MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
MADANAPALLE
(UGC-AUTONOMOUS)
www.mits.ac.in

DEPARTMENT OF MECHANICAL ENGINEERING
Course Structure
&
Detailed Syllabi

For the students admitted to

B. Tech. Regular Four Year Degree Programme from the Academic Year 2023-24

and

B. Tech. Lateral Entry Scheme from the Academic Year 2024-25

DEPARTMENT OF MECHANICAL ENGINEERING

Vision and Mission of the Institution

Vision	To become a globally recognized research and academic institution and thereby contribute to technological and socio-economic development of the nation
Mission	To foster a culture of excellence in research, innovation, entrepreneurship, rational thinking and civility by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for practice-based learning to the youth for success in their careers.

Vision and Mission of the Department

Vision	To be a Centre of Excellence in the field of Mechanical Engineering to generate quality human resource in mechanical engineering who can contribute constructively to the technological and socio-economic development of the Nation
Mission	- To provide Globally competent Mechanical Engineers through Experienced and Committed Faculty." - To nurture graduates with Scientific temperament, Rational thinking and Humanistic approach for Excelling in their Career." - To promote Excellence in teaching and research through collaborative activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Build a successful career or pursue higher education in Mechanical Engineering and allied fields.

PEO2: Design, develop, maintain, and improve engineering systems and tools, while working in a team, for sustainable growth of the economy and continuous improvement in quality of human life.

PEO3: Engage in continuous learning to keep abreast with the latest technological developments in light of constantly changing environmental and social factors.

PROGRAM OUTCOMES (POs)

At the end of the programme, graduate will be able to

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norm of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with t h e society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Apply concepts and principles from Applied Mechanics to design, develop, and evaluate mechanical systems for a specified purpose.

PSO 2: Employ governing laws of Thermodynamics, Fluid flow and Heat Transfer for design and analysis of thermo-fluid systems.

PSO 3: Utilize the knowledge and learning of materials and manufacturing sciences to design, plan and monitor production operations in an Industry.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: MECHANICAL ENGINEERING

Total Credits	160 Credits for 2023(Regular) & 120 Credits 2024(Lateral Entry) Admitted Batch onwards

I.   Induction Program and Holistic Development Activities

Sl.No	Title	Duration
1	Induction Program (Mandatory)	Three weeks' duration at the start of First Year

R23 - Curriculum Structure
I Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	23ENG101	Communicative English	2	0	0	2	2
2	BSC	23MAT101	Linear Algebra and Calculus	3	0	0	3	3
3	BSC	23CHE101	Engineering Chemistry	3	0	0	3	3
4	ESC	23CME101	Basic Civil and Mechanical Engineering	3	0	0	3	3
5	ESC	23CSE101	Introduction to Programming	3	0	0	3	3
6	HSMC	23ENG201	Communicative English Laboratory	0	0	2	2	1
7	BSC	23CHE201	Engineering Chemistry Laboratory	0	0	2	2	1
8	ESC	23CSE201	Computer Programming Laboratory	0	0	3	3	1.5
9	ESC	23ME201	Engineering Workshop	0	0	3	3	1.5
10	HSMC	23HUM201	Health and Wellness, Yoga and Sports	-	-	1	1	0.5
Total				**14**	**0**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	23MAT102	Differential Equations and Vector Calculus	3	0	0	3	3
2	BSC	23PHY101	Engineering Physics	3	0	0	3	3
3	ESC	23EEE101	Basic Electrical and Electronics Engineering	3	0	0	3	3
4	ESC	23ME101	Engineering Graphics	1	0	4	5	3
5	PCC	23ME102	Engineering Mechanics	3	0	0	3	3
6	BSC	23PHY201	Engineering Physics Laboratory	0	0	2	2	1
7	ESC	23EEE201	Electrical and Electronics Engineering Workshop	0	0	3	3	1.5
8	ESC	23CSE202	IT Workshop	0	0	2	2	1
9	PCC	23ME202	Engineering Mechanics Laboratory	0	0	3	3	1.5
10	HSMC	23HUM202	NSS / NCC / Scouts and Guides / Community Service	-	-	1	1	0.5
Total				**13**	**0**	**15**	**28**	**20.5**

(L = Lecture, T = Tutorial, P = Practical, C = Credit

R23 - Curriculum Structure
II Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	23HUM101	Universal Human Values	2	1	0	3	3
2	BS	23MAT105	Numerical Methods	3	0	0	3	3
3	ES	23ME103	Thermodynamics	2	1	0	3	3
4	PC	23ME104	Mechanics of Solids	2	1	0	3	3
5	PC	23ME105	Materials Science and Engineering	3	0	0	3	3
6	PC	23ME203	Mechanics of Solids and Materials Science Laboratory	0	0	3	3	1.5
7	PC	23ME204	Computer Aided Machine Drawing Laboratory	0	0	3	3	1.5
8	SEC	23ENG601	Soft Skills	1	0	2	3	2
9	Audit Course	23CHE901	Environmental Science	2	0	0	2	0
Total				**15**	**3**	**8**	**26**	**20**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	23HUM102	Economics and Financial Accounting For Engineers	2	0	0	2	2
2	BS	23MAT103	Probability and Statistics for Engineers	3	0	0	3	3
3	ES		Design Thinking and Innovation Related Courses (Refer ANNEXURE - II)	1	0	2	3	2
4	PC	23ME106	Manufacturing Technology I	3	0	0	3	3
5	PC	23ME107	Fluid Mechanics and Hydraulic Machines	2	1	0	3	3
6	PC	23ME108	Theory of Machines	2	1	0	3	3
7	PC	23ME205	Fluid Mechanics and Hydraulic Machines Laboratory	0	0	3	3	1.5
8	PC	23ME206	Manufacturing Technology Laboratory	0	0	3	3	1.5
9	SEC	23CSE601	Python Programming	1	0	2	3	2
Total				**14**	**2**	**10**	**26**	**21**

(L = Lecture, T = Tutorial, P = Practical, C = Credit

Dept. of Mechanical Engineering

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- *Proficiency modules*

  - Basic Computer Proficiency
  - Interpersonal skills
  - Computer Graphics
  - Web programming
  - Mobile Apps
  - Vocabulary enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

Dept. of Mechanical Engineering

DESIGN THINKING AND INNOVATION RELATED COURSES (To be offered under MOOC's Category from SWAYAM – NPTEL)		
Sl. No.	**Course Code**	**Course Title**
1	23IIC5M01	Design, Technology and Innovation
2	23IIC5M02	Introduction on Intellectual Property to Engineers and Technologists
3	23IIC5M03	Product Engineering and Design Thinking
4	23IIC5M04	Intellectual Property Rights and Competition Law
5	23IIC5M05	Innovation, Business Models and Entrepreneurship
6	23IIC5M06	Understanding Incubation and Entrepreneurship
7	23IIC5M07	Intellectual Property
8	23IIC5M08	Roadmap for Patent Creation
Any new Innovation and Incubation Course offered by SWAYAM NPTEL can be appended in future.		

I Year I Semester

Dept. of Mechanical Engineering

B. Tech I Year I Semester

23ENG101 COMMUNICATIVE ENGLISH

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Pre-requisite: None

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.

UNIT I   Lesson: HUMAN VALUES: Gift of Magi (Short Story)   9 hours

Listening: Identifying the topic, the context and specific pieces of information by listeningto 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 ofinformation.

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)   9 hours

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 linkthe 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   9 hours

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what

isdiscussed

Reading: Readinga text in detail by making basic inferences -recognizing and interpretingspecific 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   9 hours

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   9 hours
              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 andusage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

Course Outcomes:

CO1: Understand the topic, context, and pieces of specific information from personal , professional and social situations

CO2: Apply discourse markers to speak clearly in formal discussions

CO3: Analyze and apply grammatical structures to formulate contextualized phrases and sentences

CO4: Analyze texts and images to write summaries based on global comprehension

CO5: Draft coherent paragraphs and structured essays

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black 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.

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

VOCABULARY

1   https://www.youtube.com/c/DailyVideoVocabulary/videos

2   https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

23MAT101 LINEAR ALGEBRA AND CALCULUS

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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.

UNIT I   MATRICES   9 hours

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   9 hours
                 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   9 hours

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   9 hours
                 (MULTI VARIABLE CALCULUS)**

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

UNIT V   MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)   9 hours

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).

Course Outcomes:

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

CO1: Solve the system of linear equations and apply the matrix algebra techniques in practical applications.

CO2: Utilize the Eigenvalues, Eigenvectors and applications of diagonalization in the field of Science and Technology.

CO3: Relate the results of mean value theorems in real life problems.

CO4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.

CO5: Compute the area and volume by interlinking them to appropriate double and triple integrals.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

23CHE101 ENGINEERING CHEMISTRY

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

UNIT I   WATER TECHNOLOGY   9 hours

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Ion-exchange processes - desalination of brackish water, reverse osmosis (RO), electrodialysis and Specifications for drinking water as per BIS and WHO standards.

UNIT II   ELECTROCHEMISTRY AND APPLICATIONS   9 hours

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.
Primary cells – Zinc-air battery, Sodium-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 electro less plating (Nickel and Copper).

UNIT III   POLYMERS AND FUEL CHEMISTRY   9 hours

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization, Poly Dispersity Index (PDI) & it's significance.
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   9 hours

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 (with chemical reactions).

UNIT V   SURFACE CHEMISTRY AND NANOMATERIALS   **9 hours**

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.

Course Outcomes:

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

CO1: Explain the estimation of impurities present in water like hardness and softening of impure water.

CO2: Explain the working principles of batteries & demonstrate the corrosion prevention methods and factors affecting corrosion

CO3: Explain the preparation, properties, and applications of thermoplastics, thermosetting, elastomers & conducting polymers & explain calorific values, octane number, refining of petroleum and cracking of oils.

CO4: Explain the setting and hardening of cement, properties of composites, lubricants & refractories.

CO5: Summarize the concepts of colloids, micelle and nanomaterials.

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.

3. G V Subba Reddy, K N Jayaveera, C Ramachandraiah, Engineering Chemistry, McGraw-Hill; First Edition, 2019.

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester
23CME101 BASIC CIVIL AND MECHANICAL ENGINEERING

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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.

PART A: BASIC CIVIL ENGINEERING
UNIT I   BASICS OF CIVIL ENGINEERING   **8 hours**

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   **8 hours**
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   **8 hours**
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).

Course Outcomes:
CO1: Identify various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
CO2: Measure of distances, angles and levels through surveying.
CO3: Identify various transportation infrastructures, sources of water and various water conveyance, storage structures like 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. FifthEdition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, KhannaPublishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives:

The students after completing the course are expected to

- 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.

UNIT I   **8 hours**

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries andSociety- 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   **8 hours**
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   **8 hours**
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)

Course Outcomes:

On completion of the course, the student should be able to
CO1: Understand the role and importance of mechanical engineering and engineering materials
CO2: Identify the different manufacturing processes for engineering applications and explain the basics of thermal engineering and its applications.
CO3: Explain the working of different mechanical power transmission systems, power plants and robotics.

Text Books:

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

2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.

3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications

3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

23CSE101 INTRODUCTION TO PROGRAMMING

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Course Objectives:
- Comprehensive knowledge to computer systems, programming languages, and problem-solving techniques.
- Know the concept of control structures and their usage in programming.
- Introduce to the arrays, memory models, and basic string concepts
- Gain a knowledge from the concept of functions, including declaration, definition, and various aspects of function usage.
- Acquire the advanced programming concepts, including user-defined data types, pointers, and file handling.

**UNIT I   INTRODUCTION TO PROGRAMMING AND PROBLEM   9 hours
                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   9 hours

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

UNIT III   ARRAYS AND STRINGS   9 hours

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

UNIT IV   POINTERS & USER DEFINED DATA TYPES   9 hours

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

UNIT V   FUNCTIONS & FILE HANDLING   9 hours

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**.**

Course Outcomes:

A student after completion of the course will be able to

CO1: Illustrate the basic computer concepts and programming principles of C language.

CO2: Develop programs using various control structures in 'C'.

CO3: Design applications using arrays and basic string manipulation.

CO4: Demonstrate the applications of pointers, user-defined types and dynamic memory allocation.

CO5: Design various applications using functions and file concepts.

Text Books:

1. C Programming, A Problem Solving Approach, Forouzan, Gilberg,Prasad, CENGAGE, 3rd edition.

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.

2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition

3. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988

4. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester
23ENG201 COMMUNICATIVE ENGLISH LABORATORY

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.

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

Course Outcomes:

CO1: Understand the English speech sounds, stress, rhythm, intonation and syllabic division for better listening and speaking
CO2: Apply communication strategies and implement them in language learning activities.
CO3: Analyze and enhance job-relevant writing skills
CO4: Evaluate and exhibit professionalism in debates and group discussions.
CO5: Make effective presentations by developing public speaking abilities

Suggested Software:

1. Walden Infotech
2. 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*, (2nd Ed),Kindle, 2013

Dept. of Mechanical Engineering

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

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester
23CHE201 ENGINEERING CHEMISTRY LABORATORY

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L  T P C
0  0 2 1
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Course Objectives:

- To verify the fundamental concepts with experiments

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter
13. Determination of Viscosity of a solution using Ostwald's Viscometer
14. Determination of cell constant and conductance of solutions

Course Outcomes:
At the end of the course, the students will be able to
CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer materials.
CO3: Determine the physical properties like adsorption and viscosity.
CO4: Estimate the Iron and Calcium in cement.
CO5: Calculate the hardness of water.

Reference Books:
1. Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar
2. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester

23CSE201 COMPUTER PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1.5

Course Objectives:
- Provide hands-on experience in programming fundamentals, algorithm design, and basic problem-solving techniques.
- Enable students to implement control structures for program flow control in practical scenarios.
- Reinforce understanding of arrays, memory models, and string manipulation through practical exercises
- Provide hands-on practice with functions, function calls, and parameter manipulation using pointers.
- Offer practical exposure to advanced programming concepts, including user-defined data types, file handling, and pointer operations.

UNIT I

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writingthe 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 seriesof finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: 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
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.
Problems to Practice:
    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 & constantsand operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:
Lab4: Write C program to solve Simple computational problems using the operator' precedence and associativity
Problems to Practice:
    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: Write C program for Problems involving if-then-else structures.
Problems to Practice:
    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.
    vi)

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 eachof these statements is more appropriate to use.

Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Write a C program for Iterative problems e.g., the sum of series
Problems to Practice:
    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:Write a C program to solve 1D Array manipulation, linear search
Problems to Practice:
    i)   Find the min and max of a 1-D integer array.
    ii) Perform linear search on1D 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 usedas 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: Write a C program to solve Matrix problems, String operations, Bubble sort
Problems to Practice:
    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. Gainexperience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Write a C program for Pointers and structures, memory dereference.
Problems to Practice:
  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 samewithout 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: Write a C program to solve Simple functions using call by value, solving differential equations using Eulerstheorem.

Problems to Practice:
  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 functionsthat 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: Write C program for Recursive functions.
Problems to Practice:
   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: Write a C program to solve Simple functions using Call by reference, Dangling pointers.
Problems to Practice:
   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 othercharacters using pointers.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: Write a C program to handle File operations.
Problems to Practice:
   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-linearguments.
   v)   Find no. of lines, words and characters in a file.
Write a C program to print last n characters of a given file.

Course Outcomes:

CO1: Implement coding and debugging the simple programs, create algorithms, and practice problem solving strategies using programming languages.

CO2: Demonstrate programs that incorporate conditional statements, loops, and break/continue statements to control program execution.

CO3: Apply coding for real time examples with arrays, array indexing, and manipulate strings in programming tasks.

CO4: Create, call, and debug functions, modify function parameters using pointers, and gain practical knowledge of variable scope within functions.

CO5: Apply user-defined data types, manipulate files, pointer operations to solve real-world programming challenges.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India

2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester

23ME201 ENGINEERING WORKSHOP

L T P C
0 0 3 1.5

Course Objectives:

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

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 punctureand 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.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

Textbooks:

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

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester
23HUM201 HEALTH AND WELLNESS, YOGA AND SPORTS

	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.

UNIT I   **5 hours**

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   **5 hours**
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   **5 hours**
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.

Course Outcomes:
After completion of the course the student will be able to
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

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,

5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, 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 manyas 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 vivavoce on the subject.

I Year II Semester

B. Tech I Year II Semester

23MAT102 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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L  T P C
3  0 0 3
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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.

| UNIT I | DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE | 9 hours |

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) | 9 hours |

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 | 9 hours |

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 | 9 hours |

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 | 9 hours |

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

Course Outcomes:

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

CO1: Find the solution of engineering problems formulated in the form of linear first order differential equations.

CO2: Solve the linear higher order differential equations related to various engineering fields.

CO3: Determine the solutions for linear partial differential equations that model the physical processes.

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO5: Estimate the work done against field, circulation and flux using vector calculus.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, PearsonPublishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones andBartlett, 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 ScienceInternational Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester
23PHY101 ENGINEERING PHYSICS
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           L  T P  C
           3  0 0  3
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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.

UNIT I   WAVE OPTICS   9 hours
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   9 hours
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   QUANTUM MECHANICS AND FREE ELECTRON THEORY   9 hours
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 IV   SEMICONDUCTORS   9 hours
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.

UNIT V   DIELECTRIC AND MAGNETIC MATERIALS   9 hours
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.

Course Outcomes:

CO1: Apply the knowledge of Interference, Diffraction and Polarization techniques for materials testing and explore their applications in both science and technology.

CO2: Explain the crystal structure in terms of atomic positions, unit cells, and crystal symmetry and also relate the crystal symmetry to the symmetry observed in a diffraction pattern.

CO3: Evaluate the Schrodinger wave equations for simple potentials and explain the concept of conductivity of different types of materials.

CO4: Distinguish the semiconductors using Fermi level and identify the type of semiconductors using Hall effect.

CO5: Explain the origin of fundamental magnetic phenomena and types of magnetic materials. Understand the induced fields in dielectrics, and electrical behaviour of dielectrics.

Text Books:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, 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).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

23EEE101 BASIC ELECTRICAL AND ELECTRONICS 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.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I   DC & AC CIRCUITS   8 hours

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   8 hours
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   8 hours
                   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 electricitytariff, 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

Course Outcomes:
  After the completion of the course students will be able to
  CO1: Infer the basic AC and DC electrical circuits.
  CO2: Analyze construction and operation of AC and DC machines, different electrical measuring instruments.
  CO3: Illustrate operation of various power generating stations, energy consumption and electrical safety.

Text 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

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. Mehta, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford UniversityPress, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications,2018, Second Edition.

Web Resources:

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

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

UNIT I   SEMICONDUCTOR DEVICES   8 hours

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   8 hours
**   INSTRUMENTTAION**

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   8 hours

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 BooleanAlgebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple

combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Course Outcomes:

After the completion of the course students will be able to

CO1: Explain the theory, construction, and operation of electronic devices.

CO2: Apply the concept of science and mathematics to explain the working of diodes, transistors, and their applications.

CO3: Analyze logic gates and its applications in design of combinational circuits.

Text Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.

2. R. P. Jain, Modern Digital Electronics, 4th 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.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Mechanical Engineering

B. Tech I Year II Semester
23ME101 ENGINEERING GRAPHICS

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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.

UNIT I   9 hours

Introduction: Lines, Lettering   and   Dimensioning, Geometrical   Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II   9 hours
Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes
Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III   9 hours
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   9 hours
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   **9 hours**
Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer graphics: Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (Not for end examination).

Course Outcomes:
Students will use the Auto CAD software and will be able to
CO1: Construct the geometrical constructions, engineering curves and scales.
CO2: Draw the projections of points, straight lines and planes
CO3: Draw the projections of solids in various positions
CO4: Sketch the sections of solids and developments of surfaces
CO5: Draw the conversion of the isometric views to orthographic views and vice versa.

Text Books:

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, Dhananjay Jolhe, TataMcGraw Hill, 2017.

Mode of Evaluation: Day-to-day Evaluation, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

23ME102 ENGINEERING MECHANICS

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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.

UNIT I   9 hours

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications
Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant–Moment
of Force and its Application –Couples and Resultant of Force Systems.
  Friction: Introduction, limiting friction and impending motion, Coulomb'slaws of dryfriction, coefficient of friction, Cone of Static friction.

UNIT II   9 hours
Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces,converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium forSpatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

UNIT III   9 hours
Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems..
Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.
Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments
of Inertia, Mass Moment of Inertia of composite bodies.

UNIT IV   9 hours
Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V   9 hours
Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Course Outcomes:

On Completion of the course, the student should be able to

CO1: Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.

CO2: Analyze different force systems such as concurrent, coplanar and spatial systems andcalculate their resultant forces and moments.

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometricalshapes.

CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.

CO5: Solve the problems involving the translational and rotational motion of rigid bodies.

Text Books:

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

Reference Books:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester
23PHY201 ENGINEERING PHYSICS LABORATORY

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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.

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.

Course Outcomes:
CO1: Know the various phenomena of light practically and gain knowledge about various optical technique methods.
CO2: Verify the theoretical concepts of optics, magnetism and dielectrics by hands on experiment.
CO3: Apply the scientific process in the conduct of semiconductor experiments and report the experimental findings.
CO4: Understand mechanical phenomena by instruments and apply them in real time applications.
CO5: Acquire and interpret experimental data to examine the physical laws.

Web Resources:

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

Reference Books:

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

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.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester
   23EEE201 ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

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Course Objectives:

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

Activities:

1. 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 usedby the students.
2. 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 thestudents.
3. 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 LABORATORY

List of experiments:
1.   Verification of KCL and KVL
2.   Verification of Superposition theorem
3.   Measurement of Resistance using Wheat stone bridge
4.   Magnetization Characteristics of DC shunt Generator
5.   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

Note: Minimum Six Experiments to be performed.

Course Outcomes:

At the end of the course, the student will be able to
CO1: Analyze basic DC circuits.
CO2: Understand the usage of common electrical & electronic measuring instruments.
CO3: Understand the basic characteristics of electrical machines and perform energy calculations.

PART B: ELECTRONICS ENGINEERING LABORATORY

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 rectifier.
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 gatesusing 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.

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

Course Outcomes:

At the end of the course, the student will be able to
CO1: Plot and discuss the characteristics of various electron devices.
CO2: Explain the operation of a digital circuit.

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester
23ME202 ENGINEERING MECHANICS LABORATORY

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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.

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.

Course Outcomes:
CO1: Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.
CO2: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
CO3: Determine the Centre of gravity and Moment of Inertia of different configurations.
CO4: Verify the equilibrium conditions of a rigid body under the action of different force systems using free body diagrams .
CO5: Determine the Moment of Inertia compound pendulum and flywheel

Text Books:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw HillEducation 2017. 5th Edition.
2. Lab Manual provided by the department

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester

23CSE202 IT WORKSHOP

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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, BOSSTo 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.

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. Labinstructors should verify the work and follow it up with a Viva. Also students need to go throughthe 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. Labinstructor 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 configuredas 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. Finallystudents should demonstrate, to the instructor, how to access the websites and email. If there isno 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 TeXand 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?'"

Course Outcomes:

CO1: Gain expertise in computer hardware, assembly, and dual-boot OS configuration, enhancing their ability to manage and troubleshoot computer systems effectively.

CO2: Learn to connect to the LAN, configure browsers, use search engines effectively, and practice cyber hygiene for secure internet use.

CO3: Create well-formatted documents and presentations using Microsoft Office and Latex

CO4: Gain proficiency in using Excel or its FOSS equivalent for tasks like scheduling, GPA calculation, data manipulation, and formatting.

CO5: Craft effective and tailored inputs to obtain desired responses from AI tools like ChatGPT.

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, ITL Education Solutions limited, Pearson Education, 2012, 2nd 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 Anfins on and KenQuamme. – CISCO Press, Pearson Education, 3rd edition

7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCOPress, Pearson Education, 3rd edition

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester

23HUM202 NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE

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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.

UNIT I   ORIENTATION   5 hours

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

Activities:
  i) Conducting –ice breaking sessions-expectations from the course-knowing personaltalents and skills
  ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
  iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
  iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II   NATURE & CARE   5 hours
Activities:
  i) Best out of waste competition.
  ii) Poster and signs making competition to spread environmental awareness.
  iii) Recycling and environmental pollution article writing competition.
  iv) Organising Zero-waste day.
  v) Digital Environmental awareness activity via various social media platforms.
  vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
  vii) Write a summary on any book related to environmental issues.

UNIT III   COMMUNITY SERVICE   5 hours
Activities:

  i) Conducting One Day Special Camp in a village contacting village-area leaders-Surveyin the village, identification of problems- helping them to solve via media-authorities-experts-etc.

  ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
  iii) Conducting consumer Awareness. Explaining various legal provisions etc.
  iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
  v) Any other programmes in collaboration with local charities, NGOs etc.

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO3: Explore human relationships by analyzing social problems.

CO4: Determine to extend their help for the fellow beings and downtrodden people.

CO5: Develop leadership skills and civic responsibilities.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*

2. Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)

3. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, DirectorateGeneral of NCC, Ministry of Defence, New Delhi

4. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008

5. Masters G. M., Joseph K. and Nagendran R. "Introduction to EnvironmentalEngineering and Science", Pearson Education, New Delhi. 2/e 2007

General Guidelines:

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

Evaluation Guidelines:

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

II Year I Semester

B. Tech II Year I Semester

23HUM101 UNIVERSAL HUMAN VALUES

L	T	P	C
2	1	0	3

Course Prerequisite: None or Universal Human Values-I (desirable).

Course Description :

The course has 28 lectures and 14 tutorials in 5 Units. 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.

Course Objectives: None. Universal Human Values-I (desirable)

The main objectives of the course is to

1. help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure happiness and prosperity in continuity, which are the core aspirations of all human beings.
2. facilitate the development of a Holistic perspective among students towards life and profession based on right understanding of the Human reality, family, society and the rest of nature. Such holistic perspective forms the basis of Universal Human Values (UHV) and movement towards value-based living in a natural way.
3. 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.
4. aid the students to realize their full human potential and act accordingly.
5. assist the students to live with feeling of relationship, harmony and co-existence.

UNIT I   INTRODUCTION TO VALUE EDUCATION   **8 hours**

Lecture 1: Understanding Value Education
Lecture 2: self-exploration as the Process for Value Education
Tutorial 1: Practice Session PS1 - Sharing about Oneself
Lecture 3: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 4: 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   **8 hours**

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   **10 hours**
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   **8 hours**
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 –   **8 hours**
            A LOOK AT PROFESSIONAL ETHICS
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

Course Outcomes:

At the end of this course students will demonstrate the ability to
CO1: Understand the Natural Acceptance and basic human aspiration.
CO2: Aware of themselves and self-regulation.
CO3: Recognize human-human relationship (Justice) and identify human goals in the society.
CO4: Appreciate the harmony in the nature and existence.
CO5: Develop as socially and ecologically responsible engineers in handling problems with sustainable solutions (user-friendly and eco-friendly).

Text Books:

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

Online Learning Resources

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf

5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. 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
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

10. https://uhv.org.in/

11. https://www.youtube.com/@UniversalHumanValues/playlists

12. https://fdp-si.aicte-india.org/index.php

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year I Semester

23MAT105 NUMERICAL METHODS

	L	T	P	C
	3	0	0	3

Course Prerequisite: 23MAT101 & 23MAT102

Course Description:

This course reviews and continues the study of computational techniques for solving system of algebraic and transcendental equations, interpolating the polynomials, evaluating the derivatives, integrals, ordinary differential equations and curve fitting. The course emphasizes on numerical and mathematical methods of solutions.

Course Objectives:

This course enables students to

1. To introduce computation methods of solving algebraic and transcendental equations.

2. To familiarize the knowledge of interpolation.

3. To avail the basics of numerical techniques in calculus

4. To use numerical methods for solving ordinary differential equations.

5. To introduce the empirical techniques for fitting the various curves.

UNIT I   SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS   9 hours

Introduction – Errors - Sources of errors - Bisection method - Regula-falsi method – Secant Method - Iterative method - Newton Raphson method

UNIT II   FINITE DIFFERENCES AND INTERPOLATION   9 hours

Finite differences, Newton's forward and backward interpolation formulae - Gauss forward and backward formulae, Stirling's formula, Bessel's formula - Lagrange's and Newton's divided difference formulae

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION   9 hours

Formulae for derivatives, Maxima and minima of a tabulated function. Numerical Integration: Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule

UNIT IV NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL   9 hours
          EQUATIONS

Picard's Method - Taylor's series method - Euler's method - Modified Euler's Method - Runge-Kutta Method.

UNIT V   CURVE FITTING   9 hours

Introduction - Graphical method - Principle of least squares - Method of least squares - Fitting of straight line and parabola - Fitting of exponential and power curves.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Solve the system of algebraic and transcendental equations.

CO2: Interpolate the equal and unequal spaced arguments of function.

CO3: Apply the numerical techniques to find derivatives and integrals in the field of Engineering

CO4: Find the approximate numerical solutions to ordinary differential equations representing some Engineering problems.

CO5: Estimate the model parameters using the principles of least squares to a curve of best fit for the experimental observations.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.

Reference Books:

1. Curtis F. Gerald, Patrich O. Wheatley, Applied Numerical Analysis, Pearson Education, 7th Edition, 2003.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005
3. Burden and Faires, Numerical Analysis 7th edition, Thomson Learning, 2001.
4. E. Kreyszig, Advanced Engineering Mathematics, 10th edition, Wiley, 2010.
5. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5th Edition, 2010.
6. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists 3rd edition, Mc Graw Hill, 2012.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B.Tech. II Year I Semester

23ME103 THERMODYNAMICS

L T P C
2 1 0 3

Pre-requisite: Nil

Course Description:
Thermodynamics is one of the fundamental courses in the study of mechanical engineering. The principles of thermodynamics are applicable to a wide range of problems encountered in all branches of engineering. Also, thermodynamics is an essential pre-requisite for subsequent courses in mechanical engineering like fluid mechanics, applied thermodynamics, heat transfer, gas dynamics, refrigeration and air conditioning, etc. This course is designed to equip the students with a thorough understanding of basic concepts of thermodynamics and with necessary skills and techniques to solve problems in thermodynamics through a systematic analysis using fundamental principles. The specific topics to be covered in the course include concepts of system and surroundings, energy, energy transfer by work and heat, properties of substances and property changes, first and second laws of thermodynamics.

Course Objectives:
1. To familiarize concepts of heat, work, energy and governing rules for conversion of one form to another.
2. To explain relationships between properties of matter and basic laws of thermodynamics.
3. To teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
4. To introduce the concept of available energy for maximum work conversion.
5. To provide fundamental concepts of Refrigeration and Psychrometry.

UNIT I   BASIC CONCEPTS AND FIRST LAW   9 hours
Basic concepts — concept of continuum, microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer. Displacement work and other modes of work. P-V diagram. Zeroth law of thermodynamics — concept of temperature and thermal equilibrium– relationship between temperature scales. First law of thermodynamics –application to closed and open systems — steady and unsteady flow processes.

UNIT II   SECOND LAW AND AVAILABILITY ANALYSIS   9 hours
Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries, PMM-II. Carnot cycle, Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for — pure substance, ideal gases — different processes, principle of increase in entropy. Applications of II Law. Availability and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. 1st Law and 2nd Law Efficiency.

UNIT III   PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE   9 hours
Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods — Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

UNIT IV   IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS   9 hours

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor. Principle of Corresponding states. -Generalised Compressibility Chart and its use. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes.

UNIT V   GAS MIXTURES AND PSYCHROMETRY   9 hours

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture — Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Reactive Gas Mixtures. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process — adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications.

Course Outcomes:
On successful completion of the course, the student will be able to:
CO1: Understand the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.
CO2: Examine the second law of thermodynamics to evaluate the efficiency of thermal devices by calculating energy and entropy.
CO3: Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart.
CO4: Evaluate the properties of pure substance in computing the macroscopic properties of ideal and real gases using gas laws and appropriate thermodynamic relations.
CO5: Apply the properties of gas mixtures in calculating the properties of gas mixtures and various thermodynamic relations to calculate property changes.

Text Books:
1. PK Nag, Engineering Thermodynamics, 6th Edition, 2017, McGraw Hill Education, ISBN: 978-9352606429
2. ~~2.~~ Çengel, Y. A., Boles, M. A., & Kanoglu, M. (2023). Thermodynamics: An engineering approach (10th ed.). McGraw-Hill Education. ISBN: 978-1266152115.

References:
1. J.B. Jones, and R.E. Dugan, Engineering Thermodynamics, 2/e, Prentice Hall, 1996
2. Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 10/e, Wiley, 2022.
3. P.Chattopadhyay, Engineering Thermodynamics, 1/e, Oxford University Press, 2011.
4. CP Arora, Refrigeration and Air-conditioning, 4/e, McGraw Hill, 2021.

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

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examinati

B.Tech. II Year I Semester

23ME104 MECHANICS OF SOLIDS

L	T	P	C
2	1	0	3

Pre-requisite: 23ME102

Course Description:
This course is intended to make the students learn about different types of loads acting on solid materials, thereby understanding the behaviour of the materials under such a variety of loads. This course equips the students to learn the principles and methods for analysing the stresses, strains, deformations induced in the materials under loading, and thereby to know about the failure conditions of the solid materials.

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

UNIT I   SIMPLE STRESSES & STRAINS   **9 hours**
Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT II   SHEAR FORCE AND BENDING MOMENT DIAGRAMS   **9 hours**
Definition of beam – Types of beams –Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of beam.

UNIT III   FLEXURAL STRESS & SHEAR STRESS   **9 hours**
FLEXURAL STRESS : Theory of simple bending, Derivation of bending equation, Determination of bending stresses – section modulus of rectangular, circular, I and T sections– Design of simple beam sections.
SHEAR STRESS: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I and T sections.

UNIT IV   DEFLECTION OF BEAMS & TORSION   **9 hours**
DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, UDL and UVL. Mohr's theorem and Moment area method – application to simple cases.
TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

UNIT V   THICK & THIN CYLINDERS AND COLUMNS   **9 hours**
THIN & THICK CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells. Wire wound thin cylinders. Lame's equation – cylinders subjected to inside & outside pressures –compound cylinders.
COLUMNS:
Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula

Course Outcomes:
On successful completion of the course, the student will be able to:
CO1: Estimate the fundamental stresses, strains, and principal stresses by analytical and Mohr's circle.
CO2: Analyze the distribution of shear force and bending moment for various types of beams under different load conditions.
CO3: Determine the flexural and shear stress and its distribution across various beams sections like rectangular, circular, triangular, I and T sections.
CO4: Evaluate bending stresses in beams and calculate the deflection and slope of beams with different types of loads.
CO5: Calculate longitudinal and circumferential stresses of pressure vessels and analyze the elastic stability of flexible columns.

Text Books:
1. Strength of Materials by R.K. Bansal, Rainbow Book Distributors, 6th Edition, 2020.
2. Strength of Materials by S. Ramamrutham, Dhanpat Rai Publishers, 16th Edition ,2020

References:
1. Mechanics of Materials by Ferdinand P. Beer and E.Russel Johnston, McGraw Hill Education (India) publicationsEdition,8e,2020
2. Mechanics of Materials by Gere and Timoshenko, C B S Publishers & Distributors, 2nd Edition, 2004.
3. Strength of Materials by R.K. Rajput, S.Chand& Company, 5th Edition,2018.
4. Strength of Materials by Dr. Sadhu Singh, Khanna Publishers, 10th Edition,2013.
5. Mechanics of solids and structures by Dr. R. Vidyanathan and Dr. P. Perumal, Laxmi Publishers.1e, 2018.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech II Year I Semester

23ME105 MATERIALS SCIENCE AND ENGINEERING

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L  T  P  C
3  0  0  3
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Pre-requisite   Nil

Course Description:

The purpose of this course is to introduce the student to enrich their knowledge of the materials science field. Begin with the microscopic level the structure at the atomic and their impact on the material properties are discussed. The relation between heat treatment, phases and alloying elements properties of materials is also highlighted. The course mainly discusses about the different types of testing methods for materials. The final part of the course covers non-metallic materials such as ceramics and polymers.

Course Objectives:

1. To understand the stability of phases in various alloy systems and to comprehend the crystalline structure of various metals.
2. To study the properties of alloys and metals, both ferrous and nonferrous, and their uses in various fields
3. To know the impact of alloying element addition and heat treatment on the characteristics of ferrous metals.
4. To understand how to make metal powders and the uses of powder metallurgy.
5. To realize the functions and characteristics of composites, ceramics, and other cutting-edge techniques.

**UNIT I   STRUCTURE OF METALS AND EQUILIBRIUM   9 hours
           DIAGRAMS**

Structure of Metals and Constitution of alloys: Crystallization of metals, Packing Factor - SC, BCC, FCC & HCP- line density, plane density. Grain and grain boundaries, effect of grain boundaries – determination of grain size. Imperfections, Slip and Twinning. Necessity of alloying, Types of solid solutions - Hume-Rothery rule.

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe$_3$C, Lever rule. Simple numerical problems.

**UNIT II   FERROUS AND NON-FERROUS METALS AND ITS   9 hours
            ALLOYS**

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast iron. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.
Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, aluminium and its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

UNIT III   HEAT TREATMENT OF STEELS   9 hours

Effect of alloying elements on Fe-Fe_3C system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, age hardening treatment, Cryogenic treatment. Introduction to surface coating (PVD, CVD).

UNIT IV   POWDER METALLURGY   9 hours

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

UNIT V   ADVANCED MATERIALS   9 hours

Crystalline ceramics, glasses, cermet, abrasive materials, Classification of composites, manufacturing methods, particle reinforced composites, fibre-reinforced composites, PMC, MMC, CMC and CCCs. Introduction to Nanomaterials, smart materials and Bio-materials - applications.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the crystalline structure of different metals and study the stability of phases in different alloy systems by equilibrium diagrams.

CO2: Study the behaviour of ferrous and nonferrous metals and alloys and their application in different domains

CO3: Understand the effect of heat treatment and addition of alloying elements on properties of ferrous metals.

CO4: Apply the different methods of making metal powders and its applications in powder metallurgy.

CO5: Comprehend the properties and applications of ceramic, composites and other advanced methods

Text Books:

1.   Callister, William D., Jr., and David G. Rethwisch. *Materials Science and Engineering: An Introduction*. 10th ed., Wiley, 2018.

2.   S.H.Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 2017.

Reference Books:

1. Kodgire, V. D., and S. V. Kodgire. *Material Science and Metallurgy for Engineers*. 46th ed., Everest Publishing House, 2021.
2. V.Raghavan, Material Science and Engineering, 6/e, Prentice Hall of India, 2015.
3. Donald R.Askeland, Essentials of Materials science and Engineering, 4/e, CL Engineering publications, 2018.
4. George E.Dieter, Mechanical Metallurgy, 3/e, McGraw-Hill, 2017.
5. Yip-Wah Chung, Introduction to Material Science and Engineering, 2/e, CRC Press, 2022.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech II Year I Semester
    23ME203 MECHANICS OF SOLIDS AND MATERIALS SCIENCE LABORATORY

L	T	P	C
0	0	3	1.5

Course Description:
The course is about to expose the students to a broad knowledge of experimental and analyzing techniques useful in Mechanics of solids as well as in Materials engineering field. The subject introduces the correlation of properties of various materials and their structure. It revises student's knowledge of crystal structure and phase diagrams of various alloy systems. This laboratory course offers practical knowledge of heat treatment applicable to ferrous materials and studies microstructural changes and hardness evaluation.

Course Objectives:
1. To perform and determine the mechanical properties of various materials.
2. To prepare samples for micro-structural examination
3. To study the microstructures of various materials under heat treatment

List of Experiments:
A) MECHANICS OF SOLIDS EXPERIMENTS:
1. Tensile test
2. Bending test on
    a) Simply supported beam
    b) Cantilever beam
3. Torsion test
4. Hardness test
    a) Rockwell hardness test
    b) Vickers hardness test
5. Impact test
    a) Charpy test
    b) Izod test
6. Double shear test

B) MATERIALS SCIENCE EXPERIMENTS:
1. Specimen preparation for micro-structural examination – Cutting, Grinding, Polishing, Etching.
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, and High carbon steels.
3. Study of the Microstructures of Cast Irons.
4. Study of the Microstructures of Non-Ferrous alloys.
5. Study of the Microstructures of Heat-treated steels.
6. Hardenability of steels by Jominy End Quench Test.

Virtual lab experiments:
1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress. (https://virtual-labs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)
2. To find the impact resistance of mild steel and cast iron.(https://sm-nitk.vlabs.ac.in/exp/izod-impact-test).
3. To find the impact resistance of mild steel. (https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/index.html)
4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel, etc. (https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)
5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine. (https://sm-nitk.vlabs.ac.in/exp/vickers-hardness-test).

Course Outcomes:
After completion of the course students will be able to

CO1: Understand the stress strain behavior of different materials.

CO2: Evaluate the mechanical properties of different materials.

CO3: Explain the relation between elastic constants of materials.

CO4: Identify various microstructures of steels and cast irons.

CO5: Measure the hardenability of steels.

Text Book: Lab manual provided by the department

Reference Books:

1. Brandon D. G, "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.

2. Prabhudev. K. H. "Handbook of Heat Treatment of Steels", Tata McGraw-Hill Publishing

Co., New Delhi, 1988.

3. Sydney H. Avner, "Introduction to Physical Metallurgy", Tata McGraw Hill, New Delhi, 1997.

4. William D. Callister, "Materials Science and Engineering" John Wiley and Sons, 8th Edition, 2009.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B.Tech. II Year I Semester
23ME204 COMPUTER AIDED MACHINE DRAWING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite: 23ME101

Course Description:
The course is about the theory and technique of two-dimensional (2D) and three-dimensional (3D) modelling utilizing appropriate software. Topics include the creation and modification of 3D geometric shapes; and rendering techniques; and use of camera light sources, texture, and surface mapping.

Course Objectives:
1. During the term of the course, students will learn to work within virtual 3-D space.
2. Build volumetric objects including: vertices, splines, polygons, primitive shapes and Sub Patch geometry.
3. Students will use these tools to build complex objects, and then learn the basic 3-D rendering tools and techniques.
4. The student will be able to produce 2D drawing from the 3D part geometry to assure the proper dimensioning of the parts.
5. To make the students to understand and draw assemblies of machine parts and to draw their sectional views.

List of experiments
1. Introduction to 2D and 3D modelling
2. Drawing of Detachable Joints: bolt and nut with different screw thread
3. Drawing of Riveted Joints for Plates
4. Drawing of Welded Joints
5. Assembly of Shaft Coupling
6. Assembly of Universal Joint
7. Assembly of Knuckle Joint
8. Assembly of Simple Eccentric
9. Assembly of Screw Jack
10. Assembly of Plummer Block
11. Assembly of Machine vice

Course Outcomes:
On successful completion of the course, the student will be able to:
CO1: Identify different types of bolts, nuts, welding joints screw threads, keys and fasteners.
CO2: Visualize and prepare a detail drawing of a given object.
CO3: Draw details and assembly of mechanical systems.
CO4: Read and interpret the given drawing.
CO5: Create 3-D models using any standard CAD software

Text Books:
1. Lab manual provided by the department
2. Machine Drawing by K.L.Narayana, P.Kannaiah and K.Venkat Reddy, New Age International Publishers, 3/e, 2014

References:
1. Gopalakrishnan K.R, "Machine Drawing", Subhas Stores, 2007.
2. N.D.Bhatt, Machine Drawing, Charotar Publishers, 50/e, 2014.
3. James Barclay, Brain Griffiths, Engineering Drawing for Manufacture, Kogan Page Science, 2003.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech II Year I Semester
Skill Enhancement Course - I

23ENG601 SOFT SKILLS

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L   T   P   C
1   0   2   2
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Course Objectives:
1. To encourage all round development of the students by focusing on soft skills
2. To make the students aware of critical thinking and problem-solving skills
3. To enhance healthy relationship and understanding within and outside an organization
4. To function effectively with heterogeneous teams

UNIT I   SOFT SKILLS & COMMUNICATION SKILLS   6 hours

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:
Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity.
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)
Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.
Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT II   CRITICAL THINKING   6 hours

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT III PROBLEM SOLVING & DECISION MAKING   6 hours

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
Case Study & Group Discussion

UNIT IV EMOTIONAL INTELLIGENCE & STRESS MANAGEMENT   **6 hours**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V   Corporate Etiquette   **6 hours**

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Note:
1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

Course Outcomes:

At the end of this course students will demonstrate the ability to
   CO1: List out various elements of soft skills (L1, L2)
   CO2: Describe methods for building professional image (L1, L2)
   CO3: Apply critical thinking skills in problem solving (L3)
   CO4: Analyse the needs of an individual and team for well-being (L4)
   CO5: Assess the situation and take necessary decisions (L5).
   CO6: Create a productive workplace
          atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)

Text Books:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012.
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow,   I K International Publishing House, 2018.

Reference Books:

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018.
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

E Books:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year I Semester
Audit Course

23CHE901 ENVIRONMENTAL SCIENCE

	L	T	P	C
	2	0	0	0

Course Objectives:
This course enables students to

1. To make the students to get awareness of the environment.

2. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life

3. To save the earth from the inventions by the engineers.

UNIT I   MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES   6 hours
Definition, Scope, and Importance – Need for Public Awareness.
Natural Resources: Energy 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.

UNIT II   ECOSYSTEMS   7 hours
Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
a) Forest ecosystem.
b) Grassland ecosystem
c) Desert ecosystem.
d) Aquatic ecosystems (freshwater - ponds, streams, lakes, rivers, marine ecosystem- oceans, estuaries)
Biodiversity and its Conservation : Introduction, 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. Specific case studies.

UNIT III ORDERED STRUCTURES   6 hours
Definition, Cause, effects, and control measures of:
Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards
Pollution case studies - Role of an individual in the prevention of pollution

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes
Disaster management: floods, earthquakes, cyclones and landslides.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   5 hours
Sustainable Development Goals, From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rainwater harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   6 hours
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 a local area to document environmental assets River/forest grassland/hill/mountain – Polluted site - Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes.

Course Outcomes:
At the end of this course students will demonstrate the ability to
CO1: Exploring different types of renewable and non-renewable energy sources.

CO2: Students will learn about the structure and function of different ecosystems.
CO3: Students will learn about different types of pollution (air, water, soil) and their sources, effects, and control measures.
CO4: Exploring the science behind climate change, its evidence, and its impacts on ecosystems and human societies.
CO5: Understanding demographic factors and their environmental implications.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press, Third Edition, 2021.
2. Palaniswamy, "Environmental Studies", Pearson Education, Second Edition, 2014.
3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K. Raghavan Nambiar, "Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd. Second Edition, 2008.
5. A. Koushik & C. P. Koushik, Perspectives in Environmental Studies, New Age International, Fourth Edition, 2006.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications, Second Edition, 2012.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, Second Edition, 2023.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, Third Edition, 2009.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private Limited, Second Edition, 2004.
5. G.R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House, Fourth Edition, 2014.
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private Limited, Third Edition, 2007.

Online Resources:

1. Atika Qazi; Fayaz Hussain; Nasrudin ABD. Rahim; Glenn Hardaker; Daniyal Alghazzaw, "Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions," 10.1109/ACCESS.2019.2906402, IEEE Access, vol. 7, pp. 63837-63851, 2019.
2. Gina Garland, Samiran Banerjee, Anna Edlinger, Emily Miranda Oliveira, Chantal Herzog, Raphaël Wittwer, Laurent Philippot, Fernando T. Maestre, Marcel G. A. van der Heijden, "A closer look at the functions behind ecosystem multifunctionality: A review," https://doi.org/10.1111/1365-2745.13511, Journal of Ecology, vol. 109, no. 2, pp. 600-613, 2021.
3. Siddiqua, A, Hahladakis, J.N. and Al-Attiya, "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping," https://doi.org/10.1007/s11356-022-21578-z, Environmental Science and Pollution Research, 29(39), pp.58514-58536, 2022.
4. Seddon N, Chausson A, Berry P, Girardin C.A, Smith A. and Turner B, "Understanding the value and limits of nature-based solutions to climate change and other global challenges," https://doi.org/10.1098/rstb.2019.0120, Philosophical Transactions of the Royal Society B, 375(1794), p.20190120, 2020.
5. Hannes Weber and Jennifer Dabbs Sciubba, "The effect of population growth on the environment: evidence from European regions," https://doi.org/10.1007/s10680-018-9486-0, European Journal of Population, vol. 35, pp. 379-402, 2019.

Mode of Evaluation: Assignments and Mid Term Tests

II Year II Semester

B. Tech II Year II Semester
23HUM102 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
2	0	0	2

Course Prerequisite: Nil

Course Description:
The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the positions of financial statements are explained to know the analysis of financial matters.

Course Objectives:
This course enables students to
1. Describe the nature of engineering economics in dealing with the issues of scarcity;
2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;
3. Explain the different market structures and price determination in various market conditions.
4. Explain the accounting principles, types of accounting and preparation of final accounts; and
5. Describe the financial statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I   DEMAND ANALYSIS   7 hours
Scope and Significance of Economics- Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply.

UNIT II   PRODUCTION AND COST ANALYSIS   7 hours
Production Function – Short-run and long-run production – Cost Analysis: Cost concepts - Cost Structure of Firms and Output Decision- Break-Even Analysis (BEA) – significance and Limitations of BEA - Determination of Break Even Point (Simple Problems).

UNIT III MARKET STRUCTURE AND PRICING   6 hours
Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic – Price determination under Perfect, Monopoly, and Monopolistic Competition, Pricing objectives- Pricing Strategies.

UNIT IV BASICS OF ACCOUNTING   7 hours
Accounting - Double Entry System - Accounting Principles - Classification of Accounts - Rules of Debit & Credit- Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems).

UNIT V   FINANCIAL RATIO ANALYSIS AND CAPITAL BUDGETING   7 hours

Ratio Analysis - Liquidity, Solvency, Activity and Profitability Ratios - Capital Budgeting. (Simple Problems).

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand Engineering economics basic concepts,

CO2: Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,

CO3: Compare various different market structures and identify suitable market,

CO4: Demonstrate an understanding and analyzing the accounting statements, and

CO5: Exhibit the ability to apply knowledge of ratio analysis and capital budgeting techniques in financial statement analysis and investment evaluation respectively.

Text Books:

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007

2. Aryasri: Business Economics and Financial Analysis, 4/e. MGH.

3. Financial Accounting, S. N. Maheshwari, Sultan Chand, 2009

4. Varshney & Maheswari: Management Economics, Sultan Chand

5. Financial Statement Analysis, Khan and Jain, PHI, 2009

6. Financial Management, Prasanna Chandra, T.M.H, 2009

Reference Books:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007

2. Samuelson P. A. & Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007

3. Financial Management and Policy, Van Horne, James, C., Pearson, 2009.

4. Financial Management, I. M. Pandey, Vikas Publications

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year II Semester

23MAT103 PROBABILITY AND STATISTICS FOR ENGINEERS

L	T	P	C
3	0	0	3

Course Prerequisite: 23MAT101, 23MAT102

Course Description:

This course provides an introduction to probability, distributions and statistics with applications. Topics include: Conditional probability, Random variables, Probability distributions, Joint densities, Bayesian inference, Hypothesis testing, Confidence intervals, Correlation and linear regression.

Course Objectives:

This course enables students to

1. To revise the elementary concepts of probability and random variables.
2. To analyze and interpret basic summary and modeling techniques for Multi-variate data.
3. To introduce new techniques for carrying out probability calculations and identifying probability distributions.
4. To understand the foundations for statistical inference involving confidence intervals and hypothesis testing.
5. To analyze the statistical experimental designs.

UNIT I   PROBABILITY AND RANDOM VARIABLES   9 hours

Introduction to Probability, sample space and events, Axioms of probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Bayes theorem.

Random Variables - Types of Random Variables - Probability Mass Function - Probability Density Function- Distribution Function and its properties. Expectation – Properties of Expected Value - Variance - Moment generating function.

UNIT II   PROBABILITY DISTRIBUTIONS   9 hours

Discrete Distributions: Bernoulli trail, Binomial distribution, Poisson approximation to the binomial distribution, Poisson distribution and Hyper geometric distribution –properties.

Continuous Distributions: Uniform, Exponential distribution, Gamma distribution, Normal distribution. Normal probability rule and Chebyshev's inequality

UNIT III JOINT DISTRIBUTIONS   9 hours

Joint Densities and Independence - Marginal Distributions (discrete & continuous)- Expectation and Covariance, Correlation, Conditional densities and Regression, Curves of Regression.

UNIT IV HYPOTHESIS TESTING   9 hours

Population, sampling, formulation of null hypothesis, alternative hypothesis, level of significance, types of errors and power of the test. Large Sample Tests: Test for single mean, single proportion, difference of means, difference of proportions, Confidence interval for parameters in one sample and two sample problems, t test for single mean, difference of means, test for ratio of variances.

UNIT V   ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS   9 hours

Analysis of Variance: One-way and two-way classifications. Principles experimental design, Randomized Block Design (RBD) and Latin Square Design.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the probability concepts and their importance in engineering.

CO2: Apply discrete and continuous probability distributions to solve various engineering problems.

CO3: Get an idea about joint density functions, distribution functions to the random variables and analyze the multivariate problems in engineering

CO4: Perform test of hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

CO5: Analyse the statistical experimental designs for various engineering problems.

Text Books:

1. J.S. Milton and J.C. Arnold, Introduction to Probability and Statistics, 4th edition, 2003 Tata McGraw-Hill Publications.
2. Dr.B.S.Grewal, " Higher Engineering Mathematics", Khanna Publications, 42nd Edition.

Reference Books:

1. Sheldon M. Ross: Introduction to Probability and Statistics for Engineers and Scientists, 4th Edition, Elsevier, Academic Press, 2010.
2. Walpole, R.E., Myers R.H., Myer S.L., Ye. K: Probability and Statistics for Engineers and Scientists, 8th ed., Pearson Education, 2008.
3. Johnson, R.A. Miller Freund's: Probability and Statistics, 7th Edition, PHI, 2005.
4. Sheldon Ross: A First Course in Probability, 6th Edition, Pearson Education, 2002.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B.Tech. II Year II Semester

23ME106 MANUFACTURING TECHNOLOGY I

	L	T	P	C
	3	0	0	3

Pre-requisite: 23CME101

Course Description:
Manufacturing is the creation, through one or several processing operations, of components or products from basic raw materials. The effectiveness of process selection will be based on the inter-related criterion of design parameters, material selection and process economies. The course helps the students to understand the significance and applications of various traditional and advanced metal casting, joining and forming processes. The concept of stress, strain, plain stress, plain strain and yield criteria is encompassed in the course.

Course Objectives:
1. To provide abreast knowledge on working principles of different metal casting processes and gating systems.
2. To acquaint the students with the working of different types of welding processes and welding defects.
3. To impart an in-depth understanding on plastic deformation of metals, cold and hot working processes, working of a rolling mill and types, extrusion processes.
4. To impart fundamental knowledge of drawing process and sheet metal processes.
5. To familiarize the students with a basic understanding high energy rate forming process and additive manufacturing process.

UNIT I   METAL CASTING PROCESS

9 hours

Casting & Moulding Process: Introduction & types of casting process.
Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance.
Sand Moulding: Types of base sand, requirement of base sand. Binder, Additive's definition, need and types; preparation of sand moulds.
Sand casting, principles of gating, gating ratio, function of risers & runners.
Die casting – Types of die casting, gravity die casting, centrifugal casting & Investment casting.
Melting Furnaces: Principle of cupola furnace, induction furnace, electric arc furnace.
Casting defects, their causes and remedies. Testing of cast products.

UNIT II   METAL JOINING PROCESS

9 hours

Introduction: Introduction, basic principle and classification of welding processes.
Principle, advantages, limitations and Applications of Arc welding, Gas welding, Inert gas welding (TIG & MIG), Submerged arc welding,
Special type of welding: Resistance welding principles, Spot welding, friction stir welding, Thermit welding, plasma arc welding and laser beam welding
Allied processes: Soldering, Brazing and adhesive bonding
Welding defects, Heat Affected Zone, NDT techniques for weldments inspection.
Advanced Joining Processes: Joining of plastics, ceramics and glass and composites.
Metal Injection Moulding Process.

UNIT III METAL FORMING PROCESS & FORGING

9 hours

Introduction of metal forming process: Mechanical behaviour of metals in elastic and plastic deformation, stress-strain relationships, Tresca and Von-Misses yield criteria, concept of plain stress and plain strain and temperature in metal working; Hot working and cold working and annealing.
Forging – Introduction & classification, open die forging, impression die forging, closed die forging. Classification of forging press, Principle of mechanical press and hydraulic press. Calculation of forging load and power. Defects in forging.

UNIT IV   ROLLING, EXTRUSION & DRAWING

9 hours

Rolling – Introduction & classification, Types of rolling mills, die design and design considerations, Application of rolling, calculation of rolling forces. Defects in rolling.
Extrusion – Introduction & classification, backward and forward extrusion, extrusion defects, design of extrusion dies, design considerations, extrusion equipment, and application of extrusion. Defects in extrusion.
Drawing: Introduction, wire drawing, tube drawing, lubrication, die design for drawing, drawing defects. Application of drawing, advantages and limitations, calculation of drawing forces.

UNIT V   SHEET METAL FORMING PROCESS

9 hours

Sheet Metal Forming Processes: Introduction and classification, principle and applications of different types of sheet metal forming processes. Super plastic forming. Rubber forming. Limiting drawing ratio (LDR). Spring back effect. Forming limit criterion. Types of sheet metal forming dies and press - progressive die, compound die, combination die, working of mechanical press, hydraulic press. (Cold drawing, LASER cutting)
High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electrohydraulic forming, Electromagnetic forming.

Course Outcomes:
On successful completion of the course, the student will be able to:
CO1: Describe manufacturing process for a given product by pattern making, design of
      gating systems, preparation of moulding and pouring of molten metal for
      casting and defects.
CO2: Explain different types of welding techniques and other joining methods.
CO3: Compare cold working and hot working processes, also elucidate the forging process.
CO4: Elucidate the rolling, extrusion and drawing process.
CO5: Depict the principle of drawing process and various sheet metal processes like
      blanking, piercing, forming, bending, deep drawing process.

Text Books:
1. S. Kalpakjian and Steven R. Schmid – 'Manufacturing Engineering and Technology' – Prentice Hall – 2023 – 8th Edition
2. G.E. Dieter, Mechanical metallurgy (SI units), Mc Graw Hill, pub., 3rd edition, 2001
3. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, Volume1, McGraw Hill Education (India) Private Limited, 5th Edition, 2018
4. Degramo, J.T. Black, Ronald, A.K., Materials and Processes in Manufacturing, Wiley, 13rd Edition 2020.

References:
1. B. L. Juneja, Fundamentals of Metal Forming Processes, New age publishers; Second edition, 2018
2. Amitabha Ghosh & A.K. Malik, Manufacturing Science, - East – West press,2e 2010
3. Roy A Lindberg, Processes and Materials of Manufacture, 4th Ed. Pearson Edu. 2015.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Dept. of Mechanical Engineering

B.Tech. II Year II Semester

23ME107 FLUID MECHANICS AND HYDRAULIC MACHINES

L	T	P	C
2	1	0	3

Pre-requisite: Nil

Course Description:
Understanding the behaviour of fluid flow is crucial for many scientific and engineering applications. Various phenomena are related to fluid mechanics, such as atmospheric and oceanic circulation, combustion in engines, and biological processes. In this course, students are introduced to various fluid properties, concepts of fluid statics, fluid kinematics and governing equations of fluid flow derived from fundamental principles of mass and momentum conservation. The course also covers fluid flow in closed conduits and over different geometries, and also introduces the design and working principles of hydraulic turbines and pumps.

Course Objectives:
1. To provide a basic understanding of the properties and behaviour of fluids by means of analytical equations.
2. To develop an understanding about hydrostatic law, principle of buoyancy and stability of a floating body, and application of mass, momentum and energy equation in fluid flow.
3. To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.
4. Determine the force applied by a jet on stationary and moving vanes.
5. To understand the working principle of hydraulic machines: Turbines and pumps.

UNIT I FLUID PROPERTIES AND FLUID STATICS   **9 hours**
Properties of a Fluid, Newton's law of viscosity, Surface Tension and Capillarity, Pressure, Hydrostatic law, Manometry, Hydrostatic forces acting on submerged surfaces, Buoyancy and Stability, Hydrostatic forces.

UNIT II FLUID KINEMATICS AND DYNAMICS   **9 hours**
System and Control volume, Classification of flows, Lagrangian and Eulerian descriptions, Acceleration, Streamlines, Path lines and Streak lines, Fluid body motion, Conservation of mass, Stream function, Body and surface forces, Reynold Transport Theorem, Euler's Equation, Bernoulli's Equation, Venturimeter and Orifice meter, Application of Momentum equation on pipe bends.

UNIT III INTERNAL AND EXTERNAL FLOW   **9 hours**
Laminar flow in ducts, Turbulent flow in ducts, Minor and Major losses, Pipe Networks, Flow over flat plate, Boundary layer equations, Displacement, Momentum and Energy thicknesses, Momentum integral technique for boundary layers.

UNIT IV IMPACT OF JET & HYDRAULIC TURBINES   **9 hours**
Hydrodynamic force of jet striking on stationary and moving vanes, flat and curved vanes, jet impinging centrally and tangentially. Impulse and reaction turbines; Basic equation of energy transfer in rotodynamic machines, Pelton turbine: Velocity triangles, Power and Efficiency, Reaction turbines: Francis turbine and Kaplan turbine, Velocity triangles, Power and Efficiency.

UNIT V HYDRAULIC PUMPS   **9 hours**
Working principle and main parts of a centrifugal pump; Classification of centrifugal pumps; Static and Manometric head of a centrifugal pump; Efficiencies of centrifugal pump. Main parts and working of reciprocating pump; Discharge, work done and power required to drive a reciprocating pump; Slip of a reciprocating pump.

Course Outcomes:
On successful completion of the course, the student will be able to:
CO1: Understand the various properties of fluids and their applications, calculate pressure using manometric principles, determine the stability of floating bodies, and evaluate hydrostatic forces on different surfaces.
CO2: Identify fluid flow patterns and apply the governing equations of mass and momentum conservation to solve fluid flow problems.
CO3: Understanding of internal and external fluid flow physics concepts and evaluating the losses in pipe flows and analysing the boundary layer thickness.
CO4: Calculate the forces acting on different vane geometries and evaluate performance parameters of hydraulic turbines.
CO5: Differentiate different pumps and calculate their performance characteristics.

Text Books:
1. Cengel, Y.A, Cimbala, John, M., "Fluid Mechanics, Fundamentals and Applications", McGraw Hill Education; Fourth edition (28th May, 2019).
2. B.K. Venkanna, "Fundamentals of Turbomachinery", PHI Learning Pvt Ltd, 2018

Reference Books:
1. R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, Ltd., 2005, Revised Ninth Edition.
2. Robert W. Fox and Alan T. Mc Donald, "Introduction to Fluid Mechanics", John Wiley & Sons Private Ltd., 2010, Eighth Edition.
3. James R. Welty, Charles E. Wicks and Robert E. Wilson, "Fundamentals of Momentum, Heat and Mass transfer", John Wiley & Sons (Asia) private limited., 2008, 5th Edition.
4. Frank M White, "Fluid Mechanics", Tata McGraw-Hill, Ninth Edition, 2022.
5. Milton Van Dyke, "An Album of Fluid Motion", Parabolic Press, Fourteenth Edition, 1982.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B. Tech. II Year II Semester

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23ME108 THEORY OF MACHINES

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L T P C
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Course Prerequisite: 23ME102, 23MAT102

Course Description:
Course Description: The objective of this course is to understand the theory involved behind the design of a machine/mechanism. After an introduction about the structure (links, joints), degrees of freedom (DOF), inversions of kinematic chains; the commonly used mechanisms derived from the 4-bar chain are then dealt. The graphical methods for performing velocity and acceleration analyses of the constituent links of lower pair mechanisms are included. The theory of gears, kinematics of gear trains, gyroscopic motion and its application, and governors, are also studied. Cam profile synthesis corresponding to different combinations of follower motions is included and so is balancing of rotating masses in machinery. Lastly, the course gives an insight into the basic concepts of vibration analysis in mechanical systems.

Course Objectives:
1. To introduce basic definitions, commonly used mechanisms and their applications.
2. To understand the kinematic analysis (velocity and acceleration analysis) of lower pair mechanisms.
3. To synthesize cam profiles; and to perform balancing calculations for rotating masses.
4. To learn the theory of gearing and kinematic analysis of gear trains; and understand about the practical application of gyroscopic couple and also working of governors.
5. To learn to formulate the equation of motion and solving the same for analyzing mechanical vibrations.

UNIT I: SIMPLE MECHANISMS   **9 hours**
Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom– Grashof law; kinematic inversions of four bar chain and slider crank chains; Limit positions – Mechanical advantage- Transmission angle; Quick return mechanism, Straight line mechanism.

UNIT II: VELOCITY & ACCELERATION ANALYSIS   **9 hours**
Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centres, velocity and acceleration analysis using loop closure equations - kinematic analysis of simple mechanisms - Coriolis component of acceleration.

UNIT III: GOVERNORS & GYROSCOPE   **9 hours**
Governors: Types of governors; force analysis of Porter and Hartnell governors. Controlling force, stability, sensitiveness, isochronism, effort and power.
Gyroscope: Vectorial representation of angular motion, gyroscopic couple. Effect of gyroscopic couple on ship, plane disc, aero plane, stability of two wheelers.

UNIT IV: GEARS   **9 hours**
Gear Profile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference / undercutting-helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.

UNIT V: ROTATING MASSES **9 hours**

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

Cams: Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- cam profile analysis - pressure angle and undercutting.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO1: Identify the different mechanisms and their inversions in real life applications.

CO2: Calculate the velocity and acceleration of simple mechanisms by analytical & graphical methods.

CO3: Understand the principle of working of a gyroscope and determine the range of speed of different governors

CO4: Classify gears and gear trains and computing the velocity ratio.

CO5: Determine the magnitudes and angular positions of masses for balancing and sketch the cam profiles for different follower motions.

Text Books:

1. S S Rattan, Theory of Machines, 5th edition, Mc Graw Hill, 2019
2. R.S. Khurmi, Theory of Machines, 14th edition, S.Chand, 2020.

References:

1. J.E.Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014
2. Sadhu Singh, Theory of Machines: Kinematics and Dynamics, 3/e, Pearson, 2011.
3. P.L.Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers, Delhi, 2003.
4. Norton, R.L., Design of Machinery - An introduction to Synthesis and Analysis of Mechanisms and Machines,-3/e, McGraw Hill, New York, 2003.
5. William T. Thomson, Theory of vibration with applications, 5/e, Pearson Education, 2008.
6. F. Haidery, Dynamics of Machines, 13/e, Tech-Neo Publications, 2019.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Dept. of Mechanical Engineering

B.Tech. II Year II Semester
   23ME205 FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

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Pre-requisite: Fluid Mechanics and Hydraulic Machines

Course Description:
It is intended that the student would learn to use different techniques to measure discharge and measure head losses through straight and bent pipes. The students will also learn the performance evaluation of Pelton Wheel, Francis and Kaplan turbine, and centrifugal and reciprocating pumps.

Course Objectives:
1. To determine the coefficient of discharge various flow measuring equipment
2. To determine the loss of head in a pipeline
3. To conduct the performance test of hydraulic turbines and pumps.

LIST OF EXPERIMENTS
Fluid Mechanics Experiments:
1. Verification of Bernoulli's theorem
2. Determination of Coefficient of discharge of Venturimeter
3. Determination of Coefficient of discharge of Orificemeter
4. Determination of Coefficient of discharge of Turbine flow meter.
5. Determination of friction factor for a given pipeline.
6. Determination of loss of head due to sudden enlargement and contraction in a pipeline.

Hydraulic Machines Experiments
1. Performance test on Pelton wheel.
2. Performance test on Francis turbine.
3. Performance test on Kaplan turbine.
4. Performance test on centrifugal pump.
5. Performance test on reciprocating pump.

Wind Tunnel Experiments
1. Flow visualization of different objects using wind tunnel
2. Force measurement – Lift, Drag, Side force on different objects using wind tunnel

Course Outcomes:
After completion of the course, students will be able to
CO1: Verify Bernoulli's theorem for incompressible fluid flows.
CO2: Determine the co-efficient of discharge of flow measuring devices like Venturimeter and Orificemeter.
CO3: Determine the co-efficient of vanes like flat and curved vanes.
CO4: Determine the loss of head in pipelines due to friction, sudden contraction, enlargement, bends and elbows.
CO5: Determine the performance and draw operating characteristic curves for Pelton wheel, Reciprocating pump, and Multi-stage Centrifugal pump. wheel, Reciprocating pump, and Multi-stage Centrifugal pump.

Text Books:
1. Manual provided by the department.
2. Cengel, Y.A, Cimbala, John, M., "Fluid Mechanics, Fundamentals and Applications", McGraw Hill Education; Third edition (1 July 2017)

References:
1. R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, Ltd., 2005
2. Robert W. Fox and Alan T. Mc Donald, "Introduction to Fluid Mechanics", John Wiley & Sons Private Ltd., 2009, 7th Edition.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B.Tech. II Year II Semester
23ME206 MANUFACTURING TECHNOLOGY LABORATORY

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Pre-requisite: 23CME101

Course Description:
Manufacturing Technology -I lab is intended for operational experience on Metal casting, Welding, Mechanical Press working and processing of Plastics. These exercises inculcate the skills to the students starting from preparing a wooden pattern to completion of a casting which also comprises different Sand testing techniques. Students will also get good skills on Welding, mechanical press working, processing of plastics & composite which will be helpful to get an employment in Industries.

Course Objectives:
1. To provide hands-on experience of different sand-casting processes and determine the foundry sand properties
2. To provide the experience of welding process practice.
3. To familiarize with sheet metal operations practice.
4. To impart knowledge of forging operations and its practice.
5. To introduce the plastic and composite processing techniques.

LIST OF EXPERIMENTS
1. METAL CASTING LAB:
   a. Pattern Design and making – for one casting drawing.
   b. Sand properties testing - Exercise - for strengths, and permeability
   c. Moulding: Melting and Casting
2. WELDING LAB:
   Arc Welding: Lap & Butt Joint
   a. Spot Welding   b. TIG Welding   c. MIG welding   d. Brazing
3. MECHANICAL PRESS WORKING:
   a. Blanking & Piercing operation and study of simple, compound and
      progressive press tool.
   b. Hydraulic Press: Operation –Forming exercise.
4. FORGING:
   a. Preparation of simple forging model involving upsetting and bending operations.
5. PROCESSING OF PLASTICS & COMPOSITE:
   a. Injection Moulding   b. Fabrication of Composite plate

Course Outcomes:
The students after completing the course will be able to:
1. Produce real time casting moulds on their own.
2. Prepare various joints by using various welding processes.
3. Perform blanking, piercing and forming operations on the sheet metal.
4. Prepare a model using forging operation.
5. Prepare a specimen using injection moulding and hand lay-up process.

Text Books:
1. Manual provided by the department
2. S. Kalpakjian and Steven R. Schmid – 'Manufacturing Engineering and Technology' – Prentice Hall – 2013 – 7th Edition
3. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, Volume1, McGraw Hill Education (India) Private Limited, 5th Edition, 2018

References:
1. B. L. Juneja, Fundamentals of Metal Forming Processes, New age publishers; Second edition, 2018
2. Roy A Lindberg, Process and Materials of Manufacturing, 4th Ed. Pearson Edu. 2006.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech II Year II Semester
Skill Enhancement Course - II

23CSE601 PYTHON PROGRAMMING

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Course Objectives:
The main objectives of the course are to
   1. Introduce core programming concepts of Python programming language.
   2. Learn to solve problems using Python conditional and loops.
   3. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
   4. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications.
   5. Demonstrate to do input/output with files in Python.

UNIT I   DATA TYPES, EXPRESSIONS AND CONTROL FLOW   6 hours
                STATEMENTS

Introduction: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.
Sample Experiments:
   1. Write a program to find the largest element among three Numbers.
   2. Write a program to swap two numbers without using a temporary variable.
   3. Demonstrate the following Operators in Python with suitable examples.
i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators

UNIT II   LISTS & DICTIONARIES   6 hours
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.
Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
Sample Experiments:
   4. Write a program to perform the given operations on a list:
       i. Addition ii. Insertion iii. slicing
   5. Write a program to perform any 5 built-in functions by taking any list.
   6. Write a program to sum all the items in a given dictionary.

UNIT III   TUPLES AND SETS   6 hours

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:
1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.

UNIT IV   FUNCTIONS & STRINGS   6 hours

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Sample Experiments:
1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.

UNIT V   FILES HANDLING IN PYTHON   6 hours

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.
Sample Experiments:
1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Implement a Python program to print each line of a file in reverse order.
3. Write a Python program to compute the number of characters, words and lines in a file

Course Outcomes:
After completion of the course, students will be able to
  CO1: Understand to adept command of Python syntax, deftly utilizing variables, data types, and control structures.
  CO2: Interpret Strings, functions, modules, exception handling to engineer robust and efficient code solutions.
  CO3: Apply Python programming concepts like Lists and Dictionary to solve a variety of computational problems.
  CO4: Build and manipulate fundamental data structures such as tuples and sets.
  CO5: Demonstrate file handling concepts in python.

Text Books:
1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024.

Reference Books:
1. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
2. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

Online Resources:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai

2. https://www.coursera.org/learn/python?specialization=python#syllabus

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination