3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

ENGINEERING MECHANICS
(Common for CE/ME/EEE)

Subject Code: 23EST104

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertiaand determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion ofrigid bodies.

COURSE OUTCOMES: Upon successful completion of the course the students will be able to

CO1: Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.
CO2: Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.
CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.
CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
CO5: Solve the problems involving the translational and rotational motion of rigid bodies.

UNIT -I
Introduction to Engineering Mechanics: Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant– Moment of Force and its Application –Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction.

UNIT -II
Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of

concurrent forces, Numerical examples on spatial system of concurrent forces using vector approach, Analysis of plane trusses.

UNIT- III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Pappus theorems.

Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia.

UNIT -IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics – D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT -V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L.G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

THERMODYNAMICS

Subject Code: 23MET101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the concepts of heat, work, energy and governing rules for conversion of one form to other.
- To explain relationships between properties of matter and basic laws of thermodynamics.
- To teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- To introduce the concept of available energy for maximum work conversion.
- To provide fundamental concepts of air standard cycles used in IC engines.

COURSE OUTCOMES: Upon the completion of this course, the students will be able to

CO 1: Understand and apply basic concepts of Thermodynamics

CO2: Understand and apply the first law of Thermodynamics for open and closed systems under steady conditions.

CO 3: Understand and apply Second law of Thermodynamics for Heat engines and Heat pumps. Understand the concept of entropy in a system undergoing any Thermodynamic process.

CO4: Calculate available and unavailable energies for steady flow process and Non-flow process, Understand and derive Thermodynamic relations.

CO 5: Establish an expression for mean effective pressure and thermal efficiency for different thermodynamic cycles and compare their performance.

UNIT-I

Introduction to Thermodynamics: Macroscopic versus Microscopic View point Thermodynamic System and control volume, Thermodynamic Properties, processes and cycles, Thermodynamic equilibrium, Quasi-Static Process, Concept of Continuum, Zeroth Law of Thermodynamics, Reversible and Irreversible Processes.

Work and Heat Transfer: Work Transfer, pdV Work, pdV Work in Various Quasi-Static Processes, Free expansion, Heat Transfer.

UNIT-II

First Law of Thermodynamics: First Law of Thermodynamics and Internal energy, PMM1, Corollaries of First Law of Thermodynamics.

First Law Applied to Flow Systems: Steady Flow process, Steady Flow Energy Equation, SFEE applied to Nozzle and Diffuser, Turbine and Compressor, Heat Exchanger.

UNIT-III

Second Law of Thermodynamics: Limitations of First law, Kelvin-Planck statement –Cyclic Heat Engine, Clausius' statement, Refrigerator and Heat Pump, Equivalence of Kelvin-Planck and Clausius' Statement, Carnot Cycle, Carnot's Theorem.

Entropy: Clausius' Theorem, The property of entropy, The Inequality of Clausius, Concept of entropy-Entropy Principle, Third Law Thermodynamics.

UNIT-IV

Exergy: AE Referred to cycle – Decrease in AE when heat transfer through Finite Temperature Difference, Exergy of a finite body at temperature T, Maximum work in Reversible Process, Exergy of a Closed system, Exergy of a Steady flow system.

Gas Laws & Thermodynamic Relations: Avagadro's law, Equation of state of gas, Ideal gas, Maxwell's Equations, TdS Equations, Difference in Heat Capacities, Ratio of Heat Capacities..

UNIT-V

Thermodynamic Cycles: Otto cycle, Diesel cycle, Dual Combustion cycle, Mean Effective Pressure for Otto, Diesel, and Dual cycle, Comparison of Otto, Diesel, and Dual cycle.

TEXT BOOKS:

1. Engineering Thermodynamics, P.K. Nag, Tata McGraw-Hill Publications.
2. Thermal Engineering, R.K. Rajput, S.Chand Publications.
3. Thermodynamics: An Engineering Approach, Michael A. Boles and Yungus A. Cengel, Tata McGraw-Hill Publications.
4. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.

REFERENCES BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications,
2. Thermal Engineering, M.L.Mathur, F.S.Mehta, Jain Brothers Publications,
3. Introduction to Thermodynamics, J.B.Jones, G.A.Hawkins, John Wiley Publications,
4. Fundamentals of Thermodynamics, Gordon John Van Wylen, Richard Edwin Sonntag, John Wiley Publications

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

ENGINEERING WORKSHOP

(Common to ME/CE/ECE/EEE)

Subject Code: 23ESL104

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

COURSE OUTCOMES: Upon the completion of this course, the students will be able to
CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice
CO5: Apply the Plumbing tools in plumbing operations

SYLLABUS

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 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 tyre

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.

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, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, MediaPromoters 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.

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

COMMUNICATIVE ENGLISH LAB

(Common to All Branches of Engineering)

Subject Code: 23BHL101

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES

- To enable students to cultivate proper speech habits
- To enhance the ability of students to make extempore speeches
- To help students master techniques of being successful in debates and group discussions
- To assist students to acquire effective and adequate presentation skills
- To prepare students to face interviews in an assertive manner

COURSE OUTCOMES

CO 1: Students will be able to pronounce words accurately.
CO 2: Students will be able to speak spontaneously.
CO 3: Students will be able to participate in debates and group discussions and contribute proactively.
CO 4: Students will be able to present data on select topics using pre-existing slides.
CO 5: Students will be able to face interviews confidently.

UNIT I: Phonetics — Neutral English Accent
UNIT II: JAM session — Role play
UNIT III: Debate — Group Discussion
UNIT IV: Poster Presentation — PPT Presentations
UNIT V: Cover letter — Résumé — Interview Skills

Suggested Software:

- Walden InfoTech
- Young India Films

Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press. 2018.
2. Samson T : Innovate with English, Foundations
3. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016.
4. Jayashree, M Let's Hear them Speak: Developing Listening-Speaking skills in English. Sage Publications.
5. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
6. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rd Ed.) Trinity Press.

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
12) https://www.linguahouse.com/en-GB
13) https://www.ted.com/watch/ted-ed

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

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

ENGINEERING CHEMISTRY LAB

(Common to ME/CE)

Subject Code: 23BHL104

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To verify the fundamental concepts with experiments

COURSE OUTCOMES: At the end of the course, the students will be able to
CO1: Determine the cell constant, conductance, potential and pH of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Determine the molecular/system properties such as kinematic viscosity, Flash and fire point and acid number etc.
CO4: Estimate the Iron (by colurimeter) and Calcium in cement.
CO5: Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, of surface tension and viscosity etc

List of Experiments:
1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery.(P^HMETRY)
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter
13. Conductometric titration of strong acid vs. strong base.
14. Potentiometry - determination of redox potentials and emfs.
15. Determination of surface tension and viscosity.
16. Determination of acid number of lubricating oil.
17. Determination of flash and fire point of lubricating oil.

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

R23 - B. Tech. - ME **I Year B. Tech. II Semester**

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to All Branches of Engineering)

Subject Code: 23MCS103

L	T	P	C
0	0	1	0.5

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: After completion of the course the student will be able to
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
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

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 Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:
Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth 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 cardiorespiratory 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 Timetable 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.