

**B.Tech. I Year I Semester**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23FE01	Communicative English	2	0	0	2	30	70	100
2	23FE03	Linear Algebra and Calculus	3	0	0	3	30	70	100
3	23FE04	Engineering Physics	3	0	0	3	30	70	100
4	23CM01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
5	23ME01	Engineering Graphics	2	0	2	3	30	70	100
<b>Laboratory Courses</b>									
6	23FE51	Communicative English Lab	0	0	2	1	30	70	100
7	23FE53	Engineering Physics Lab	0	0	2	1	30	70	100
8	23IT51	IT Workshop	0	0	2	1	30	70	100
9	23ME51	Engineering Workshop	0	0	3	1.5	30	70	100
10	23AU02	NSS/NCC/Scouts and Guides/Community Service	0	0	1	0.5	30	70	100
<b>Total</b>			<b>13</b>	<b>0</b>	<b>12</b>	<b>19</b>	<b>300</b>	<b>700</b>	<b>1000</b>

**B.Tech. I Year II Semester**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23FE05	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	23FE06	Engineering Chemistry	3	0	0	3	30	70	100
3	23EE01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
4	23CS01	Introduction to Programming	3	0	0	3	30	70	100
5	23ME02	Engineering Mechanics	3	0	0	3	30	70	100
<b>Laboratory Courses</b>									
6	23FE54	Engineering Chemistry Lab	0	0	2	1	30	70	100
7	23EE51	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
8	23CS51	Computer Programming Lab	0	0	3	1.5	30	70	100
9	23ME52	Engineering Mechanics Lab	0	0	3	1.5	30	70	100
10	23AU01	Health and wellness, Yoga and sports	0	0	1	0.5	30	70	100
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>	<b>300</b>	<b>700</b>	<b>1000</b>

**B.Tech. II Year I Semester**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23FE09	Numerical Methods and Transform Techniques	3	0	0	3	30	70	100
2	23HS01	UHV – 2 Understanding Harmony and Ethical Human Conduct	2	1	0	3	30	70	100
3	23AE01	Introduction to Aerospace Engineering	2	0	0	2	30	70	100
4	23AE02	Engineering Fluid Mechanics	3	0	0	3	30	70	100
5	23AE03	Engineering Thermodynamics	3	0	0	3	30	70	100
6	23MC01	Environmental Science	2	0	0	-	30	-	-
<b>Laboratory Courses</b>									
7	23AE51	Engineering Fluid Mechanics Lab	0	0	3	1.5	30	70	100
8	23AE52	Applied Thermodynamics Lab	0	0	3	1.5	30	70	100
9	23CS57	Python Programming Lab	0	0	2	1	30	70	100
10	23AES1	Computer Aided Design Lab	0	1	2	2	30	70	100
<b>Total</b>			<b>15</b>	<b>2</b>	<b>10</b>	<b>20</b>	<b>300</b>	<b>630</b>	<b>930</b>

**B.Tech. II Year II Semester**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23HS03	Industrial Management	2	0	0	2	30	70	100
2	23FE13	Complex variables, Probability and Statistics	3	0	0	3	30	70	100
3	23AE04	Materials and Manufacturing Technology	3	0	0	3	30	70	100
4	23AE05	Solid Mechanics	3	0	0	3	30	70	100
5	23AE06	Aerodynamics	3	0	0	3	30	70	100
<b>Laboratory Courses</b>									
6	23AE53	Manufacturing Technology Lab	0	0	3	1.5	30	70	100
7	23AE54	Solid Mechanics Lab	0	0	3	1.5	30	70	100
8	23AES2	MATLAB applications in Engineering Lab	0	1	2	2	30	70	100
9	23ME57	Design Thinking and Innovation	1	0	2	2	30	70	100
<b>Total</b>			<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>	<b>270</b>	<b>630</b>	<b>900</b>
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation									

I Year I Semester

**23FE01-COMMUNICATIVE ENGLISH**

(Common to All Branches of Engineering)

L	T	P	C
2	0	0	2

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.	Understand
CO2	Apply grammatical structures to formulate sentences and correct word forms.	Apply
CO3	Use discourse markers to speak clearly on a specific topic in informal discussions.	Apply
CO4	Read / Listen the texts and write summaries based on global comprehension of these texts.	Understand
CO5	Prepare a coherent paragraph, essay, and resume.	Apply

**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 afterlistening to audio texts.

**Speaking:** Discussion in pairs/small groups on specific topics followed by short structuretalks.

**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: Elon Musk**

**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 of 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. Pathfinder: Communicative English for Undergraduate Students, 1<sup>st</sup> Edition, OrientBlack Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language 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.

**Online Learning Resources:**

**GRAMMAR:**

1. [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. [www.eslpod.com/index.html](http://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](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)

I Year I Semester

**23FE03- LINEAR ALGEBRA AND  
CALCULUS**

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

**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:**

COs	Statements	Blooms Level
CO1	Apply matrix algebra techniques to solve engineering problems.	Apply
CO2	Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix.	Apply
CO3	Expand various functions using Mean value theorems.	Understand
CO4	Understand the concepts of functions of several variables which are useful in optimization.	Understand
CO5	Evaluate areas and volumes by using double and triple integrals.	Apply

**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 and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

**UNIT II Eigenvalues, Eigenvectors and Orthogonal Transformation**

Eigenvalues, Eigenvectors and their properties, 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 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.

**UNIT IV Partial Differentiation and Applications (Multi variable calculus)** Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, 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, triple integrals, change of order of integration, 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, 44<sup>th</sup> Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> Edition.

**REFERENCE BOOKS:**

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

I Year I Semester

**23FE04- ENGINEERING PHYSICS**

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Analyze the intensity variation of light due to interference, diffraction, and Polarization	Apply
CO2	Understand the basics of crystals and their structures	Understand
CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials	Understand
CO4	Explain fundamentals of quantum mechanics and free electron theory of metals	Understand
CO5	Identify the type of semiconductor using Hall Effect	Apply

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

**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: 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 - Density of states - Fermi energy

#### **UNIT V Semiconductors**

Semiconductors: 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:**

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

#### **REFERENCE BOOKS:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

#### **Online Learning Resources:**

- <https://www.loc.gov/rr/scitech/selected-internet/physics.html>

**23CM01- BASIC CIVIL AND MECHANICAL  
ENGINEERING**  
(Common to All Branches of Engineering)

I Year I Semester

L	T	P	C
3	0	0	3

**PART A: BASIC CIVIL ENGINEERING**

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development.	Understand
CO2	Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying.	Understand
CO3	Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs.	Understand
CO4	Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance.	Understand
CO5	Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures.	Understand

**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- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

**UNIT II**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling - Simple problems on levelling and bearings- Contour mapping.

**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, Satheesh Gopi, 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, KhannaPublishers, Delhi 2023. 38<sup>th</sup> Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10<sup>th</sup> Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

**PART B: BASIC MECHANICAL ENGINEERING****Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
<b>CO6</b>	Summarize the different manufacturing processes.	<b>Remember</b>
<b>CO7</b>	Explain the basics of thermal engineering and its applications.	<b>Understand</b>
<b>CO8</b>	Illustrate the working of different mechanical power transmission systems and power plants.	<b>Understand</b>
<b>CO9</b>	Describe the basics of robotics and its applications.	<b>Understand</b>

**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.)

### **TEXT BOOKS:**

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A text 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, Cengagelearning India Pvt. Ltd.

### **REFERENCE BOOKS:**

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

I Year I Semester

**23ME01- ENGINEERING GRAPHICS**

(Common to All Branches of Engineering)

L	T	P	C
2	0	2	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 and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	Understand
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	Apply
CO3	Understand and draw projection of solids in various positions in first quadrant.	Apply
CO4	Able to draw the development of surfaces of simple objects	Apply
CO5	Prepare isometric and orthographic sections of simple solids.	Apply

**UNIT I**

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. **(Covered theoretically in class. Not for the end examination)**

**Scales:** Plain scales, diagonal scales and vernier scales. **(Covered theoretically in class. Not for the end examination)**

**Curves:** Construction of ellipse, parabola and hyperbola by general method only, Cycloids, Involute, Normal and tangent to Curves.

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

**UNIT II**

**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.

### UNIT III

**Projections of Solids:** Types of solids: Polyhedra 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.

I Year I Semester

**23FE51- COMMUNICATIVE ENGLISH LAB**

(Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

**Course Objectives:**

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. The students will get trained in basic communication skills and also make them ready to face job interviews.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Understand the different aspect of the English language proficiency with emphasis on LSRW skills.	Understand
CO2	Apply Communication Skills through various language learning activities.	Apply
CO3	Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension.	Understand
CO4	Exhibit professionalism in participating in debates and group discussions.	Apply

**List of Topics:**

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

**Suggested Software:**

- Walden Infotech
- Young India Films

**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*, (2<sup>nd</sup> Ed),Kindle, 2013

**Online Resources:**

**Spoken English:**

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishmedialab.com](http://www.englishmedialab.com)
3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](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](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](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp_IA)



I Year I Semester

**23FE53- ENGINEERING PHYSICS LAB**

(Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

**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:**

COs	Statements	Blooms Level
CO1	Analyze the wave properties of light using optical instruments	Apply
CO2	Estimate the elastic moduli of various materials and acceleration due to gravity	Apply
CO3	Demonstrate the vibrations in stretched strings	Understand
CO4	Evaluate dielectric constant and magnetic field of circular coil carrying current	Apply
CO5	Examine the characteristics of semiconductor devices	Apply

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

experiment.

**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, M.N. Srinivasan, S. Chand Publishers, 2017.

**Online Resources**

- [www.vlab.co.in](http://www.vlab.co.in)
- <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

I Year I Semester

## 23IT51- IT WORKSHOP

(Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Identify the components of a PC and troubleshooting the malfunctioning of PC.	Apply
CO2	Develop presentation /documentation using Office tools and LaTeX.	Apply
CO3	Build dialogs and documents using ChatGPT.	Apply
CO4	Improve individual / teamwork skills, communication and report writing skills with ethical values.	Apply

**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.

**Task 2:** 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 on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors 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.

**Task 2: Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3: Search Engines & Netiquette:** 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 pop ups, block active x downloads to avoid viruses and/or worms.

### **LaTeX and WORD**

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

**Task 2: Using La TeX and 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 both La TeX and Word.

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

**Task 4: Creating a Newsletter:** Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, 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 toolbars, 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,

### **LOOKUP/VLOOKUP**

**Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting**

### **POWER POINT**

**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, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**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 – Background, textures, Design Templates, Hidden slides.

### **AI TOOLS – ChatGPT**

**Task 1:** 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 a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** 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 tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education, 2012, 2<sup>nd</sup> edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3<sup>rd</sup> edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3<sup>rd</sup> edition

I Year I Semester

**23ME51- ENGINEERING WORKSHOP**

(Common to All Branches of Engineering)

L	T	P	C
0	0	3	1.5

**Course Objectives:**

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Identify workshop tools and their operational capabilities.	Remember
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding.	Understand
CO3	Modal various basic prototypes in fitting trade.	Apply
CO4	Apply basic electrical engineering knowledge for House Wiring Practice	Apply

**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 joint or Bridlejoint
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.
9. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheeler vehicle and its repairs.

**TEXT BOOKS:**

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, 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

I Year I Semester

**23AU02- NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE**

(Common to All Branches of Engineering)

L	T	P	C
-	-	1	0.5

**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:**

COs	Statements	Blooms Level
CO1	Understand the importance of discipline, character and service motto.	Understand
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.	Apply
CO3	Explore human relationships by analyzing social problems.	Understand
CO4	Determine to extend their help for the fellow beings and downtrodden people.	Apply
CO5	Develop leadership skills and civic responsibilities.	Apply

**UNIT I Orientation**

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

**Activities:**

- Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
- Conducting orientations programs for the students –future plans-activities-releasing road map etc.
- Displaying success stories-motivational biopics- award winning movies on societal issues etc.
- Conducting talent show in singing patriotic songs-paintings- any other contribution.

**UNIT II Nature & Care Activities:**

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

**UNIT III Community Service Activities:**

- 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.
- Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- Conducting consumer Awareness. Explaining various legal provisions etc.
- 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, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

I Year II Semester

## 23FE05- DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

**Course Objectives:**

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- 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:**

COs	Statements	Blooms Level
CO1	Solve the differential equations related to various engineering fields (Unit – I&II)	Apply
CO2	Apply knowledge of partial differentiation in modelling and solving of Partial differential equations.	Apply
CO3	Interpret the physical meaning of different operators such as gradient, curl and divergence.	Apply
CO4	Evaluate the work done against a field, circulation and flux using Vector Calculus.	Apply

**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, complimentary function, general solution, particular integral, 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, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT V Vector integration**

LWithoutegral-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

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 Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

**23FE06- ENGINEERING CHEMISTRY**  
**I Year II Semester (Common to Civil, Chemical, Mechanical Engineering  
 and allied branches)**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To enable the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions.
- To understand quality of water, fuels for various applications, polymers, electrochemistry and batteries.
- To learn the basic concepts of surface chemistry and identify the significance of modern engineering materials.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Identify the troubles due to hardness of water and its maintenance in industrial applications.	Understand
CO2	Apply Nernst equation in calculating cell potentials, compare batteries for different applications and outline the principles of corrosion for design and effective maintenance of various devices.	Understand
CO3	Outline the importance of polymers and alternate fuels.	Understand
CO4	Summarize the suitability of engineering materials like composites, refractories, lubricants, and building materials.	Understand
CO5	Understand the concepts of colloids, micelles and nanomaterials	Understand

**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 Electrochemistry and Applications**

Electrodes – electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium ion 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 electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electroless plating (Nickel and Copper).

**UNIT III 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, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

#### **UNIT IV 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.

#### **UNIT V Surface Chemistry and Nanomaterials**

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

#### **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. 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

I Year II Semester

**23EE01- BASIC ELECTRICAL AND  
ELECTRONICS ENGINEERING  
(Common to All branches of Engineering)**

L	T	P	C
3	0	0	3

**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:**

COs	Statements	Blooms Level
CO1	Extract electrical variables of AC & DC circuits using fundamental laws.	Understand
CO2	Understand the operation of electrical machines and measuring instruments.	Understand
CO3	Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems.	Understand

**PART A: BASIC ELECTRICAL ENGINEERING****UNIT I DC & AC Circuits**

**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.

**TEXT 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, Dhanpat Rai & 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, Mc Graw 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. Bhattacharya, Person Publications, 2018, Second Edition.

**Web Resources:**

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

**PART B: BASIC ELECTRONICS ENGINEERING**

**Course Objectives:**

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

**Course Outcomes:**

COs	Statements	Blooms Level
CO4	Interpret the characteristics of various semiconductor devices	Remember
CO5	Infer the operation of rectifiers, amplifiers.	Understand
CO6	Contrast various logic gates, sequential and combinational logic circuits.	Understand

**UNIT I SEMICONDUCTOR DEVICES**

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 BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**

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, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

**UNIT III DIGITAL ELECTRONICS**

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code,

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

**TEXT BOOKS:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009

**REFERENCE BOOKS:**

1. R. S. Sedha, A Textbook 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.

**End examination pattern:**

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 markseach. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for eachquestion.



I Year II Semester

**23CS01- INTRODUCTION TO  
PROGRAMMING**  
(Common to All branches of Engineering)

L	T	P	C
3	0	0	3

**Course Objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Understand basics of computers, concept of algorithms and flowcharts.	Understand
CO2	Understand the features of C language.	Understand
CO3	Interpret the problem and develop an algorithm to solve it.	Apply
CO4	Implement various algorithms using the C programming language.	Apply
CO5	Develop skills required for problem-solving and optimizing the code	Apply

**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.

**UNIT III Arrays and Strings**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

**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 Lifetime of Variables, Basics of File Handling

**Note:** The syllabus is designed with C Language as the fundamental language of implementation.

**TEXT BOOKS:**

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

**REFERENCE BOOKS:**

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2<sup>nd</sup> edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3<sup>rd</sup> edition

**23ME02- ENGINEERING MECHANICS**  
**I Year II Semester (Common to Civil, Mechanical Engineering & Allied  
 branches)**

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 inertia and 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 of rigid bodies.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Determine the resultant of coplanar concurrent and non-concurrent force systems	Apply
CO2	Apply static equilibrium conditions to determine unknown planar force systems and determine the frictional forces for bodies in contact.	Apply
CO3	Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.	Apply
CO4	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.	Apply
CO5	Solve the problems involving the translational and rotational motion of rigid bodies.	Apply

**UNIT I**

**Introduction to Engineering Mechanics**– Introduction, Basic Terminology in mechanics, Laws of mechanics, Characteristics of forces, resolution & composition of forces.

**Systems of Forces:** Coplanar Concurrent Forces– Coplanar Non-Concurrent Forces, moment of force, applications- Couples and Resultant of Force Systems.

**UNIT II**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Triangle law of forces, polygon law of forces condition of equilibrium, Analysis of plane trusses, Principle of virtual work with simple examples.

**Friction:** Introduction, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction, limiting friction and impending motion of blocks resting on horizontal and inclined planes.

**UNIT III**

**Centroid:** Centroids of simple figures (from basic principles)–Centroids of I, T, C, L Sections.

**Centre of Gravity:** Centre of gravity of simple bodies (from basic principles).

**Area Moments of Inertia:** Definition, Moment of inertia of I, T, C, L Sections– Polar Moment of Inertia, Transfer Theorem.

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

#### UNIT IV

**Rectilinear and Curvilinear motion of a particle:** Introduction to Kinematics and Kinetics, General principles in dynamics, Rectilinear and curvilinear motions- motion with uniform velocity, uniform acceleration and non-uniform acceleration – D’Alembert’s Principle - Work Energy method and applications to particle motion-Impulse Momentum method (theory only).

#### UNIT V

**Rigid body Motion:** Kinematics and Kinetics of rigid bodies in translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method and simple applications.

#### TEXT BOOKS:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., McGraw Hill Education 2017. 5<sup>th</sup> 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. 4<sup>th</sup> 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. 4<sup>th</sup> Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L.
4. G. Kraige., John Wiley, 2008. 6<sup>th</sup> Edition.
5. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press,2014. Second Edition
6. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc.,New Delhi, 2022, 14<sup>th</sup> Edition

**23FE54- ENGINEERING CHEMISTRY LAB**

**I Year II Semester (Common to Civil, Chemical, Mechanical Engineering & Allied branches)**

L	T	P	C
0	0	2	1

**Course Objectives:**

- To enable the students to analyze water samples and perform different types of volumetric titrations.
- To provides an overview of preparation of polymers, nanomaterials and analytical techniques.
- To measure the important parameters of fuels, lubricants and composition of cement.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Analyze important parameters of water to check its suitability for drinking purposes and industrial applications.	Analyze
CO2	Acquire practical knowledge related to preparation of Bakelite and nanomaterials.	Apply
CO3	Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus.	Apply
CO4	To estimate the amount of calcium in cement and the strength of acid present in Pb-Acid battery.	Apply
CO5	Improve individual / teamwork skills, communication and report writing skills with ethical values.	Apply

**List of Experiments:**

- Determination of Hardness of a groundwater sample.
- Estimation of Dissolved Oxygen by Winkler's method
- Determination of Strength of an acid in Pb-Acid battery
- Preparation of a polymer (Bakelite)
- Determination of percentage of Iron in Cement sample by colorimetry
- Estimation of Calcium in port land Cement
- Preparation of nanomaterials by precipitation method.
- Adsorption of acetic acid by charcoal
- Determination of percentage Moisture content in a coal sample
- Determination of Viscosity of lubricating oil by Redwood Viscometer 1
- Determination of Viscosity of lubricating oil by Redwood Viscometer 2
- Determination of Calorific value of gases by Junker's gas Calorimeter

**Reference:**

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

**23EE51- ELECTRICAL AND ELECTRONICS  
ENGINEERING WORKSHOP  
(Common to All branches of Engineering)**

I Year II Semester

L	T	P	C
0	0	3	1.5

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Compute voltage, current and power in an electrical circuit.	Apply
CO2	Compute medium resistance using Wheat stone bridge.	Apply
CO3	Discover critical field resistance and critical speed of DC shunt generators.	Apply
CO4	Estimate reactive power and power factor in electrical loads.	Understand
CO5	Plot the characteristics of semiconductor devices.	Apply
CO6	Demonstrate the working of various logic gates using ICs.	Understand

**Activities:**

- Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
  - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
- Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
  - Provide some exercises so that measuring instruments are learned to be used by the students.
- Components:
  - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
  - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

**PART A: ELECTRICAL ENGINEERING LAB**

**List of experiments:**

- Verification of KCL and KVL
- Verification of Superposition theorem
- Measurement of Resistance using Wheat stone bridge
- Magnetization Characteristics of DC shunt Generator
- Measurement of Power and Power factor using Single-phase wattmeter

6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

**Reference Books:**

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

**Note:** Minimum Six Experiments to be performed.

**PART B: ELECTRONICS ENGINEERING LAB**

**Course Objectives:**

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

**List of Experiments:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
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, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

**References:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

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

**I Year II Semester 23CS51- COMPUTER PROGRAMMING LAB**  
(Common to All branches of Engineering)

L	T	P	C
0	0	3	1.5

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Read, understand, and trace the execution of programs written in C language.	Understand
CO2	Apply the right control structure for solving the problem.	Apply
CO3	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C.	Apply
CO4	Improve individual / teamwork skills, communication and report writing skills with ethical values.	Apply

**UNIT I****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 like Vi, Vim & Emacs etc.
- 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 Flow charts.

**Lab 2:** Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- i. Sum and average of 3 numbers
- 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:



**Lab 3:** 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

## UNIT II

### WEEK 4

**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 associativity:

**Lab4:** Simple computational problems using the operator' precedence and associativity

- 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. Take marks of 5 subjects in integers, and find the total, average in float

### WEEK 5

**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 the max and min of four 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.

### WEEK 6

**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:** Iterative problems e.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. Compute sine and cos series
- iv. Checking a number palindrome
- v. Construct a pyramid of numbers.

**UNIT III****WEEK 7:**

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:** 1D Array manipulation, linear search

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

**WEEK 8:**

**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.

**Lab 8:** 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

**UNIT IV****WEEK 9:**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & 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 a 1D array using malloc()
- ii. Write a C program to find the total, average of n students using structures
- iii. Enter n students data using calloc() and display failed students list
- iv. Read student name and marks from the command line and display the student details alongwith the total.
- v. Write a C program to implement realloc()

**WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures

(Singly linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10 :** Bitfields, 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 bitfields.
- iv. Write a C program to copy one structure variable to another structure of the same type.

**UNIT V**

**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 Eulerstheorem.

- 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'smethod

**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

**Lab 12:** 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.

**WEEK 13:**

**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 lowercase, 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 using fread() and fwrite()
- 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, McGraw Hill

**REFERENCE BOOKS:**

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

I Year II Semester

**23ME52- ENGINEERING MECHANICS LAB**  
 (Mechanical Engineering & allied branches)

L	T	P	C
0	0	3	1.5

**Course Objectives:** The students completing the course are expected to:

- Verify the Law of Parallelogram and Triangle of Forces.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Analyse the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller	Apply
CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.	Apply
CO3	Determine the Centre of gravity and Moment of Inertia of different configurations.	Apply
CO4	Apply the equilibrium conditions of a rigid body under the action of different force systems	Apply

*Students have to perform any 10 of the following Experiments:*

**List of Experiments:**

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
7. Study of the systems of pulleys and draw the free body diagram of the system.
8. Determine the acceleration due to gravity using a compound pendulum.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.

**References:**

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5<sup>th</sup> Edition, McGrawHill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14<sup>th</sup> Edition, Pearson Education, Inc., New Delhi, 2022

**23AU01- HEALTH AND WELLNESS, YOGA  
AND SPORTS**  
(Common to All branches of Engineering)

I Year II Semester

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

<b>CO1</b>	Understand the importance of yoga and sports for Physical fitness and sound health.	<b>Understand</b>
<b>CO2</b>	Demonstrate an understanding of health-related fitness components	<b>Apply</b>
<b>CO3</b>	Compare and contrast various activities that help enhance their health	<b>Understand</b>
<b>CO4</b>	Assess current personal fitness levels.	<b>Apply</b>
<b>CO5</b>	Develop Positive Personality	<b>Apply</b>

**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.
- ii. Practicing general and specific warm up, aerobics
- iii. 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.

**B.Tech II Year I**  
**Semester**

**23FE09 - NUMERICAL METHODS AND**  
**TRANSFORM TECHNIQUES**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- 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:**

COs	Statements	Blooms Level
<b>CO1</b>	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals	<b>Apply</b>
<b>CO2</b>	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	<b>Apply</b>
<b>CO3</b>	Apply the Laplace transform for solving differential equations	<b>Apply</b>
<b>CO4</b>	Find or compute the Fourier series of periodic signals	<b>Apply</b>
<b>CO5</b>	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms	<b>Apply</b>

**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  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  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 (without proof) - Finite Fourier transforms.

**TEXT BOOKS:**

1. **B. S. Grewal**, Higher Engineering Mathematics, 44<sup>th</sup> Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**REFERENCE BOOKS:**

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India.
2. **Steven C. Chapra**, Applied Numerical Methods with MATLAB 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. **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press

**B.Tech II Year I  
Semester**

**23HS01 - UHV-2 UNDERSTANDING HARMONY  
AND ETHICAL HUMAN CONDUCT**

L	T	P	C
2	1	0	3

**Course Objectives:**

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity	Understand
CO2	Identify one's self, and one's surroundings (family, society nature)	Understand
CO3	Relate human values with human relationship and human society	Understand
CO4	Illustrate the need for universal human values and harmonious existence	Understand
CO5	Develop as socially and ecologically responsible engineers	Apply

Course Topics The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

**UNIT I**

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

**UNIT II** Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

**UNIT III** Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal.

**UNIT IV** Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature  
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

**UNIT V** Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order  
Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

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

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

### **READINGS:**

#### **Textbook and Teachers Manual**

##### **a. The Textbook**

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

##### **b. The Teacher's Manual**

R R Gaur, R Asthana, G P Bagaria, 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

#### **Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, 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 – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

#### **Mode of Conduct:**

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values. It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

**Online Resources:**

- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
- <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
- <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
- <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
- <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>  
[https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)

**B.Tech II Year I  
Semester**

**23AE01 – INTRODUCTION TO AEROSPACE  
ENGINEERING**

L	T	P	C
2	0	0	2

**Course Objective:**

- To learn the components of airplane and different types of flight vehicles, the basic aspects of aerodynamics and airfoils.
- To learn the elements of propulsive systems, function of structural components in wing and fundamental aspects of flight vehicle in space.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Describe functions of various external and internal components of an airplane	Understand
CO2	Classify the various forces and moments acting on an airfoil	Understand
CO3	Differentiate the working principles of various aircraft engines systems	Understand
CO4	Formulate the basic aspects of space flight	Apply

**UNIT - I**

**BASIC ASPECTS:** History-Early Planes, Components of Airplane and Their Functions, Types of Flight Vehicles, Classifications, Standard Atmosphere, Altitude, Hydrostatic Equation, Geopotential and Geometric Altitudes

**UNIT -II**

**BASIC AERODYNAMICS:** Introduction – Airfoils - Airfoil Nomenclature, Classifications of NACA Airfoils, Wing Geometry, Aerodynamic Forces, Lift, Drag and Moment Coefficients, Co-Efficient of Pressure, Centre of Pressure, Aerodynamics Centre, Pressure Distribution Over Aerofoil, Types of Drag.

**UNIT - III**

**PROPULSION:** Introduction, Propeller, Reciprocating Engine, Jet Propulsion-The Thrust Equation, Elements of Turbojet Engine-Turbofan Engine-Rocket Engine, Rocket Propellants-Liquid Propellants, Solid Propellants, Rocket Staging

**UNIT - IV**

**FLIGHT VEHICLE STRUCTURES:** Introduction, Fuselage-Monocoque, Semi-Monocoque Structures, Components of Wing-Spars, Ribs, Longerons, Stringers, Bulkheads, Aircraft Materials-Metallic and Non-Metallic Materials, Use of Aluminium Alloy, Titanium, Stainless Steel and Composite Materials

**UNIT – V**

**SPACE FLIGHT:** Introduction, Orbit Equation, Basic Aspects of Space Vehicle Trajectories, Kepler's Laws, Earth and Planetary Entry, Space Explorations- Space Vehicles and Its types, Reusable Space Vehicles, Space Shuttle, Satellites, Types of Satellites and Their Functions.

**TEXT BOOK:**

1. Anderson. J. D, Mary L. Bowden, Introduction to Flight, Ninth Edition, McGraw-Hill Education, 2021.

**REFERENCE BOOKS:**

1. E. Rathakrishnan., Introduction to Aerospace Engineering (Basic Principles of Flight), Wiley, First Edition, 2021
2. Houghton. E. L., Carpenter P.W., Aerodynamics for Engineering Students, Seventh Edition, Butterworth-Heinemann, 2017.
3. Kermode. A. C, Mechanics of Flight, Eleventh Edition, Pearson Education, 2007.

**Online Learning Resources:**

1. <https://archive.nptel.ac.in/courses/101/101/101101079/>
2. <https://ocw.tudelft.nl/courses/introduction-aerospace-engineering/>

**B.Tech II Year I Semester 23AE02 – ENGINEERING FLUID MECHANICS**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To demonstrate the properties of fluids and behavior of fluids under static conditions.
- To teach differential relations for fluid flows, features of flow through pipes.
- To understand the working of Hydraulic turbines and Hydraulic pumps.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply fluid static principles on objects submerged in fluids	<b>Apply</b>
CO2	Apply the conservation laws to solve elementary fluid flow problems	<b>Apply</b>
CO3	Apply the fluid flow principles to simple pipe network for fluid transportation	<b>Apply</b>
CO4	Determine the performance of various hydraulic turbines and pumps	<b>Apply</b>

**UNIT - I**

**INTRODUCTION:** Fluids and Continuum, Classification of Fluids, Properties of Fluid – Pressure, Temperature, Density, Specific Weight, Specific Gravity, Viscosity-Newton’s Law of Viscosity, Compressibility, Surface Tension, Capillarity, Vapour Pressure

**Fluid Statics:** Pressure Acting at a Point in a Static Fluid-Pascal’s Law, Basic Equation of Fluid Statics-Hydrostatic Pressure Distribution, Hydrostatic Forces on Submerged Plane Surfaces, Manometers, Buoyancy and Stability, Hydrostatic pressure distribution in earth’s atmosphere

**UNIT - II**

**ANALYSIS OF FLUID FLOW:** Eulerian and Lagrangian Approaches, Velocity Field, Flow Patterns- Pathline, Streamline, Streakline, Timeline, Stream Tube.

**DIFFERENTIAL RELATIONS FOR FLUID FLOW:** Acceleration Field of a Fluid, Differential Equation of Mass Conservation, Differential Equation of Linear Momentum, Euler’s Equation, Stream Function, Rotationality and Irrotationality, Vorticity, Velocity Potential, Potential Flow, Bernoulli Equation and its Applications- Orifice Tank, Venturi Meter, Pitot-static tube, Nozzle, Water siphon

**UNIT - III**

**FLOW THROUGH PIPES:** Introduction, Reynolds Experiment, Head Loss, Darcy-Wiesbach Equation, Hydraulic Gradient and Total Energy Lines, Laminar Fully Developed Pipe Flow- Hagen Poiseuille Law, Moody Chart, Pipes in Series, Equivalent Pipe, Pipes in Parallel, Minor Losses, Hydraulic Diameter.

**DIMENSIONAL ANALYSIS AND SIMILARITY:** Introduction, Principle of Dimensional Homogeneity, Buckingham’s Pi Theorem, Dimensionless Groups, Similarity.



#### UNIT IV

**HYDRAULIC TURBINES:** Introduction, Classification of Turbines- Impulse and Reaction Turbines, Pelton Turbine, Francis Turbine and Kaplan Turbine-Working Principle, Velocity Triangles, Work Done and Efficiency, Draft Tube, Surge Tank, Unit and Specific Quantities

#### UNIT V

**CENTRIFUGAL PUMPS:** Classification, Working Principle, Velocity Triangles, Work Done, Head and Efficiencies, Losses, Specific Speed, Pumps in Series and Parallel

**RECIPROCATING PUMPS:** Classification, Working Principle, performance calculation- Equation for discharge, Co-Efficient of Discharge and Slip, Equation for power input, Indicator Diagram.

#### TEXT BOOK

1. Rathakrishnan. E, Fluid Mechanics an Introduction, Fourth Edition, Prentice Hall of India, 2021.
2. Balachandran P, Engineering Fluid Mechanics, Prentice Hall of India, 2012.

#### REFERENCES

1. White. F.M, Fluid Mechanics, Seventh Edition, McGraw-Hill Education 2011
2. Fox. R.W, Mcdonald, A.J, Introduction of Fluid Mechanics, Fifth Edition, John Wiely, 1999.
3. Douglas. J.F, Gesiorek. J.M., Swaffield. J, A., Fluid Mechanics, Fourth Edition, Pearson Education, 2002.
4. Shames. I.H, Mechanics of Fluids, Third Edition, McGraw-Hill, 1992.

#### Online Learning Resources:

- <https://archive.nptel.ac.in/courses/112/105/112105206/>
- <https://archive.nptel.ac.in/courses/112/104/112104118/>
- <https://www.edx.org/learn/fluid-mechanics>
- [https://onlinecourses.nptel.ac.in/noc20\\_ce30/previewnptel.ac.in](https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in)
- [www.coursera.org/learn/fluid-powerera](http://www.coursera.org/learn/fluid-powerera)

**B.Tech II Year I Semester 23AE03 – ENGINEERING THERMODYNAMICS**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To learn the basic concepts of energy conversions, laws of thermodynamics, concept of entropy and properties of pure substances.
- To familiarize basic aspects of gas power cycles and internal combustion engines

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Describe the thermodynamic properties of various systems	Understand
ACO2	Apply the laws of thermodynamics to analyze various thermal systems.	Apply
CO3	Understand the properties of pure substances	Understand
CO4	Formulate performance parameters of various gas power cycles	Apply
CO5	Describe the working of Internal Combustion Engines.	Understand

**UNIT - I**

**Basic Concepts:** Introduction, Macroscopic and Microscopic Viewpoints, Thermodynamic System, Types of systems, Properties of a System, Continuum Thermodynamic Equilibrium, Quasi Static Process, Temperature-Temperature Scales, Zeroth Law of Thermodynamics, Energy, Forms of Energy, Heat, Work, Different forms of Work, Path and Point Functions.

**UNIT - II**

**First Law of Thermodynamics:** Introduction, Joule's Experiment, First Law Analysis of Closed System, Internal Energy, Conservation of Mass, Conservation of Energy, Specific Heat, Enthalpy, Principle-Flow Work.

**First Law Analysis of Control Volume:** The Steady Flow Process-Steady Flow Energy Equation, Applications of Steady Flow Energy Equation, Steady Flow Devices, Energy Analysis of Steady Flow Devices.

**UNIT - III**

**Second Law of Thermodynamics:** Introduction, Thermal Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps. Kelvin-Planck & Clausius Statements and their Equivalence/Corollaries. Reversible and Irreversible Processes, Carnot Cycle, Carnot Principles, Absolute Thermodynamic Temperature Scale, The Carnot Heat Engine, Heat Pump and Refrigerator.

**Entropy:** Introduction Entropy- Clausius Inequality, Principle of Increase of Entropy, Tds-Relations, Entropy Change for incompressible and compressible substances, Isentropic Relations for Ideal Gases, Maxwell Relation, Third Law of Thermodynamics.

#### UNIT – IV

**Properties of Pure Substances:** Introduction, Phases of Pure Substance, Phase Change Processes- Saturated Liquid, Saturated Vapor, Super-Heated Vapor, Property Diagrams- Pressure-Volume, Pressure-Temperature, Temperature-Entropy, Enthalpy-Entropy, Pressure-Volume-Temperature Surface, Dryness Fraction-Saturated Liquid Vapor Mixture.

**Gas Power Cycles:** Introduction, Analysis of Power Cycles, The Carnot cycle, Air-standard Assumptions, Otto, Diesel, Dual, and Brayton Cycles.

#### UNIT – V

**Internal Combustion (IC) Engines:** Classification of IC Engines, Components of IC engines, working Principles of 4-Stroke and 2-Stroke Engines, Working Principles of Spark Ignition (SI) Engine, Compression Ignition (CI) Engine, Valve and Port Timing Diagrams, Air-fuel Mixture, Carburation, Performance Analysis of IC engines.

#### TEXT BOOKS:

1. Rathakrishnan. E, Fundamentals of Engineering Thermodynamics, Second Edition, Prentice Hall of India, 2010.
2. Mahesh M Rathore, Thermal Engineering, Sixteenth Reprint, McGraw Hill Education India Private Limited, 2017

#### REFERENCE BOOKS:

1. Nag. P.K, Engineering Thermodynamics, Sixth Edition, McGraw Hill Education India Private Limited, 2017.
2. Yunus A Cengel, Michale A. Boles, and Mehmet Konoglu, Thermodynamics: An Engineering Approach, Ninth Edition in SI units, McGraw Hill Education India Private Limited, 2019.
3. Sonntag. R. E, Borgnakke. C Van, Fundamentals of Thermodynamics, Tenth Edition, John Wiley & Sons publications Inc, 2019.

#### Online Learning Resources:

- <https://www.edx.org/learn/thermodynamics>
- <https://archive.nptel.ac.in/courses/112/106/112106310>
- <https://www.coursera.org/learn/thermodynamics-intro>

**B.Tech II Year I  
Semester**

**23MC01 – ENVIRONMENTAL SCIENCE**

L	T	P	C
2	0	0	-

**Course Objectives:**

The objective of this course is to understand Environmental issues like natural resource depletion, pollution, interaction between human and ecosystems and their role in the food web in the natural world, importance of global biodiversity and significance of environmental law in India.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	The necessity of resources, their exploitation and sustainable management	Understand
CO2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation	Understand
CO3	Environmental problems like pollution, disasters and possible solutions.	Remember
CO4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits	Remember
CO5	Environmental issues like over population, human health etc related to local, regional and global levels	Understand

**UNIT – I**

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

Natural Resources : Renewable and non-renewable 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:

**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:

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

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 – Hot-spots 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

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 – 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 Carbon credits & Mission LiFE - 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 – 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.

#### **TEXT BOOKS:**

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. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
2. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
3. M.Anji Reddy, “Textbook of Environmental Sciences and Technology”, BS Publication, 2014.
4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
5. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
7. 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://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->

**B.Tech II Year I  
Semester**

**23AE51 - ENGINEERING FLUID MECHANICS LAB**

L	T	P	C
0	0	3	1.5

**Course Objective:**

- To learn about the insights of calculating the discharge in various flow measuring devices.
- To work on performance parameters of hydraulic machines.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply the principles of Fluid mechanics in discharge measuring devices used in pipes, channels and tanks	<b>Apply</b>
CO2	Analyze the performance of various hydraulic machines	<b>Analyze</b>

**LIST OF EXPERIMENTS**

**(Any of the 10 Experiments are required to be conducted)**

1. Verification of Bernoulli's Theorem
2. Calibration of Venturi meter
3. Calibration of Orifice meter.
4. Determination of friction factor for a given pipeline
5. Determination of loss of head due to sudden contraction in a pipeline
6. Determine Co-Efficient of Impact of jets on Vanes.
7. Performance Test on Pelton Wheel.
8. Performance Test on Kaplan Turbine.
9. Performance Test on Single Stage Centrifugal Pump.
10. Performance Test on Reciprocating Pump.
11. Determination of co-efficient discharge using Turbine flow meter.
12. Flow visualization using Reynolds experiment.
13. Flow Visualization study using Water Flow Channel

**REFERENCE:** Lab Manual

**B.Tech II Year I  
Semester**

**23AE52 - APPLIED THERMODYNAMICS LAB**

L	T	P	C
0	0	3	1.5

**Course Objectives:**

- To familiarize the working of various Internal Combustion Engines and to evaluate the performance parameters of Internal Combustion Engines.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Demonstrate the working of various IC Engine systems and components.	Understand
CO2	Analyze the performance characteristics of Internal Combustion Engines	Analyze

**LIST OF EXPERIMENTS**

**(Any of the 10 Experiments are required to be conducted)**

- I.C. Engine Valve and Port Timing Diagram.
- Determination of calorific value of fuel using bomb calorimeter.
- Determination of viscosity of fuel by using viscometer.
- Performance Test on single cylinder 4-Stroke Diesel engine by using Mechanical Dynamometer.
- Evaluation of performance parameters of twin cylinder 4-stroke Diesel engine.
- Determination of performance characteristics of 2-Stroke Petrol Engine.
- Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Diesel Engine.
- Preparation of Heat Balance Sheet for 4 stroke Diesel engine
- Performance Test on Reciprocating Air-Compressor.
- Demonstration of automobile working components.
- Measurement of exhaust emissions and smoke of I.C Engines.
- Solar parabolic concentrator apparatus

**References:** Lab manual.



**B.Tech II Year I  
Semester**

**23CS57 - PYTHON PROGRAMMING LAB**

L	T	P	C
0	0	2	1

### 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:

COs	Statements	Blooms Level
CO1	Solve the different methods for linear, non-linear and differential equations	Evaluate
CO2	Learn the PYTHON Programming language	Remember
CO3	Familiar with the strings and matrices in PYTHON	Remember
CO4	Write the Program scripts and functions in PYTHON to solve the methods	Create
CO5	Evaluate different methods of numerical solutions	Evaluate

#### Experiment 1: Introduction to Python

- Objective: Install Python and set up the development environment.
- Tasks:
  - Install Python and an IDE (e.g., PyCharm, VSCode, 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 at least 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 text files.
  - 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 raise custom 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 datasets.
  - 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 JSON data 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.

**Online Learning Sources:**

- [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.ad.kw.Python+language.de.c.dm.pl.ti.kwd-76278984197882%3Aloc-90.li\\_116074.pd.&couponCode=IND21PM](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.ad.kw.Python+language.de.c.dm.pl.ti.kwd-76278984197882%3Aloc-90.li_116074.pd.&couponCode=IND21PM)
- [https://www.w3schools.com/python/python\\_intro.asp](https://www.w3schools.com/python/python_intro.asp)
- <https://www.youtube.com/watch?v=eWRfhZUzrAc>
- [https://onlinecourses.nptel.ac.in/noc20\\_cs83/preview](https://onlinecourses.nptel.ac.in/noc20_cs83/preview)
- <https://www.edx.org/learn/python>
- Virtual Labs - <https://python-iitk.vlabs.ac.in/>
- Virtual Labs - <https://virtual-labs.github.io/exp-arithmetic-operations-iitk/>
- Virtual Labs - <https://cse02-iiith.vlabs.ac.in/>  
[https://mlritm.ac.in/assets/cse/cse\\_lab\\_manuals/R20\\_cse\\_manuals/Python%20Lab%20Manual.pdf](https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/Python%20Lab%20Manual.pdf)

**B.Tech II Year I  
Semester**

**23AES1 - COMPUTER AIDED DESIGN LAB**

L	T	P	C
0	1	2	2

**Course Objective:**

- The course aims to teach developing and drawing Machine components using AutoCAD.
- To teach the students fundamentals of AutoCAD.
- To learn 2-D, Isometric and 3-D Component Designs.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Draw simple objects using functional tools in AutoCAD	<b>Understand</b>
CO2	Create solid models of machine and Simple Aircraft components.	<b>Apply</b>
CO3	Translate 3D components into 2D drawings.	<b>Apply</b>

**List of Experiments (10 Experiments)**

- **Introduction to AUTOCAD**
- **BASIC AUTOCAD COMMANDS**
  1. Basic drawing commands (line, circle, arc, ellipse, polygon, and rectangle).
  2. Edit commands (copy, move, erase, zoom).
  3. Array commands (polar array, rectangular array, P-edit, divide, pline, offset).
  4. Hatching & line commands (hatching with different angles & different types of lines).
  5. Mirror & trim commands (mirror an object, trim, extend a line, chamfer & fillet, explode).
  6. Dimensioning & text commands (linear, angular, radius, diameter & text).
- **2-D DRAWINGS OF MACHINE COMPONENTS**
- **ISOMETRIC DRAWINGS**
- **3-D DESIGNS OF SIMPLE AIRCRAFT COMPONENTS**
  1. Propeller Blade Hub
  2. Structural components of Wing
  3. Propulsive components like Nozzles, Turbine, combustion chamber, etc.
  4. Engine Casing
  5. Basic Aircraft model
  6. Aircraft Components Like Nose, Wing, Fuselage Tail parts, etc.

**B.Tech II Year II  
Semester**

**23HS03 - INDUSTRIAL MANAGEMENT**

L	T	P	C
2	0	0	2

**Course Objectives:**

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

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Learn about how to design the optimal layout	Remember
CO2	Demonstrate work study methods	Apply
CO3	Explain Quality Control techniques	Understand
CO4	Discuss the financial management aspects and	Understand
CO5	Understand the human resource management methods.	Understand

**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, merit rating, quantitative methods, wage incentive plans, and types.

**VALUE ANALYSIS:** Value engineering, implementation procedure, enterprise resource planning and supply chain management.

**TEXT BOOKS:**

- 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' 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:**

- [https://onlinecourses.nptel.ac.in/noc21\\_me15/preview](https://onlinecourses.nptel.ac.in/noc21_me15/preview)
- [https://onlinecourses.nptel.ac.in/noc20\\_mg43/preview](https://onlinecourses.nptel.ac.in/noc20_mg43/preview)
- <https://www.edx.org/learn/industrial-engineering>
- <https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi>
- [https://youtube.com/playlist?list=PLbjTnjt5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX\\_5RG69hS3v2ll](https://youtube.com/playlist?list=PLbjTnjt5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG69hS3v2ll)

**B.Tech II Year II  
Semester**

**23FE13 - COMPLEX VARIABLES,  
PROBABILITY AND STATISTICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
3	0	0	3

**Course Objectives:**

- To familiarize the complex variables.
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic.	Apply
CO2	Make use of Cauchy residue theorem to evaluate certain integrals.	Apply
CO3	Infer the statistical inferential methods based on small and large sample tests .	Analyze
CO4	Find the differentiation and integration of complex functions used in engineering problems.	Apply
CO5	Design the components of a classical hypothesis test.	Analyze

**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 tilt types

$$\int_{-\infty}^{\infty} f(x)dx \text{ and } \int_c^{c+2\pi} f(\sin \theta, \cos \theta)d\theta$$

**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  $\chi^2$

theory distributions— Introduction to t, 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 on proportions

**TEXT BOOKS:**

1. **B. S. Grewal**, Higher Engineering Mathematics, 44<sup>th</sup> Edition, Khanna Publishers.
2. **Miller and Freund's**, Probability and Statistics for Engineers, 7/e, Pearson, 2008.

**REFERENCE BOOKS:**

1. **J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9<sup>th</sup> edition, Mc-Graw Hill, 2013.
2. **S. C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. **Jay 1. Devore**, Probability and Statistics for Engineering and the Sciences, 9<sup>th</sup> Edition, Cengage.
4. **Shron L. Myers, Keying Ye, Ronald E Walpole**, Probability and Statistics for Engineers and the Scientists, 8<sup>th</sup> Edition. Pearson 2007.
5. **Sheldon M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4<sup>th</sup> Edition, Academic Foundation, 2011.

**Online Learning Sources:**

<https://biet.ac.in/pdfs/PROBABILITY%20AND%20STATISTICS%20&%20CO>

<https://archive.nptel.ac.in/courses/111/103/111103070/MPLEX%20VARIABLES.pdf>

<https://archive.nptel.ac.in/courses/111/105/111105090/>

<http://acl.digimat.in/nptel/courses/video/111102160/L23.html>

[https://onlinecourses.nptel.ac.in/noc21\\_ma57/preview](https://onlinecourses.nptel.ac.in/noc21_ma57/preview)



**B.Tech II Year II  
Semester**

**23AE04 - MATERIALS AND  
MANUFACTURING TECHNOLOGY**

3	0	0	3
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**Course Objectives:**

- The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys.
- To learn equilibrium diagrams and to learn primary manufacturing processes, working of basic machines and various operations to be performed.
- Teach conventional and unconventional machining processes.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Understand the properties of the metals and alloys based on structures.	<b>Understand</b>
CO2	Classify, construct and analyze equilibrium diagrams, various ferrous, non-ferrous metals and alloys.	<b>Understand</b>
CO3	Acquire knowledge of the basic aspects of casting process.	<b>Understand</b>
CO4	Know the various basic concepts of welding process, metal forming process and sheet metal operations in the manufacturing of products.	<b>Understand</b>
CO5	Know different conventional and unconventional machining processes while manufacturing a product	<b>Understand</b>

**UNIT – I**

**STRUCTURE OF METALS:** Crystal Structures-Body centered cubic, Face centered cubic, closed packed hexagonal, Mechanism of grain and grain boundaries, Effect of grain boundaries on the properties of metal / alloys, Determination of grain size. Solid solutions-Interstitial Solid Solution and Substitution Solid Solution, Hume Rothery rules.

**UNIT – II**

**EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS:** Classification of equilibrium diagrams- isomorphous, eutectic, partial eutectic equilibrium diagrams. Lever rule, Study of Cu-Ni and Iron-Iron carbide equilibrium diagram.

**STEEL:** Classification of steels, structure, properties and applications of plain carbon steel, low carbon steel, medium carbon steel and high carbon steel.

**CAST IRONS:** structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, spheroidal graphite cast iron.

**NON-FERROUS METALS AND ALLOYS:** structure, properties and applications of copper and its alloys, Aluminium and its alloys.

**UNIT – III**

**INTRODUCTION TO MANUFACTURING AND CASTING:** Classification of Manufacturing Processes; Steps Involved in Making a Casting- Advantages and Its Applications, Types of Patterns- Pattern Allowances, Principles of Gating, Gating Ratio, Types of Raisers, Special Casting Processes – Centrifugal – Die - Investment – Continuous.

**UNIT - IV**

**WELDING:** Classification of Welding Process- Types of Weld- Welded Joints, Principle and Applications- Gas Welding- Arc Welding- Friction Welding, Soldering and Brazing.

**METAL FORMING PROCESSES:** Types of Rolling Mills and Products; Principles of Forging - Types of Forging-Smith Forging, Drop Forging

**EXTRUSION OF METALS:** Hot Extrusion and Cold Extrusion –Forward Extrusion and Backward Extrusion, Impact Extrusion, Hydrostatic Extrusion.

#### **UNIT - V**

**MACHINING PROCESSES:** Tool Geometry; Cutting Tool & Tool Wear- Cutting Materials; Cutting Fluids; Introduction and Working Principle of Lathe and Operations

**SHAPING, PLANNING, MILLING AND DRILLING MACHINES:** Principles of Working, Principle Parts, Specifications, Classification, Comparison and Operations Performed.

**INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES:** Classification of Unconventional Machining Processes. Abrasive Jet Machining, Ultrasonic Machining, Laser Beam Machining

#### **TEXT BOOKS:**

1. V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 42<sup>nd</sup> Edition, 2018.
2. Rao. P. N, Manufacturing Technology, Volume 1 and 2 Tata McGraw-Hill, 2018.

#### **REFERENCE BOOKS:**

1. Ghosh. A, Malik. A. K, Manufacturing Science, Second Edition, East West Publisher, 2010.
2. Kalpakjain. S, Schmid. S. R, Manufacturing Processes for Engineering Materials, 6<sup>th</sup> Edition, Pearson Education, 2017
3. Richard A.Flinn, Paul K.Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.
4. William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.

**B.Tech II Year II**  
**Semester**

**23AE05 - SOLID MECHANICS**

3	0	0	3
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**Course Objectives:**

- To learn the basic concepts of stress, strain and relations based on linear elasticity,
- Students can analyze beams and draw shear force and bending moment diagrams
- To learn theory of simple bending, Shear and torsion.
- Understand the principal stresses and shear stress distribution.
- Design and analysis of components subjected to deformation and internal pressure.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Describe the concept of stress and strain to analyze and design structural members and machine parts under various loading conditions.	<b>Understand</b>
CO2	Evaluate stress, shear force, bending moment, under different loading conditions.	<b>Apply</b>
CO3	Analyze Bending and torsional stresses of different components.	<b>Apply</b>
CO4	Understand shear stress distributions over different cross sections and concept of Principle Stresses.	<b>Understand</b>
CO5	Model and analyze the behavior of basic structural members subjected to deflection and internal pressure.	<b>Analyze</b>

**UNIT- I**

**SIMPLE STRESSES AND STRAINS:** Stresses and Strains Due to Axial Force, Hooke's Law, Factor of Safety, Stepped Bars – Uniformly Varying Sections - Stresses in Composite Bars Due to Axial Force and Temperature - Strain Energy Due to Axial Force, Stresses Due to Sudden Loads and Impact. Lateral Strain: Poisson's Ratio - Change in Volume – Shear Stress - Shear Strain - Relationship Between Elastic Constants

**UNIT – II**

**SHEAR FORCE AND BENDING MOMENT:** Relationship Between Loading - Shear Force and Bending Moment - Shear Force and Bending Moment Diagrams for Cantilever, Simply Supported and Overhanging Beams Subjected to Concentrated Loads and Uniformly Distributed Loads Only - Maximum Bending Moment and Point of Contra Flexure.

**UNIT - III**

**STRESSES IN BEAMS: THEORY OF SIMPLE BENDING:** - Introduction-Pure Bending-Theory of Simple Bending with Assumptions - Derivation of The Bending Equation-Bending Stresses in Symmetric Sections – Section Modulus - Calculation of Normal Stresses Due to Flexure Application.

**TORSION:** Theory of Torsion and Assumptions - Derivation of the Torsion Equation, Polar Modulus, Power Transmitted by a Shaft, Stresses in Solid and Hollow Circular Shafts

#### UNIT – IV

**SHEAR STRESSES:** Introduction, Derivation of Shear Stress Distribution Formula – Shear Stress Distribution Across Various Beam Cross Sections Like Rectangular, Circular, Triangular, I and T Sections.

**PRINCIPAL STRESSES:** State of Stress at a Point-Principal Plane-Principal Stresses- Normal, Tangential and Resultant Stresses on Inclined Planes-Member Subjected to Direct Stress in One Plane, Two Mutually Perpendicular Planes- Two Mutually Perpendicular Planes with Simple Shear, Graphical Method (Mohr's Circle Method).

#### UNIT – V

**DEFLECTION OF BEAMS:** Deflection and Slope of Beams Subjected to Point Load and Uniformly Distributed Load- Differential Equation of Elastic Line – Double integration and Macaulay's Methods -Deflection of Statically Determinate Beams-Simply Supported Beam, Cantilever Beam, Overhang Beam with Point Load and Uniformly Distributed Load.

**Thin, Thick Shells:** Introduction- Thin Cylindrical Vessel Subjected to Internal Pressure-Stresses Due to Internal Pressure- Hoop and Longitudinal Stresses -Efficiency of Joint- Stresses in a Thick Cylindrical Shell-Lame's Equations.

#### TEXT BOOKS:

1. Ramamrutham. S, Narayanan R, Strength of Materials, Dhanpat Rai & Sons, 2017.
2. B.C. Punmia, Strength of materials,10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018.

#### REFERENCE BOOKS:

1. Popov. E. P, Mechanics of Materials, Prentice Hall Inc, 1976.
2. Gere & Timoshenko, Mechanics of materials, 2/e, CBS publications, 2004.
3. Andrew. P, Singer F.L., Strength of Materials, Harper and Row Publishers, New York, 1987.
4. Gambhir. M. L, Fundamentals of Solid Mechanics, PHI Learning, 2009.

#### Online Learning Resources:

- [https://onlinecourses.nptel.ac.in/noc19\\_ce18/preview](https://onlinecourses.nptel.ac.in/noc19_ce18/preview).
- [https://youtube/iY\\_ypsychVNY?si=310htc4ksTQJ8Fv6](https://youtube/iY_ypsychVNY?si=310htc4ksTQJ8Fv6).
- [https://www.youtube.com/watch?v=WEy939Rkd\\_M&t=2s](https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s)
- <https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204>
- <https://www.coursera.org/learn/mechanics-1>
- <https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-1-linear-elastic-behavior>
- <https://archive.nptel.ac.in/courses/112/107/112107146/>

**B.Tech II Year II**  
Semester

**23AE05 - AERODYNAMICS**

L	T	P	C
3	0	0	3

**Course Objective:**

- To learn the theoretical methods to solve the potential flow problems
- To familiarize potential flow theory to solve for airfoil characteristics
- To familiarize the finite wing theory and properties of viscous flows and boundary layer development over flat plate

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply Laplace equation for obtaining 2D and axisymmetric solutions	Apply
CO2	Apply conformal transformation to form aerodynamic shapes	Apply
CO3	Apply potential flow theory to solve airfoil characteristics	Apply
CO4	Apply Prandtl's lifting line theory to predict finite wing properties	Apply
CO5	Illustrate the effect of boundary layer on flow over objects	Understand

**UNIT - I**

**POTENTIAL FLOW:** Introduction, Laplace's Equation, Basic Flows – Uniform Parallel Flow, Source, Sink, Simple Vortex, Doublet, Combination of Simple Flows-Flow Past a Half Body, Rankine Oval, Flow Past a Circular Cylinder without Circulation and with Circulation, Kutta-Joukowski Theorem

**UNIT - II**

**CONFORMAL TRANSFORMATION:** Introduction, Basic Principles, Methods for Performing Transformation, Kutta-Joukowski Transformation, Transformation of Circle to Straight Line, Transformation of Circle to Ellipse, Transformation of Circle to Symmetrical Aerofoil, Transformation of Circle to Cambered Aerofoil

**UNIT - III**

**THIN AEROFOIL THEORY:** Introduction, Aerofoil Characteristics, Vortex Sheet, Kutta Condition, Kelvin's Circulation Theorem, Starting Vortex, Thin Aerofoil Theory-Symmetrical Aerofoil and Cambered Aerofoil.

**UNIT - IV**

**FINITE WING THEORY:** Introduction, Down Wash, Induced Drag, Trailing Vortex, Vortex Filament, Biot-Savart Law and Helmholtz Theorems, Prandtl's Classical Lifting Line Theory-Elliptic Lift Distribution, General Lift Distribution.

**UNIT - V**

**BOUNDARY LAYER:** Introduction, Boundary Layer Development, Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness, Types of Boundary Layer, Momentum Integral Estimates- Karman Analysis of the Flat Plate, Boundary Layer Equations-2D Flow, Boundary Layer Growth on a Flat Plate-Blasius Solution, Boundary Layer with Pressure Gradient

**TEXT BOOKS:**

1. Anderson, J.D., Fundamentals of Aerodynamics”, Sixth Edition, McGraw-Hill Book Co., New York, 2017.
2. Rathakrishnan. E, Theoretical Aerodynamics, Wiley, 2013.

**REFERENCE BOOKS:**

1. Houghton. E. L., Carpenter P. W, Collicott. C. H, Valentine. D. T, Aerodynamics for Engineering students, Seventh Edition, Elseveir, 2017.
2. Milne-Thomson. L. H., Theoretical aerodynamics, Courier Corporation, 2012.
3. Clancy. J. L, Aerodynamics, Sterling Book House, 2006.

**Online Learning Resources:**

- <https://archive.nptel.ac.in/courses/101/105/101105059/>

**B.Tech II Year II  
Semester**

**23AE53 - MANUFACTURING TECHNOLOGY LAB**

L	T	P	C
0	0	3	1.5

**Course Objectives:**

- To acquire basic knowledge of casting process
- To demonstrate various joining processes using welding
- To demonstrate lathe machine and special machine operations

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Develop various products using casting	Apply
CO2	Fabricate machine components with suitable welding, lathe and other machining operations	Apply
CO3	Manufacture plastic components using various plastic processing techniques	Apply

**I. METAL CASTING LAB**

1. Pattern Design and making - for one casting drawing.
2. Moulding, Melting and Casting - 1 Exercise

**II. WELDING LAB**

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 2 Exercises

**III. PROCESSING OF PLASTICS**

1. Injection Moulding
2. Blow Moulding

**IV. MACHINE TOOLS LAB**

1. Lathe Operations
2. Special Machines: Drilling, Shaping, Milling Grinding (Surface Grinding).
3. Preparation of Single Point Cutting Tool

**References:** Lab manuals.

**B.Tech II Year II  
Semester**

**23AE54 - SOLID MECHANICS LAB**

L	T	P	C
0	0	3	1.5

**Course Objectives:**

To learn the methods to predict the response of a structure under loading and its susceptibility to various failure modes

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Analyze the various materials under different equilibrium loading conditions.	Analyze
CO2	Perform tests and analyze materials subjected to tension, torsion, bending, and buckling	Apply

**LIST OF EXPERIMENTS**

**(Any of the 10 experiments are required to be conducted)**

1. Tension test on metal bar.
2. Compression test on helical spring.
3. Torsion test on square metal bar.
4. Brinell hardness test on metals.
5. Rockwell Hardness test on metals
6. Impact test on metal specimen i) Izod ii) Charpy
7. Shear test on metals
8. Bending test on solid metal specimen
9. Bending test on hollow metal specimen
10. Deflection test on Simply supported beam
11. Deflection test on Cantilever beam
12. Deflection test on Overhang beams.

**REFERENCE:** Lab Manual

**Virtual lab:**

1. To investigate the principal stresses  $\sigma_a$  and  $\sigma_b$  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>).



**B.Tech II Year II**  
**Semester**

**23AES2 - MATLAB APPLICATIONS IN**  
**ENGINEERING LAB**

L	T	P	C
0	1	2	2

**Course Educational Objectives:** This course is designed to use the basic in-built commands and to write the MATLAB code to solve ordinary differential equation, integration and make the user-friendly environment using graphical user interface.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply the basic MATLAB operations in basic engineering problems	Apply
CO2	Solve the system of linear algebraic equation using matrix operation	Apply
CO3	Apply the graphical user interface to write the code as more user friendly	Apply

### LIST OF EXPERIMENTS

#### Part – I: Introduction to MATLAB

1. (a) Find the sum of first 100 natural numbers (b) Perform Basic matrix operations?
2. (a) Write a MATLAB program that adds all elements of an array named S with even indices. (b) Perform double integration problems?
3. Find the roots of a linear equations by using Newton's and Secant Method.
4. (a) Introduction to basic plots 2D, 3D (b) MATLAB Graphical user interface – addition and subtraction

#### Part – II: Application of MATLAB

5. Write a MATLAB Code to determine Lift Curve Slope from the given parameters?
6. Solving of ordinary differential equation using Runge-Kutta method a numerical approach
7. (a) Write a MATLAB Code to determine Compute the Laplace transform of  $1/\sqrt{x}$  (b) Write a MATLAB Code to determine Eigenvalues and eigenvectors of a linear algebraic equations
8. (a) Solve System of Linear Equations (b) Solve system of nonlinear equations
9. Graphics – kinematics of particle – position, velocity, and acceleration
10. Develop the graphical user interface to identify the area moment of inertia of simple section – trapezoidal and triangle.
11. Identification of shear force and bending moment diagram of cantilever beam with point load
12. MATLAB Graphical user interface: Design and develop a scientific calculator

#### Online Learning Resources:

- <https://www.mathworks.com/solutions/cloud/resources.html>
- [https://www.edx.org/learn/matlab/mathworks-matlab-essentials?index=product&objectID=course-28ae36f9-40f5-4049-8fca-a93b5c486e81&webview=false&campaign=MATLAB+Essentials&source=edX&product\\_category=course&placement\\_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fmatlab](https://www.edx.org/learn/matlab/mathworks-matlab-essentials?index=product&objectID=course-28ae36f9-40f5-4049-8fca-a93b5c486e81&webview=false&campaign=MATLAB+Essentials&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fmatlab)

**B.Tech II Year II  
Semester**

**23ME57 - DESIGN THINKING AND INNOVATION**

L	T	P	C
1	0	2	2

**Course Objectives:**

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

**Course Outcomes:**

COs	Statements	Blooms Level
CO1	Apply fundamental design components, principles, and new materials to create and improve design projects.	Apply
CO2	Apply the design thinking process to develop and present innovative product solutions	Apply
CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions	Analyze
CO4	Analyze to work in a multidisciplinary environment	Analyze
CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity	Evaluate

**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.

### **TEXT BOOKS:**

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.

### **Online Learning 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://swayam.gov.in/nd1_noc19_mg60/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_de16/preview](https://onlinecourses.nptel.ac.in/noc22_de16/preview)