

Course Structure and Syllabus

SITE-23

Mechanical Engineering

Group-A**I Sem B.Tech (AIML, CIC, CSE, CSD, CSM & CST)**

S.No.	Subject Code	Course	L	T	P	C
1	23CMEGT1010	Communicative English	2	0	0	2
2	23CMMAT1020	Linear Algebra & Calculus	3	0	0	3
3	23AMCHT1030 23CICHT1030 23CSCHT1030 23CDCHT1030 23CACHT1030 23CTCHT1030	Chemistry	3	0	0	3
4	23CMCET1040	Basic Civil & Mechanical Engineering	3	0	0	3
5	23CMCST1050	Introduction to C-Programming	3	0	0	3
6	23CMEGL1060	Communicative English Lab	0	0	2	1
7	23AMCHL1070 23CDCHL1070 23CACHL1070 23CICHL1070 23CSCHL1070 23CTCH1L070	Chemistry Lab	0	0	2	1
8	23CMCSL1080	Computer Programming Lab	0	0	3	1.5
9	23CMMEL1090	Engineering Workshop	0	0	3	1.5
10	23CMPES1100	Health and wellness, Yoga and Sports	-	-	1	0.5
Total			14	0	11	19.5

Group-B
I Sem B.Tech (CE, ME, EEE, ECT, ECE & IT)

S.No.	Subject Code	Course	L	T	P	C
1	23CMMAT1010	Linear Algebra & Calculus	3	0	0	3
2	23CMPHT1020	Engineering Physics	3	0	0	3
3	23CMCST1030	Introduction to C-Programming	3	0	0	3
4	23CMEET1040	Basic Electrical & Electronics Engineering	3	0	0	3
5	23CMMET1050	Engineering Graphics	1	0	4	3
6	23CMCSL1060	IT Workshop	0	0	2	1
7	23CMCHL1070	Engineering Physics Lab	0	0	2	1
8	23CMCSL1080	Computer Programming Lab	0	0	3	1.5
9	23CMEEL1090	Electrical & Electronics Engineering Workshop	0	0	3	1.5
10	23CMNSS1100	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total			13	0	15	20.5

Group-A**II Sem B.Tech (AIML, CIC, CSE, CSD, CSM & CST)**

S.No.	Subject Code	Course	L	T	P	C
1	23CMMAT2010	Differential Equations & Vector Calculus	3	0	0	3
2	23CMPHT2020	Engineering Physics	3	0	0	3
3	23CMEET2030	Basic Electrical & Electronics Engineering	3	0	0	3
4	23CMMET2040	Engineering Graphics	1	0	4	3
5	23AMAMT2050 23CICIT2050 23CDCDT2050 23CSCST2050 23CACAT2050 23CTCTT2050	Data Structures	3	0	0	3
6	23CMPHL2060	Engineering Physics Lab	0	0	2	1
7	23CMCSL2070	IT Workshop	0	0	2	1
8	23CMEEL2080	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	23AMAML2090 23CICIL2090 23CDCDL2090 23CSCSL2090 23CACAL2090 23CTCTL2090	Data Structures Lab	0	0	3	1.5
10	23CMNSS2100	NSS/NCC/Scouts Guides/Community Service	-	-	1	0.5
Total			13	0	15	20.5

Group-B**II Sem B.Tech (CE, ME, EEE, ECT, ECE & IT)**

S.No.	Subject Code	Course	L	T	P	C
1	23CMEGT2010	Communicative English	2	0	0	2
2	23CMMAT2020	Differential Equations & Vector Calculus	3	0	0	3
3	23CECHT2030 23MECHT2030	Engineering Chemistry	3	0	0	3
	23ECCHT2030 23ETCHT2030 23EECHT2030 23ITCHT2030	Chemistry	3	0	0	3
4	23CMCET2040	Basic Civil & Mechanical Engineering	3	0	0	3
5	23CECET2050 23MEMET2050 23ECECT2050 23ETETT2050 23EEEET2050 23ITITT2050	Engineering Mechanics Engineering Mechanics Network Analysis Network Analysis Electrical Circuit Analysis-I Data Structures	3	0	0	3
6	23CMEGL2060	Communicative English Lab	0	0	2	1
7	23CECHL2070 23CECHL2070	Engineering Chemistry Lab	0	0	2	1
7	23ECCHL2070 23ETCHL2070 23EECHL2070 23ITCHL2070	Chemistry	0	0	2	1
8	23CMMEL2080	Engineering Workshop	0	0	3	1.5
9	23CECEL2090 23MEMEL2090 23ECECL2090 23ETETL2090 23EEEEL2090 23ITITL2090	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab Network Analysis & Simulation Lab Network Analysis & Simulation Lab Electrical Circuits Lab Data Structures Lab	0	0	3	1.5
10	23CMPES2100	Health and wellness, Yoga and Sports	-	-	1	0.5
Total			14	0	11	19.5

COMMUNICATIVE ENGLISH			
Subject Code	23CMEGT 1010/2010	IA Marks	30
Number of Lecture Hours/ Week	02	Exam Marks	70
Total Number of Lecture Hours	32	Exams Hours	03
Credits -02			
<p>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</p> <p>Course Outcomes: CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues. CO2: Apply grammatical structures to formulate sentences and correct word forms. CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions. CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. CO5: Create a coherent paragraph, essay, and resume.</p>			
Unit I			
<p>Lesson: HUMAN VALUES: Gift of Magi (Short Story) Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information. Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences. Grammar: Parts of Speech, Basic Sentence Structures-forming questions Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.</p>			07 hours
Unit II			
<p>Lesson: NATURE: The Brook by Alfred Tennyson (Poem) Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts. Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Writing: Structure of a paragraph - Paragraph writing (specific topics) Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions. Vocabulary: Homonyms, Homophones, Homographs</p>			06 hours
Unit III Lesson: BIOGRAPHY: Elon Musk			
<p>Listening: Listening for global comprehension and summarizing what is listened to. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.</p>			07 hours

<p>Writing: Summarizing, Note-making, paraphrasing Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations Vocabulary: Compound words, Collocations</p>	
Unit IV	
<p>Lesson: INSPIRATION: The Toys of Peace by Saki Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. Writing: Letter Writing: Official Letters, Resumes Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice Vocabulary: Words often confused, Jargons</p>	07 hours
Unit V	
<p>Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay) Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts Reading: Reading comprehension. Writing: Writing structured essays on specific topics. Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement) Vocabulary: Technical Jargons</p>	06 Hours
<p>Textbooks:</p> <ol style="list-style-type: none"> 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) 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 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. 	
<p>Web Resources: GRAMMAR:</p> <ol style="list-style-type: none"> 1. www.bbc.co.uk/learningenglish 2. https://dictionary.cambridge.org/grammar/british-grammar/ 3. www.eslpod.com/index.html 4. https://www.learngrammar.net/ 5. https://english4today.com/english-grammar-online-with-quizzes/ 6. https://www.talkenglish.com/grammar/grammar.aspx <p>VOCABULARY</p> <ol style="list-style-type: none"> 1. https://www.youtube.com/c/DailyVideoVocabulary/videos 2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA 	

LINEAR ALGEBRA & CALCULUS			
Subject Code	23CMMAT1010/1020	IA Marks	30
Number of Lecture Hours/Week	3	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 03			
Course Objectives:			
<ul style="list-style-type: none"> 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 -1 Matrices			
Rank of a matrix by echelon form, normal form, PAQ form. Cauchy – Binet formulae (without proof). Inverse of Non-singular matrices by Gauss –Jordan method, System of linear equations: Consistent and inconsistent, Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods .Applications: Finding the current in a electrical circuit			Hours 10
Unit -2- Eigen values, Eigen vectors and Orthogonal Transformation			
Eigen values, Eigen vectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Diagonalization of a matrix, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.			Hours 10
Unit – 3- Calculus			
Mean Value Theorems: Rolle’s Theorem, Lagrange’s mean value theorem with their geometrical interpretation, Cauchy’s mean value theorem, Taylor’s and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.			Hours 10
Unit – 4- Partial differentiation and Applications (Multi variable calculus)			
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Euler’s theorem, Taylor’s and Maclaurin’s series expansion of functions of two variables. Jacobian, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.			Hours 10
Unit – 5- Multiple Integrals (Multi variable Calculus			
Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).			Hours 10
Course outcomes: At the end of the course, the student will be able to			
CO1: Develop and use of matrix algebra techniques that are needed by engineers for Practical applications.			
CO2: Utilize mean value theorems to real life problems.			
CO3: Familiarize with functions of several variables which is useful in Optimization.			
CO4: Learn important tools of calculus in higher dimensions.			
CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.			
Question paper pattern:			
1. Question paper consists of 6 questions and all questions are compulsory.			
2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.			
3. There shall be 2 short answer questions from each unit.			
4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each.			

Student shall answer any one of them.

5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question.

Text Books:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).
6. B. V. Ramana, Higher Engineering Mathematics, 2013 Edition, Tata Mc. Graw Hill Education.

ENGINEERING PHYSICS			
Subject Code	23CMPHT1020 23CMPHT2020	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 3			
COURSE OBJECTIVES:			
The objectives of this course, help the students:			
<ul style="list-style-type: none"> 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 -1 Wave Optics			
Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton’s Rings, Determination of wavelength and refractive index. Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol’s Prism -Half wave and Quarter wave plates.			Hours – 12
Unit -2 Crystallography and X-ray diffraction			
Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC. X-ray diffraction: Miller indices – separation between successive (hkl) planes.Bragg’s law - X-ray Diffractometer – crystal structure determination by Laue’s and powder methods.			Hours – 8
Unit – 3 Dielectric and Magnetic Materials			
Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation – 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.			Hours –10
Unit – 4 Quantum Mechanics and Free electron Theory			
Quantum Mechanics: Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function – Schrodinger’s time independent and dependent wave equations– Particle in a one-dimensional infinite potential well. Free Electron Theory: Classical free electron theory (Qualitative with discussion of			Hours – 10

merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy	
Unit – 5 Semiconductors	
Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein’s equation – Hall effect and its applications.	Hours – 8
<p>COURSE OUTCOMES:</p> <p>On completion of the course student will able to</p> <p>CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.</p> <p>CO2: Familiarize with the basics of crystals and their structures.</p> <p>CO3: Summarize various magnetic and dielectric properties to design engineering materials.</p> <p>CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.</p> <p>CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.</p> <p>CO6: Identify the type of semiconductor using Hall effect.</p>	
<p>QUESTION PAPER PATTERN:</p> <p>i) There shall be 6 questions and all questions are compulsory.</p> <p>ii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.</p> <p>iii) There shall be 2 short answer questions from each unit.</p> <p>a) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.</p> <p>iv) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.</p>	
<p>TEXT BOOKS:</p> <p>1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.</p> <p>2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)</p>	
<p>REFERENCE BOOKS:</p> <p>1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.</p> <p>2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.</p> <p>3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University</p>	

CHEMISTRY			
Subject Code	23AMCHT1030/23CICHT1030/23CDCHT1030/23CSCHT1030/23CACHT10230/23CTCHT1030/23ECCHT2030/23ETCHT2030/23EECHT2030/23ITCHT2030	IA Marks	30
Number of Lecture Hr	3	Exam Marks	70
Total Number Hr	48	Exam Hours	03
Credits – 03			
COURSE OBJECTIVES:			
The objectives of this course, help the students to			
<ol style="list-style-type: none"> 1. Familiarize modern engineering materials and its applications 2. Train the students on the principles and applications of electrochemistry and polymers 3. Introduce instrumental methods and chromatography. 			
Unit-1 Structure and Bonding Models			
Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2 , particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O ₂ and CO, etc. π -molecular orbitals of butadiene and benzene, calculation of bond order.			Hours –9
Unit -2 Modern Engineering materials			
Semiconductors: Introduction, preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion and ion implantation), applications. Superconductors: Introduction - Types, properties and applications. Supercapacitors: Introduction, basic concept - Classification - Applications. Nano materials: Introduction, classification of carbon nanotubes, properties and applications of fullerenes, carbon nanotubes and Graphene nanoparticles.			Hours –9
Unit-3 Electrochemistry and Applications			
Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry - potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells – lithium-ion batteries – working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell – working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).			Hours –10
Unit – 4 Polymer Chemistry			

<p>Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanism of free radical addition polymer formation. Poly Dispersity Index. Plastics – Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon -6,6, carbon fibres.</p> <p>Elastomers – Buna-S, Buna-N – preparation, properties and applications.</p> <p>Conducting polymers – polyacetylene, polyaniline, mechanism of conduction and applications. Bio - Degradable polymers – Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).</p>	Hours –10
Unit – 5 Instrumental Methods and Applications	
<p>Electro-magnetic spectrum. Absorption of radiation: Beer-Lambert’s law. UV-Visible Spectroscopy - Instrumentation, applications, IR spectroscopy - Instrumentation, applications. Chromatography - Basic Principle, Classification – Thin Layer and Paper Chromatography, HPLC: Instrumentation and Applications.</p>	Hours –10
<p>COURSE OUTCOMES: On completion of the course student will be able to</p> <ol style="list-style-type: none"> 1. Interpret the bond order and magnetic character of molecules. 2. Recall the properties and applications of nano materials. 3. Outline the applications of semiconductors and super conductors. 4. Compare the materials of construction for battery and electrochemical cells. 5. Explain the preparation, properties and applications of thermo and thermosetting plastics and rubbers 6. Summarize the concepts of Instrumental methods. 	
<p>QUESTION PAPER PATTERN: SECTION A:</p> <ol style="list-style-type: none"> 1. This section contains ten questions carrying 2 marks each. 2. Two questions from each unit should present. <p>SECTION B:</p> <ol style="list-style-type: none"> 6. This section will have 5 questions with internal choice. 7. Each full question carries 10 marks. <p>Each full question may have sub question covering all topics under a unit.</p>	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition). 2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell. 3. Peter Atkins, Juliode Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010. 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007. 2. J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008 3. Text book of Polymer Science, Fred W.Billmayer Jr, 3rd Edition 	

BASIC CIVIL AND MECHANICAL ENGINEERING			
Subject Code	23CMCET104 0/ 23CMCET204 0	Internal Marks	30
Number of Lecture Hours / Week	03	External Marks	70
Total Number of Lecture Hours		Exam Hours	3Hrs
Credits – 03			
BASIC CIVIL ENGINEERING			
Course Objectives:			
<ol style="list-style-type: none"> 1. Get familiarized with the scope and importance of Civil Engineering sub-divisions. 2. Introduce the preliminary concepts of surveying. 3. Acquire preliminary knowledge on Transportation and its importance in nation's economy. 4. Get familiarized with the importance of quality, conveyance and storage of water. 5. Introduction to basic civil engineering materials and construction techniques. 			
Unit-1			Hours
Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.			
Unit-2			
Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on leveling and bearings-Contour mapping.			
Unit-3			
Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).			
Course outcomes: On completion of the course, the student should be able to:			
<ol style="list-style-type: none"> 1. Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. 2. Know the concepts of surveying and to understand the measurement of 			

<p>distances, angles and levels through surveying.</p> <ol style="list-style-type: none"> 3. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. 4. Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated. 5. Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 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. 	
<p>References:</p> <ol style="list-style-type: none"> 1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition. 2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016 3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition. 4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition. 5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012. 	
BASIC MECHANICAL ENGINEERING	
<p>Course Objectives: The students after completing the course are expected to</p> <ol style="list-style-type: none"> 1. Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries. 2. Explain different engineering materials and different manufacturing processes. 3. Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications. 	
Unit-I	
<p>Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.</p> <p>Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics,\ Composites, Smart materials.</p>	
Unit-II	
<p>Manufacturing Processes: Principles of Casting, Forming, and joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.</p> <p>Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle,</p>	

Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.	
Unit-III	
<p>Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.</p> <p>Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.</p> <p>Introduction to Robotics - Joints & links, configurations, and applications of robotics.</p>	
<p>Course outcomes:</p> <p>On completion of the course, the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the different manufacturing processes. 2. Explain the basics of thermal engineering and its applications. 3. Describe the working of different mechanical power transmission systems and power plants. 4. Describe the basics of robotics and its applications. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd. 2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd. 3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd. 	
<p>References:</p> <ol style="list-style-type: none"> 1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd. 2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd. 3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications 4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I 	
Question paper pattern:	

BASIC ELECTRICAL & ELECTRONICS ENGINEERING			
Subject Code	23CMEET1040 23CMEET2030	IA Marks	30
Number of Lecture Hours/Week	3L	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits-03			
PART A: BASIC ELECTRICAL ENGINEERING			
Course Objectives: To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.			
Unit -1			
DC & AC Circuits DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems. AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).			Hours – 7
Unit -2			
Machines and Measuring Instruments Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines. Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.			Hours – 8
Unit – 3			
Energy Resources, Electricity Bill & Safety Measures Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation. Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker(MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.			Hours – 9

Course Outcomes: On completion of the course student will be able to:	
<ol style="list-style-type: none"> 1. Describe fundamental laws, operating principles of motors/generators, MC/MI instruments. (L2) 2. Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2) 3. Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3) 4. Calculate electrical load and electricity bill of residential and commercial buildings. (L4) 	
Textbooks:	
<ol style="list-style-type: none"> 1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition. 2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013. 3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition. 2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020. 3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017. 4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition. 	
PART B: BASIC ELECTRONICS ENGINEERING	
Course Objectives:	
To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.	
Unit – 1	
SEMICONDUCTOR DEVICES Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.	Hours – 8
Unit – II	
BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION Rectifiers and Power Supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.	Hours – 8
Unit – III	
DIGITAL ELECTRONICS Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic	Hours – 8

Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).	
Textbooks: <ol style="list-style-type: none">1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009	
Reference Books: <ol style="list-style-type: none">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.	

INTRODUCTION TO PROGRAMMING			
Subject Code	23CMCST1030/1050	IA Marks	30
Number of Lecture Hours/Week	3	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 03			
Course Objectives:			
<ol style="list-style-type: none"> 1. To introduce students to the fundamentals of computer programming. 2. To provide hands-on experience with coding and debugging. 3. To foster logical thinking and problem-solving skills using programming. 4. To familiarize students with programming concepts such as data types, control structures, functions, and arrays. 5. To encourage collaborative learning and teamwork in coding projects. 			
Course Outcomes: A student after completion of the course will be able to			
CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking. CO2: Analyse a problem and develop an algorithm to solve it.			
CO3: Implement various algorithms using the C programming language.			
CO4: Understand more advanced features of C language.			
CO5: Develop problem-solving skills and the ability to debug and optimize the code.			
Unit -1			Hours
Introduction to Programming and Problem Solving			08
<p>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.</p> <p>Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.</p>			
Unit -2			
Control Structures Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue.			10
Unit – 3			
Arrays and Strings Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.			10
Unit – 4			
Pointers & User Defined Data types Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.			10

Unit – 5	
Functions & File Handling Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.	10

Text Books/ Reference Books:	
T1	"The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988
T2	Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996
R1	Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 200
R2	Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
R3	C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS			
Subject Code	23CMMAT2010/20	IA Marks	30
Number of Lecture Hours/Week	3	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 03			
Course Objectives:			
<ul style="list-style-type: none"> • To enlighten the learners in the concept of differential equations and multi variable calculus. • To furnish the learners with basic concepts and techniques at plus two level to lead the min to advanced level by handling various real-world applications. 			
Unit -1 Differential equations of first order and first degree			
Linear differential equations - Bernoulli's equations - Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay-Electrical circuits.			10 Hr
Unit -2 Linear differential equations of higher order (Constant Coefficients)			
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 – 3 Partial Differential Equations			
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Non linear PDE - Standard forms. Homogeneous Linear Partial differential equations with constant coefficients.			Hours – 10
Unit – 4 Vector differentiation			
Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.			Hours – 08
Unit – 5 Vector integration			
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stokes theorem (without proof), volume integral, Divergence theorem (without proof) and related problems. (evaluation only)			Hours – 10
Course outcomes: At the end of the course, the student will be able to			
CO1: Solve the differential equations related to various engineering fields.			
CO2: Solve the differential equations of higher order related to various engineering fields			
CO3: Identify solution methods for partial differential equations that model physical Processes.			
CO4: Interpret the physical meaning of different operators such as gradient, curl and Divergence.			
CO5: Estimate the work done against a field, circulation and flux using vector calculus.			

Question paper pattern:

8. Question paper consists of 6 questions and all questions are compulsory.
9. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.
10. There shall be 2 short answer questions from each unit.
11. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
12. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question.

Text Books:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 2015th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana Mc Graw Hill Education, 2017.

ENGINEERING CHEMISTRY			
Subject Code	23CECHT2030/23MECHT2030	IA Marks	30
Number of hours/Week	3	Exam Marks	70
Total Number of Lecture Hr	48	Exam Hours	03
Credits – 03			
<p>Course Objectives: The objectives of this course, help the students to</p> <ol style="list-style-type: none"> 4. Impart the concept of soft and hard water, softening methods of hard water 5. Train the students on the principles and applications of electrochemistry, polymers, surface chemistry and cement 6. Familiarize modern engineering materials 			
Unit-1 Water Technology			
Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen – Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment –Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.		Hours –9	
Unit -2 Electrochemistry and Applications			
Electrodes – electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel -Cadmium (NiCad), and lithium ion batteries – working principle of the batteries including cell reactions; Fuelcells – Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell. Corrosion: Introduction to corrosion, electrochemical theory of corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, Corrosion control methods – Control by proper design, cathodic and anodic protection - electroplating and electroless plating (Nickel and Copper).		Hours –10	
Unit -3 Polymers and Fuel Chemistry			
Introduction to polymers, functionality of monomers, Tacticity, Mechanism of free radical chain growth polymerization. Thermoplastics and Thermo - setting plastics: Preparation, properties and applications of polystyrene. 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.		Hours –10	
Unit – 4 Modern Engineering Materials			

<p>Composites- Definition, Classification- Particle, Fibre reinforced composites, properties and Engineering applications.</p> <p>Refractories - Classification, Properties, Factors affecting the refractory materials and Applications.</p> <p>Lubricants - Classification, Functions of lubricants, Properties of lubricating oils –Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, Saponification and Applications.</p> <p>Building materials – Manufacturing of Portland Cement, Constituents, Setting and Hardening of cement.</p>	Hours –10
Unit – 5	
<p>Surface Chemistry and Nanomaterials</p> <p>Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, chemical methods of preparation of nano metals by Chemical reduction method and metal oxides by Sol-gel method, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.</p>	Hours –9
<p>COURSE OUTCOMES:</p> <p>On completion of the course student will be able to</p> <ol style="list-style-type: none"> 1. Interpret the various problems faced in industries due to boiler troubles. 2. Demonstrate the corrosion prevention methods and factors affecting corrosion. 3. Outline the preparation, properties and applications of thermoplastics & thermosetting, elastomers & conducting polymers. 4. Explain calorific values, octane number, refining of petroleum and cracking of oils. 5. Outline the setting and hardening of cement. 6. Summarize the concepts of colloids, micelle and nanomaterials. 	
<p>QUESTION PAPER PATTERN:</p> <p>SECTION A:</p> <ol style="list-style-type: none"> 3. This section contains ten questions carrying 2 mark each. 4. Two questions from each unit should present. <p>SECTION B:</p> <ol style="list-style-type: none"> 13. This section will have 5 questions with internal choice. 14. Each full question carries 10 marks. <p>Each full question may have sub question covering all topics under a unit.</p>	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 4. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition). 5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell. 6. Peter Atkins, Juliode Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010. 	
<p>ReferenceBooks:</p> <ol style="list-style-type: none"> 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. Text book of Polymer Science, Fred W.Billmayer Jr, 3rd Edition 	

ENGINEERING GRAPHICS			
Subject Code	23CMMET1050 23CMMET2040	Internal Marks	30
Number of Lecture Hours / Week	1+4	External Marks	70
Total Number of Lecture Hours		Exam Hours	100
Credits – 03			
Course Objectives:			
<ol style="list-style-type: none"> 1. To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing 2. To impart knowledge on the projection of points, lines and plane surfaces 3. To improve the visualization skills for better understanding of projection of solids 4. To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces. 5. To make the students understand the viewing perception of a solid object in Isometric and Perspective projections. 			
Unit-1			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, Involute, Normal and tangent to Curves. Scales: Plain scales, diagonal scales and vernier scales.			
Unit-2			
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-3			
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-4			
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-5	
<p>Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.</p> <p>Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (<i>Not for end examination</i>).</p>	
<p>Course outcomes:</p> <ol style="list-style-type: none"> 1. Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. 2. Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. 3. Understand and draw projection of solids in various positions in first quadrant. 4. Explain principles behind development of surfaces. 5. Prepare isometric and perspective sections of simple solids. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016. 	
<p>References:</p> <ol style="list-style-type: none"> 1. Engineering Drawing, K.L. Narayana and P. Kanniah, 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, Tata McGraw Hill, 2017. 	
Question paper pattern:	

ENGINEERING MECHANICS			
Subject Code	23CECET2050 23MEMET2050	Internal Marks	30
Number of Lecture Hours / Week	03	External Marks	70
Total Number of Lecture Hours		Exam Hours	100
Credits – 03			
Course Objectives:			
<ol style="list-style-type: none"> 1. To get familiarized with different types of force systems. 2. To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces. 3. To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies. 4. To apply the Work-Energy method to particle motion. 5. To understand the kinematics and kinetics of translational and rotational motion of rigid bodies. 			
Unit-1 Introduction to Engineering Mechanics			Hrs
– Basic Concepts. Scope and Applications Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application – Couples and Resultant of Force Systems. Friction: Introduction, limiting friction and impending motion, Coulomb’s laws of dry friction, coefficient of friction, Cone of Static friction.			
Unit-2 Equilibrium of Systems of Forces			
: Free Body Diagrams, Lami’s Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples			
Unit-3			
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-4 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-5 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			
<ol style="list-style-type: none"> 1. Understand the fundamental concepts in mechanics and determine the frictional 			

<p>forces for bodies in contact.</p> <ol style="list-style-type: none">Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.Solve the problems involving the translational and rotational motion of rigid bodies.
<p>Text Books:</p> <ol style="list-style-type: none">Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.
<p>References:</p> <ol style="list-style-type: none">Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second EditionEngineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition
<p>Question paper pattern:</p>

DATA STRUCTURES			
Subject Code	23AMAMT2050/23CACAT2050/23CICIT2050 23CDCDT2050/23CSCST2050/23CTCTT2050 23ITITT2050	IA Marks	30
Number of Lecture Hours/Week	3	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 03			
<p>Course Objectives:</p> <ul style="list-style-type: none"> • To provide the knowledge of basic data structures and their implementations. • To understand importance of data structures in context of writing efficient programs. • To develop skills to apply appropriate data structures in problem solving. <p>Course Outcomes: At the end of the course, Student will be able to</p> <p>CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.</p> <p>CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.</p> <p>CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.</p> <p>CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.</p> <p>CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.</p> <p>CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.</p>			
Unit -1			Hours
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort			08
Unit -2			
Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.			10
Unit – 3			
Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc			10
Unit – 4			
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.			10
Dequeues: Introduction to dequeues (double-ended queues), Operations on dequeues and their applications.			

Unit – 5	
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.	10

Text Books/ Reference Books:	
T1	Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2 nd Edition.
T2	Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Silicon Press, 2008
R1	Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
R2	C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
R3	Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
R4	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
R5	Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

ELECTRICAL CIRCUIT ANALYSIS -I			
Subject Code	23EEEET2050	IA Marks	30
Number of Lecture Hours/Week	3L	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits-03			
Course Objectives:			
To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.			
Unit -1			
INTRODUCTION TO ELECTRICAL CIRCUITS: Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.			Hours – 10
Unit -2			
MAGNETIC CIRCUITS Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.			Hours – 10
Unit – 3			
SINGLE PHASE CIRCUITS Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallelRC circuit.			Hours – 10
Unit – 4			
RESONANCE AND LOCUS DIAGRAMS Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.			Hours – 9
Unit – 5			
NETWORK THEOREMS (DC & AC EXCITATIONS) Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.			Hours – 9

Course Outcomes:

On completion of the course student will be able to:

1. Remembering the basic electrical elements and different fundamental laws.
2. Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems.
3. Apply the concepts to obtain various mathematical and graphical representations.
4. Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
5. Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

Text Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, TataMc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised ThirdEdition.

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku,Mc Graw Hill Education (India), 2013, Fifth Edition.
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and **K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.**
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023,Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018,Seventh Revised Edition.

NETWORK ANALYSIS			
Subject Code	23ECECT2050/23ETETT2050	Internal Marks	30
Number of Lecture Hours/Week	03	External Marks	70
Total Number of Lecture Hours	48	Exam Hours	03
Credits – 03			
Course Objectives:			
This course will enable students to:			
<ol style="list-style-type: none"> 1. To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits 2. To impart knowledge on applying appropriate theorem for electrical circuit analysis 3. To explain transient behavior of circuits in time and frequency domains 4. To teach concepts of resonance 5. To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship. 			
Unit -1			Hours
Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples. Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also			8
Unit -2			
Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.			10
Unit – 3			
Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-LC circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.			10
Unit – 4			
Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies. Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.			8
Unit – 5			
Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also. Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching			10

networks.	
Total	48
<p>Course outcomes: On completion of the course student will be able to</p> <ol style="list-style-type: none"> 1. Understand basic electrical circuits with nodal and mesh analysis. 2. Analyse the circuit using network simplification theorems. 3. Find Transient response and Steady state response of a network. 4. Analyse electrical networks in the Laplace domain. 5. Compute the parameters of a two-port network. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019. 2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020. 3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI 	
<p>Reference Books</p> <ol style="list-style-type: none"> 1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013. 2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7 th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017 3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education. 	

COMMUNICATIVE ENGLISH LAB			
Subject Code	23CMEGL1050/2060	IA Marks	30
Number of Practical Hours/Week	02	Exam Marks	70
Total Number of Practical Hours	32	Exam Hours	02
Course Objectives:			
The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.			
Course Outcomes:			
CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.			
CO2: Apply communication skills through various language learning activities.			
CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.			
CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.			
CO5: Create effective Course Objectives:			
List of Topics/Experiments: Vowels & Consonants ,Neutralization/Accent Rules Communication Skills & JAM .Role Play or Conversational Practice ,E-mail Writing Resume Writing, Cover letter, SOP ,Group Discussions-methods & practice Debates - Methods & Practice, PPT Presentations/ Poster Presentation Interviews Skill			
Suggested Software: Walden Infotech ,Young India Films			
Reference Books:			
1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.			
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016			
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.			
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed) , Kindle, 2013			
Web Resources:			
Spoken English:			
1. www.esl-lab.com			
2. www.englishmedialab.com			
3. www.englishinteractive.net			
4. https://www.britishcouncil.in/english/online			
5. http://www.letstalkpodcast.com/			
6. https://www.youtube.com/c/mmmEnglish_Emma/featured			
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured			
8. https://www.youtube.com/c/engvidAdam/featured			
9. https://www.youtube.com/c/EnglishClass101/featured			
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists			
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw			
Voice & Accent:			
1. https://www.youtube.com/user/letstalkaccent/videos			
2. https://www.youtube.com/c/EngLanguageClub/featured			
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc			
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA			

ENGINEERING PHYSICS LAB			
Subject Code	23CMPHL1070 23CMPHL2060	IA Marks	30
Number of Practice Hours/Week	02	Exam Marks	70
Total Number of Practice Hours	14	Exam Hours	02
Credits – 1.0			
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			
<ol style="list-style-type: none"> 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. 19. Determination of Fermi energy of Copper by using meter bridge 			

TEXT BOOKS:

1. “*Physics Laboratory Manual*” Prepared by Department of Physics, SITE.

REFERENCE BOOKS:

1. S. Balasubrahmanian, M.N. Srinivasan ‘‘A Text book of Practical Physics’’- S. Chand Publishers, 2017.
2. Advanced Practical Physics Vol 1& 2 SP Singh & M.S Chauhan Pragati Prakashan, Meerut

WEB SOURCES:

www.vlab.co.in

<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

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

CHEMISTRY LABORATORY			
Subject Code	23AMCHL1070/23CACHL1070/23CACHL1070/ 23CDCHL1070/23CICHL1070/23CSCHL1070/2 3CTCHL1070/23ECHLL2070/23ETCHL2070/23 ITCHL2070	IA Marks	30
Number of Hr/Week	3	Exam Mr	70
Total Number Hr	36	Exam Hrs	02
Credits – 1.0			
List of Experiments			
(Any 10 experiments must be conducted)			
<ol style="list-style-type: none"> 1. Conductometric titration of strong acid vs. strong base 2. Conductometric titration of weak acid vs. strongbase 3. Determination of cell constant and conductance of solutions 4. Potentiometry – determination of redox potentials and emfs 5. Potentiometric titration of strong acid vs. strong base 6. Determination of Strength of an acid in Pb-Acid battery 7. Preparation of a Bakelite 8. Verify Lambert-Beer's law 9. Wavelength measurement of sample through UV-Visible Spectroscopy 10. Determination of pH of the given samples using pH-meter 11. Preparation of nanomaterials by precipitation method 12. Estimation of Ferrous Iron by Dichrometry 13. Estimation of Potassium permanganate using oxalic acid 14. Determination of Calcium by complexometry 			
Demonstration Experiments			
<ol style="list-style-type: none"> 1. Thin Layer Chromatography 2. Determination of Fe⁺³ by a colorimetric method. 			

IT WORKSHOP			
Subject Code	23CMCSL1060/2070	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			
Course Objectives:			
<ul style="list-style-type: none"> • To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables • To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS • To teach basic command line interface commands on Linux. • To teach the usage of Internet for productivity and self-paced life-long learning • To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools. 			
Course Outcomes:			
CO1: Perform Hardware troubleshooting.			
CO2: Understand Hardware components and inter dependencies.			
CO3: Safeguard computer systems from viruses/worms.			
CO4: Document/ Presentation preparation.			
CO5: Perform calculations using spreadsheets			
PC Hardware & Software Installation			
Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.			
Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.			
Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.			
Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva			
Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva			
Internet & World Wide Web			
Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the			

WWW on the LAN.

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

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

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

LaTeX and WORD

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

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

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

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

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

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

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

LOOKUP/VLOOKUP

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

POWER POINT

Task 1: Students will be working on basic power point utilities and tools

which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

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

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

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

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

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

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

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

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

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, 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 Ken Quamme. – CISCO Press, Pearson Education, 3rd

COMPUTER PROGRAMMING LAB			
Subject Code	23CMCSL1080	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			
<p>Course Objectives: The course aims to give students hands – on experience and train them on the concepts of the C-programming language.</p> <p>Course Outcomes: CO1: Read, understand, and trace the execution of programs written in C language. CO2: Select the right control structure for solving the problem. CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers. CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.</p>			
<p>UNIT I WEEK 1 Objective: Getting familiar with the programming environment on the computer and writing the first program. Suggested Experiments/Activities: Tutorial 1: Problem-solving using Computers. Lab1: Familiarization with programming environment i) Basic Linux environment and its editors like Vi, Vim & Emacs etc. ii) Exposure to Turbo C, gcc iii) Writing simple programs using printf(), scanf() WEEK 2 Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation. Suggested Experiments /Activities: Tutorial 2: Problem-solving using Algorithms and Flow charts. Lab 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 iii) Simple interest calculation WEEK 3 Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants. Suggested Experiments/Activities: Tutorial 3: Variable types and type conversions: Lab 3: Simple computational problems using arithmetic expressions. i) Finding the square root of a given number ii) Finding compound interest iii) Area of a triangle using heron’s formulae iv) Distance travelled by an object UNIT II WEEK 4 Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works. Suggested Experiments/Activities:</p>			

Tutorial4: Operators and the precedence and as associativity:

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

i) Evaluate the following expressions.

a. $A+B*C+(D*E) + F*G$

b. $A/B*C-B+A*D/3$

c. $A+++B---A$

d. $J= (i++) + (++i)$

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of “if construct” namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.

ii) Find the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers.

UNIT III WEEK 7:

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

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on 1D array.

iii) The reverse of a 1D integer array

iv) Find 2's complement of the given binary number.

v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer

arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

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

UNIT IV WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

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

Lab10 : Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

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

UNIT V WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

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

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:**Tutorial 12:** Recursion, the structure of recursive calls**Lab 12:** Recursive functions

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

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

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

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

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

Textbooks:

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

Reference Books:

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

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP			
Subject Code	23CMEEL1090/2080	IA Marks	30
Number of Lecture Hours/Week	3P	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
PART A: ELECTRICAL ENGINEERING LAB			
Course Objectives:			
To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.			
List of Experiments(Any six experiments must be conducted)			
<ol style="list-style-type: none"> 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. 			
COURSE OUTCOMES:			
After completion of this course, the student will be able to:			
<ol style="list-style-type: none"> 1. Measure voltage, current and power in an electrical circuit. (L3) 2. Measure of Resistance using Wheat stone bridge (L4) 3. Discover critical field resistance and critical speed of DC shunt generators. (L4) 4. Investigate the effect of reactive power and power factor in electrical loads. (L5) 			
PART B: ELECTRONICS ENGINEERING LAB			
Course Objectives:			
To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.			
List of Experiments(Any six experiments must be conducted)			
<ol style="list-style-type: none"> 1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias. 2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator. 3. Implementation of half wave and full wave rectifiers 4. Plot Input & Output characteristics of BJT in CE and CB configurations 5. Frequency response of CE amplifier. 6. Simulation of RC coupled amplifier with the design supplied 7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs. 8. Verification of truth tables of S-R-,J-K & D flip flops using respective ICs . 			
COURSE OUTCOMES: At the end of the course, the student will be able to			
<ol style="list-style-type: none"> 1. Identify & testing of various electronic components. 2. Understand the usage of electronic measuring instruments. 3. Plot and discuss the characteristics of various electron devices. 4. Explain the operation of a digital circuit. 			

ENGINEERING WORKSHOP			
Subject Code	23CMMEL1090/2080	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours		Exam Hours	100
Credits –1.5			
Course Objectives:			
To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.			
Syllabus			
<ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint 3. Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. <ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre 5. Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections. <ol style="list-style-type: none"> a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires 6. Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns. 7. Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint. 8. Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters. 9. Basic repairs of Two-wheeler vehicle – Demonstration of working of two-wheeler vehicle and its repairs. 			
Course outcomes:			
<ol style="list-style-type: none"> 1. Identify workshop tools and their operational capabilities. 2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. 3. Apply fitting operations in various applications. 4. Apply basic electrical engineering knowledge for House Wiring Practice 			

ENGINEERING CHEMISTRY LABORATORY			
Subject Code	23CECHL2070 23MECHL2070	IA Marks	30
Number of Peroids/Week	3	Exam Marks	70
Total Number of Practice Hours	36	Exam Hours	02
Credits – 1.0			
List of Experiments (Any 10 experiments must be conducted)			
<ol style="list-style-type: none"> 1. Determination of Hardness of ground water sample. 2. Estimation of Dissolved Oxygen by Winkler's method 3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH 4. Determination of surface tension of given liquid 5. Determination of Strength of an acid in Pb-Acid battery 6. Preparation of a polymer (Bakelite) 7. Determination of percentage of Iron in Cement sample by colorimetry 8. Estimation of Calcium in Portland Cement 9. Preparation of nano materials by precipitation method. 10. Adsorption of acetic acid by charcoal 11. Determination of Chloride by argentometry. 12. Determination of Viscosity of lubricating oil by Redwood Viscometer1 13. Determination of Viscosity of lubricating oil by Redwood Viscometer2 14. Determination of Cloud and Pour point of oil. <p style="text-align: center;">Demonstration Experiments</p> <ol style="list-style-type: none"> 15. Thin Layer Chromatography 16. Determination of Ferrous iron using potentiometer. 			

DATA STRUCTURES LAB			
Subject Code	23AMAML2090/23CACAL2090 23CDCDL2090/23CICIL2090/23CSCSL2090 23CTCTL2090/23ITITL2090	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			
<p>Course Objectives: The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.</p> <p>Course Outcomes: At the end of the course, Student will be able to</p> <p>CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.</p> <p>CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.</p> <p>CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.</p> <p>CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues and apply them appropriately to solve data management challenges.</p> <p>CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.</p>			
<p>List of Experiments:</p> <p>Exercise 1: Array Manipulation</p> <ul style="list-style-type: none"> i) Write a program to reverse an array. ii) C Programs to implement the Searching Techniques – Linear & Binary Search iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort <p>Exercise 2: Linked List Implementation</p> <ul style="list-style-type: none"> i) Implement a singly linked list and perform insertion and deletion operations. ii) Develop a program to reverse a linked list iteratively and recursively. iii) Solve problems involving linked list traversal and manipulation. <p>Exercise 3: Linked List Applications</p> <ul style="list-style-type: none"> i) Create a program to detect and remove duplicates from a linked list. ii) Implement a linked list to represent polynomials and perform addition. iii) Implement a double-ended queue (deque) with essential operations. <p>Exercise 4: Double Linked List Implementation</p> <ul style="list-style-type: none"> i) Implement a doubly linked list and perform various operations to understand its properties and applications. ii) Implement a circular linked list and perform insertion, deletion, and traversal. <p>Exercise 5: Stack Operations</p> <ul style="list-style-type: none"> i) Implement a stack using arrays and linked lists. ii) Write a program to evaluate a postfix expression using a stack. 			

- iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

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

Exercise 7: Stack and Queue Applications

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

Exercise 8: Binary Search Tree

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

Exercise 9: Hashing

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

Textbooks:

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

Reference Books:

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

NETWORK ANALYSIS AND SIMULATION LABORATORY			
Subject Code	23ECECL2090/23ETETL2090	Internal Marks	30
Number Lecture Hr/	03	External Marks	70
Total No Hr	36	Exam Hours	03
Credits – 1.5			
Course Objectives:			
This course will enable students to			
<ol style="list-style-type: none"> 1. To gain hands on experience in verifying Kirchoff's laws and network theorems 2. To analyze transient behavior of circuits 3. To study resonance characteristics 4. To determine 2-port network parameters 			
List of Experiments:			
The following experiments need to be performed using both Hardware and simulation Software The experiments need to be simulated using software and the same need to be verified using the hardware.			
<ol style="list-style-type: none"> 1. Study of components of a circuit and Verification of KCL and KVL. 2. Verification of mesh and nodal analysis for AC circuits 3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits 4. Verification of maximum power transfer theorem for AC circuits 5. Verification of Tellegen's theorem for two networks of the same topology. 6. Study of DC transients in RL, RC and RLC circuits 7. To study frequency response of various 1st order RL & RC networks 8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses 9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit. 10. Determination of open circuit (Z) and short circuit (Y) parameters 11. Determination of hybrid (H) and transmission (ABCD) parameters 12. To measure two port parameters of a twin-T network and study its frequency response 			
Course outcomes:			
On completion of the course student will be able to			
<ol style="list-style-type: none"> 1. Verify Kirchoff's laws and network theorems. 2. Measure time constants of RL & RC circuits. 3. Analyze behavior of RLC circuit for different cases. 4. Design resonant circuit for given specifications. 5. Characterize and model the network in terms of all network parameters 			
Hardware Requirements: Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components			
Software requirements: Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications			
References:			
<ol style="list-style-type: none"> 1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019. 2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020. 			

ELECTRICAL CIRCUITS LAB			
Subject Code	23EEEEEL2090	IA Marks	30
Number of Lecture Hours/Week	3P	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.			
List of Experiments(Any ten experiments must be conducted)			
<ol style="list-style-type: none"> 1. Verification of Kirchhoff's circuit laws. 2. Verification of node and mesh analysis. 3. Verification of network reduction techniques. 4. Determination of cold and hot resistance of an electric lamp 5. Determination of Parameters of a choke coil. 6. Determination of self, mutual inductances, and coefficient of coupling 7. Series and parallel resonance 8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits 9. Verification of Superposition theorem 10. Verification of Thevenin's and Norton's Theorems 11. Verification of Maximum power transfer theorem 12. Verification of Compensation theorem 13. Verification of Reciprocity and Millman's Theorems 			
COURSE OUTCOMES:			
On completion of the course student will be able to:			
<ol style="list-style-type: none"> 1. Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams. 2. Apply various theorems to compare practical results obtained with theoretical calculations. 3. Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil. 4. Analyse different circuit characteristics with the help of fundamental laws and various configurations. 5. Create locus diagrams of RL, RC series circuits and examine series and parallel resonance. 			

ENGINEERING MECHANICS & BUILDING PRACTICES LAB			
Subject Code	23CECEL2090	IA Marks	30M
Number of Periods/Week	03	Exam Marks	70M
Total Number of Practice Hours	36	Exam Hours	3
Credits – 1.5			
List of Experiments (Any 10 experiments must be conducted)			
<ol style="list-style-type: none"> 1. To study various types of tools used in construction. 2. Forces in Pin Jointed Trusses 3. Experimental Proof of Lami's Theorem 4. Verification of Law of Parallelogram of Forces. 5. Determination of Center of Gravity of different shaped Plane Lamina. 6. Determination of coefficient of Static and Rolling Friction. 7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever 8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc. 9. Field-Visit to understand the Quality Testing - report. 10. Safety Practices in Construction industry 11. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV 12. Study of Plumbing in buildings. 			

ENGINEERING MECHANICS LAB			
Subject Code	23MEMEL2090	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours		Exam Hours	100
Credits –1.5			
Course Objectives:			
The students completing the course are expected to:			
<ol style="list-style-type: none"> 1. Verify the Law of Parallelogram and Triangle of Forces. 2. Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina. 3. Analyze the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel. 			
List of Experiments:			
<ol style="list-style-type: none"> 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. 			
*Students have to perform any 10 of the following Experiments:			
Course outcomes:			
<ol style="list-style-type: none"> 1. Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. 2. Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. 3. Determine the Centre of gravity and Moment of Inertia of different configurations. 4. Verify the equilibrium conditions of a rigid body under the action of different force systems. 			

HEALTH AND WELLNESS, YOGA AND SPORTS			
Subject Code	23CMPES1100/2100	IA Marks	
Number of Practica Hours/Week	01	Exam Marks	100
Total Number of Lecture Hours	00	Exam Hours	03
Credits – 0.5			
Course Objectives:			
The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.			
Course Outcomes: After completion of the course the student will be able to			
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.			
CO2: Demonstrate an understanding of health-related fitness components. CO3: Compare and contrast various activities that help enhance their health. CO4: Assess current personal fitness levels.			
CO5: Develop Positive Personality			
Unit -1			
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.			Hours – 10
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 -2			
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.			Hours – 8
Activities:			
Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar			
Unit – 3			
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.			Hours – 10
Activities:			
i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics			
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.			

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. 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, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on this subject.

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE			
Subject Code	23CMNSNS1100/2100	IA Marks	00
Number of Practical Hours/Week	01	Exam Marks	100
Total Number of Lecture Hours	00	Exam Hours	03
Credits – 0.5			
<p>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.</p> <p>Course Outcomes: After completion of the course the students will be</p> <p>CO1: Understand the importance of discipline, character and service motto .</p> <p>CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.</p> <p>CO3: Explore human relationships by analyzing social problems.</p> <p>CO4: Determine to extend their help for the fellow beings and downtrodden people.</p> <p>CO5: Develop leadership skills and civic responsibilities.</p>			
Unit -1			
<p>Orientation General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.</p> <p>Activities:</p> <ol style="list-style-type: none"> i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc. iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc. iv) Conducting talent show in singing patriotic songs-paintings- any other contribution. 			Hours – 10
Unit -2 Community & Care Activities			
<ol style="list-style-type: none"> 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. 			Hours – 8
Unit – 3 Community Services			
<p>Activities:</p> <ol style="list-style-type: none"> i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts- etc. 			Hours – 10
<ol style="list-style-type: none"> i) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS, ii) Conducting consumer Awareness. Explaining various legal provisions etc. iii) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education. iv) Any other programmes in collaboration with local charities, NGOs etc. 			

Reference Books:

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

General Guidelines:

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

Evaluation Guidelines:

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



SITE 23-II YEAR COURSE STRUCTURE & SYLLABUS

B.Tech. II Year III Semester

S.No.	Course			L	T	P	C
	Category	Code	Title				
1	Basic Science	23MEMAT3010	Numerical Methods and Transform Techniques	3	0	0	3
2	HSMC	23MEMST3020	Universal Human Values– Understanding Harmony & Ethical Human Conduct	2	1	0	3
3	Engineering Science	23MEMET3030	Thermodynamics	2	0	0	2
4	Professional Core	23MEMET3040	Mechanics of Solids	3	0	0	3
5		23MEMET3050	Material Science and Metallurgy	3	0	0	3
6		23MEMEL3060	Mechanics of Solids and Materials Science Lab	0	0	3	1.5
7		23MEMEL3070	Computer-aided Machine Drawing	0	0	3	1.5
8	Engineering Science	23MECSL3080	Python programming Lab	0	0	2	1.0
9	Skill Enhancement Course	23MEXXS3090	Embedded Systems and IoT	0	1	2	2
10	Audit Course	23MECHN3100	Environmental Science	2	0	0	-
Total				15	02	10	20

B.Tech. II Year IV Semester

S.No.	Course			L	T	P	C
	Category	Code	Title				
1	Management Course- I	23MEMST4010	Industrial Management	2	0	0	2
2	Basic Science	23MEMAT4020	Complex Variables, Statistical Methods	3	0	0	3
3	Professional Core	23MEMET4030	Manufacturing processes	3	0	0	3
4		23MEMET4040	Fluid Mechanics & Hydraulic Machines	3	0	0	3
5		23MEMET4050	Theory of Machines	3	0	0	3
6		23MEMEL4060	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
7		23MEMEL4070	Manufacturing processes Lab	0	0	3	1.5
8	Skill Enhancement Course	23MEAHS4080	Soft Skills	0	1	2	2
9	Engineering Science	23MEMST4090	Design Thinking & Innovation	1	0	2	2
Total				15	01	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

NUMERICAL METHODS AND TRANSFORM TECHNIQUES			
Subject Code	23MEMAT3010	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives:			
1.	To elucidate the different numerical methods to solve nonlinear algebraic equations		
2.	To disseminate the use of different numerical techniques for carrying out numerical integration.		
3.	To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications		
4.			
5.			
Unit I- Iterative Methods:			
Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (Simultaneous Equations)			10 Hrs
Interpolation: Newton’s forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange’s interpolation formula			
Unit II- Numerical integration, Solution of ordinary differential equations with initial conditions			
Trapezoidal rule– Simpson’s 1/3rd and 3/8th rule– Solution of initial value problems by Taylor’s series– Picard’s method of successive approximations– Euler’s method –Runge- Kutta method (second and fourth order) – Milne’s Predictor and Corrector Method.			10 Hrs
Unit III - Laplace Transforms			
Definition of Laplace transform - Laplace transforms of standard functions – Properties of Laplace Transforms – Shifting theorems–Transforms of derivatives and integrals – Unit step function – Dirac’s delta function – Inverse Laplace transforms – Convolution theorem (without proof).			10 Hrs
Applications: Solving ordinary differential equations (initial value problems) and integral differential equations using Laplace transforms			
Unit IV- Fourier series:			
Introduction– Periodic functions – Fourier series of periodic function –Dirichlet’s conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.			08 Hrs
Unit V- Fourier Transforms			

Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Infinite Fourier transforms – Sine and cosine transforms – Properties– Inverse transforms – Convolution theorem (without proof) – Finite Fourier transforms.		10 Hrs
Course Outcome:		BTL
CO1	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton’s forward & backward interpolation and Lagrange’s formulae for equal and unequal intervals	L3
CO2	Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations	L3
CO3	Apply the Laplace transform for solving differential equations	L3
CO4	Find or compute the Fourier series of periodic signals	L3
CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms	L3
Question Paper Pattern:		
<p>15. Question paper consists of 6 questions and all questions are compulsory.</p> <p>16. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.</p> <p>17. There shall be 2 short answer questions from each unit.</p> <p>18. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.</p> <p>19. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question.</p>		
Textbooks:		
<p>1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.</p> <p>2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education</p>		
Reference Books:		
<p>1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.</p> <p>2. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.</p> <p>3. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.</p> <p>4. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.</p>		

Universal Human Values– Understanding Harmony& Ethical Human Conduct			
Subject Code	23MEMST3020	IA Marks	30
Number of Lecture Hours/ Week	02	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives:			
1.	To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.		
2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.		
3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.		
4.			
5.			
Unit I- Introduction to Value Education (6 lectures and 3 tutorials for practice session)			
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Lecture 2: Understanding Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance			10 Hrs
Unit II- Harmony in the Human Being (6 lectures and 3 tutorials for practice session)			
Lecture 7: Understanding Human being as the Co-existence of the self and the body. Lecture 8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture 12: Programme to ensure self-regulation and Health			08 Hrs

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body		
Unit III - Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)		
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society Lecture 18: Vision for the Universal Human Order Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal		10 Hrs
Unit IV- Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)		
Lecture 19: Understanding Harmony in the Nature Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture 22: The Holistic Perception of Harmony in Existence Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.		10 Hrs
Unit V- Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)		
Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture 26: Competence in Professional Ethics Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order		10 Hrs
Course Outcome:		
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	L1, L2
CO2	Identify one's self, and one's surroundings (family, society nature)	L1, L2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	Relate human values with human relationship and human society.	L4
CO5	Justify the need for universal human values and harmonious existence	L5

CO6	Develop as socially and ecologically responsible engineers.	L3, L6
<p>Question Paper Pattern:</p> <ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. The Textbook R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034 47-1 2. The Teacher's Manual R R Gaur, R Asthana, G P Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews 7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal 9. Rediscovering India - by Dharampal 10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi 11. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English) 		
<p>Web Resources:</p> <ol style="list-style-type: none"> 1. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20 Handout%20I ntroduction%20to%20Value%20Education.pdf 2. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%202- 		

Harmony%20in%20the%20Human%20Being.pdf

3. [https://fdp-si.aicte-india.org/UHVII% 20Class%20Notes%20&%20Handouts/UHV%20Handout%203Harmony%20in%20the%20Family.pdf](https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203Harmony%20in%20the%20Family.pdf)
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3S2%20Respect%20July%2023.pdf>
5. [https://fdp-si.aicte-india.org/UHVII% 20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf](https://fdp-si.aicte-india.org/UHVII%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%20FDPSI% 20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf](https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf)
7. <https://fdp-si.aicteindia.Org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

Thermodynamics			
Subject Code	23MEMET3030	IA Marks	30
Number of Lecture Hours/ Week	02	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -02			
Course Objectives:			
1.	Familiarize concepts of heat, work, energy and governing rules for conversion of one form to other.		
2.	Explain relationships between properties of matter and basic laws of Thermodynamics.		
3.	Teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.		
4.	Introduce the concept of available energy for maximum work conversion.		
5.	Provide fundamental concepts of Refrigeration and Psychrometry.		
Unit I			
Introduction: Basic Concepts : System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility			10 Hrs
Unit II			
Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroeth Law of Thermodynamics – PMM-I, Joule’s Experiment – First law of Thermodynamics and applications. Limitations of the First Law – Enthalpy, Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.			08 Hrs
Unit III			
Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot’s principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.			10 Hrs
Unit IV			
Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase			10 Hrs

Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.		
Unit V		
Introduction to Refrigeration: working of Air, Vapour compression, VCR system Components, COP Refrigerants. Introduction to Air Conditioning: Psychrometric properties & processes – characterization of sensible and latent heat loads – load concepts of SHF Requirements of human comfort and concept of effective temperature-comfort chart – comfort air conditioning, and load calculations..		10 Hrs
Course Outcome:		BTL
CO1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.	L3
CO2	Apply the Zeroth and First Law of Thermodynamics.	L3
CO3	Understand Second Law of Thermodynamics.	L2
CO4	Analyze the Mollier charts, T-S and h-s diagrams, Steam calorimetry, Phase Transformations	L4
CO5	Evaluate the COP of refrigerating systems and properties, processes of psychrometry and sensible and latent heat loads.	L5
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. P.K.Nag, Engineering Thermodynamics, 5/e, Tata McGraw Hill, 2013. 2. Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 7/e, Wiley, 2009. 		
Reference Books:		
<ol style="list-style-type: none"> 1. J.B. Jones, and R.E. Dugan, Engineering Thermodynamics, 1/e, Prentice Hall, 1995. 2. Y.A.Cengel & M.A.Boles, Thermodynamics – An Engineering Approach, 7/e, McGraw Hill, 2010. 3. P.Chattopadhyay, Engineering Thermodynamics, 1/e, Oxford University Press, 2011. 4. CP Arora, Refrigeration and Air-conditioning, 4/e, McGraw Hill, 2021. 		

Web Resources:

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

Mechanics of Solids

Subject Code	23MEMET3040	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03

Credits -03**Course Objectives:**

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

Unit I- SIMPLE STRESSES & STRAINS

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

10 Hrs

Unit II- SHEAR FORCE AND BENDING MOMENT

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams

08 Hrs

– Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam		
Unit III - FLEXURAL STRESSES & SHEAR STRESSES:		
FLEXURAL STRESSES: Theory of simple bending, Derivation of bending equation, Determination of bending stresses – section modulus of rectangular, circular, I and T sections– Design of simple beam sections.		10 Hrs
SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I and T sections.		
Unit IV- DEFLECTION OF BEAMS & TORSION		
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.		10 Hrs
TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.		
Unit V- THIN AND THICK CYLINDERS & COLUMNS:		
THIN AND THICK CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells. Wire wound thin cylinders. Lamé’s equation – cylinders subjected to inside & outside pressures – compound cylinders.		10 Hrs
COLUMNS: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler’s Formula, Rankine’s Formula		
Course Outcome:		BTL
CO1	Learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components	L1
CO2	Analyse beams and draw correct and complete shear and bending moment diagrams for beams.	L4
CO3	Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, and moments.	L3
CO4	Model & Analyze the behavior of basic structural members subjected to various	L4

	loads.	
CO5	Design and analysis of Industrial components like pressure vessels.	L6
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. GH Ryder, Strength of materials, Palgrave Macmillan publishers India Ltd, 1961 2. B.C. Punmia, Strength of materials, 10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018 		
Reference Books:		
<ol style="list-style-type: none"> 1. Gere & Timoshenko, Mechanics of materials, 2/e, CBS publications, 2004. 2. U.C.Jindal, Strength of Materials, 2/e, Pearson Education, 2017. 3. Timoshenko, Strength of Materials Part – I& II, 3/e, CBS Publishers, 2004. 4. Andrew Pytel and Ferdinand L. Singer, Strength of Materials, 4/e, Longman Publications, 1990. 5. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015. 		
Web Resources:		
<ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc19_ce18/preview. 2. https://youtube/iY_ypsychVNY?si=310htc4ksTQJ8Fv6. 3. https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s 4. https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204 5. https://www.coursera.org/learn/mechanics-1 6. https://www.edx.org/learn/engineering/massachusetts-institute-of-technology/mechanical-behavior-of-materials-part-1-linear-elastic-behavior 7. https://archive.nptel.ac.in/courses/112/107/112107146/ 		

Material Science and Metallurgy			
Subject Code	23MEMET3050	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives:			
1.	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.		
2.	Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains		
3.	Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.		
4.	Grasp the methods of making of metal powders and applications of powder metallurgy		
5.	Comprehend the properties and applications of ceramic, composites and other advanced methods		
Unit I			
<p>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's rules, intermediate alloy phases, and electron compounds</p> <p>Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe₃C.</p>			10 Hrs
Unit II			
<p>Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey castiron, Spheriodal graphite castiron, Alloycastiron. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.</p> <p>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</p>			08 Hrs

alloys.		
Unit III		
Heat treatment of Steels: Effect of alloying elements on Fe-Fe ₃ C system, annealing, normalizing, hardening, TTT diagrams, tempering, harden ability, surface – hardening methods, age hardening treatment, Cryogenic treatment.		10 Hrs
Unit IV		
Powder Metallurgy: Basic processes- Methods of producing metal powders- milling atomization- Granulation-Reduction-Electrolytic Deposition. Compacting methods – Sintering - Methods of manufacturing sintered parts. Secondary operations, Applications of powder metallurgical products.		10 Hrs
Unit V		
Ceramic and Advanced materials: Crystalline ceramics, glasses, cermets, abrasive materials, Classification of composites, manufacturing methods, particle reinforced composites, fiber reinforced composites, PMC, MMC, CMC and CCCs. Introduction to Nano materials and smart materials.		10 Hrs
Course Outcome:		BTL
CO1	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.	L2
CO2	Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains.	L1
CO3	Understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.	L2
CO4	Grasp the methods of making of metal powders and applications of powder metallurgy.	L3
CO5	Comprehend the properties and applications of ceramic, composites and other advanced methods.	L4
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
1. S.H.Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997.		

2. Donald R. Askeland, Essentials of Materials science and Engineering, 4/e, CL Engineering publications, 2018.

Reference Books:

1. Dr. V.D. Kodgire, Material Science and Metallurgy, 3rd/e, Everest Publishing House, 2017.
2. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004
3. William D. Callister Jr, Materials Science and Engineering: An Introduction, 8/e, John Wiley and Sons, 2009.
4. George E. Dieter, Mechanical Metallurgy, 3/e, McGraw-Hill, 2013.
5. Yip-Wah Chung, Introduction to Material Science and Engineering, 2/e, CRC Press, 2022.
6. A V K Suryanarayana, Material Science and Metallurgy, B S Publications, 2014.
7. U. C. Jindal, Material Science and Metallurgy, 1/e, Pearson Publications, 2011.

Web Resources:

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

MECHANICS OF SOLIDS & MATERIALS SCIENCE LAB			
Subject Code	23MEMEL3060	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
1	Evaluate the values of yield stress, ultimate stress and bending stress of the given specimen under tension test and bending test		
2	Conduct the torsion test to determine the modulus of rigidity of given specimen.		
3	Justify the Rockwell hardness test over with Brinell hardness and measure the hardness of the given specimen.		
4	Examine the stiffness of the open coil and closed coil spring and grade them.		
5	Analyze the microstructure and characteristics of ferrous and non-ferrous alloy specimens.		
List of Experiments (Any six experiments must be conducted)			
NOTE: Any 6 experiments from each section A and B.			
A) MECHANICS OF SOLIDS LAB:			
1. Tensile test			
2. Bending test on			
a) Simply supported beam			
b) Cantilever beam			
3. Torsion test			
4. Hardness test			
a) Brinell's hardness test			
b) Rockwell hardness test			
c) Vickers hardness test			
5. Test on springs			
6. Impact test			
a) Charpy test			
b) Izod test			
7. Punch shear test			
8. Liquid penetration test			
B) MATERIAL SCIENCE LAB:			
1. Preparation and study of the Microstructure of pure metals.			
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, and High carbon steels.			
3. Study of the 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.			
Course Outcomes: After completion of this course, the student will be able to:			BTL
CO 1	Understand the stress strain behavior of different materials.		L2
CO 2	Evaluate the hardness of different materials.		L4

CO 3	Explain the relation between elastic constants and hardness of materials.	L1
CO 4	Identify various microstructures of steels and cast irons.	L3
CO 5	Evaluate hardness of treated and untreated steels.	L4

Reference Books:

1. To investigate the principal stresses σ_a and σ_b at any given point of a structural element or machine component when it is in a state of plane stress.
(<https://virtuallabs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html>)
2. To find the impact resistance of mild steel and cast iron.
(<https://smnitk.vlabs.ac.in/exp/izod-impact-test>).
3. To find the impact resistance of mild steel.
(<https://sm-nitk.vlabs.ac.in/exp/charpyimpact-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-hardnesstest>).

Computer-Aided Machine Drawing			
Subject Code	23MEMEL3070	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
1	Introduce conventional representations of material and machine components.		
2	Train to use software for 2D and 3D modeling.		
3	Familiarize with thread profiles, riveted, welded and key joints.		
4	Teach solid modeling of machine parts and their sections.		
5	Explain creation of 2D and 3D assembly drawings and familiarize with limits, fits, and tolerances in mating components		
List of Experiments (Any six experiments must be conducted)			
The following are to be done by any 2D software package			
Conventional representation of materials and components:			
<ul style="list-style-type: none"> • Detachable joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts. • Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints. • Welded joints: Lap joint and T joint with fillet, butt joint with conventions. • Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key. Couplings: rigid – Muff, flange; flexible – bushed pin-type flange coupling, universal coupling, Oldham's' coupling. 			
The following exercises are to be done by any 3D software package:			
Sectional views:			
Creating solid models of complex machine parts and sectional views.			
<ul style="list-style-type: none"> • Assembly drawings:(Any four of the following using solid model software) Lathe tool post, tool head of shaping machine, tail-stock, machine vice, gate valve, carburetor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipevice, clamping device, Geneva cam, universal coupling. • Production drawing: Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances. 			
Course Outcomes: After completion of this course, the student will be able to:			BTL
CO 1	Demonstrate the conventional representations of materials and machine components.		L3
CO 2	Model riveted, welded and key joints using CAD system.		L6
CO 3	Create solid models and sectional views of machine components.		L6
CO 4	Generate solid models of machine parts and assemble them.		L5
CO 5	Translate 3D assemblies into 2D drawings		L6
Textbooks:			
1. Machine Drawing by K.L.Narayana, P.Kannaiah and K.Venkat Reddy, New Age International Publishers, 3/e, 2014			

2. Machine drawing by N.Sideshwar, P. Kannaiah, V.V.S.Sastry, TMH Publishers. 2014.

Reference Books:

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

Python programming Lab			
Subject Code	23MECSL3080	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
1	Fundamental Understanding: Develop a solid foundation in Python programming, covering essential syntax, semantics, and constructs.		
2	Data Manipulation: Equip students with skills to handle and manipulate data using Python libraries like Pandas and NumPy.		
3	Problem-Solving: Enhance problem-solving abilities by implementing various algorithms and data structures in Python.		
4	Software Development: Foster software development skills, including version control, package management, and project documentation.		
5	Advanced Techniques: Introduce advanced Python topics such as web scraping, API interaction, and database management.		
List of Experiments (Any six experiments must be conducted)			
Experiment 1: Introduction to Python			
<ul style="list-style-type: none"> - Objective: Install Python and set up the development environment. - Tasks: <ul style="list-style-type: none"> - Install Python and an IDE (e.g., PyCharm, VSCode, or Jupyter Notebook). - Write and run a simple "Hello, World!" program. - Understand and demonstrate basic Python syntax and semantics. 			
Experiment 2: Basic Python Programming			
<ul style="list-style-type: none"> - Objective: Learn basic programming constructs in Python. - Tasks: <ul style="list-style-type: none"> - Create programs using variables, data types, and operators. - Implement basic input and output functions. - Write programs using control structures (if statements, for loops, while loops). 			
Experiment 3: Functions and Modules			
<ul style="list-style-type: none"> - Objective: Understand functions and module usage in Python. - Tasks: <ul style="list-style-type: none"> - Define and call functions with different types of arguments and return values. - Explore and use built-in Python modules. - Write a script that imports and utilizes at least two different standard library modules. 			
Experiment 4: Lists and Tuples			
<ul style="list-style-type: none"> - Objective: Work with Python lists and tuples. - Tasks: <ul style="list-style-type: none"> - Create, modify, and iterate over lists and tuples. - Perform list comprehensions to create new lists. - Demonstrate the immutability of tuples. 			

Experiment 5: Dictionaries and Sets

- Objective: Explore dictionaries and sets in Python.
- Tasks:
 - Create and manipulate dictionaries.
 - Use dictionary comprehension
 - Create and perform operations on sets.

Experiment 6: Strings and File I/O

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

Experiment 7: Error Handling and Exceptions

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

Experiment 8: Object-Oriented Programming (OOP)

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

Experiment 9: Libraries and Packages

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

Experiment 10: Working with Data

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

Experiment 11: Web Scraping and APIs

- Objective: Extract data from the web and interact with APIs.
- Tasks:

- Access and parse data from RESTful APIs.
- Process and analyze JSON data from APIs.

Experiment 12: Databases

- **Objective:** Work with databases in Python.
- **Tasks:**
 - Connect to a database using SQLite and SQLAlchemy.
 - Perform CRUD operations on the database.
 - Write queries to manage and retrieve data.

Course Outcomes: After completion of this course, the student will be able to:

CO 1	
CO 2	
CO 3	
CO 4	
CO 5	

Textbooks:

Reference Books:

1. https://www.w3schools.com/python/python_intro.asp
2. <https://www.youtube.com/watch?v=eWRfhZUzrAc>
3. https://onlinecourses.nptel.ac.in/noc20_cs83/preview
4. <https://www.edx.org/learn/python>
5. Virtual Labs - <https://python-iitk.vlabs.ac.in/>
6. Virtual Labs - <https://virtual-labs.github.io/exp-arithmetic-operations-iitk/>
7. Virtual Labs - <https://cse02-iiith.vlabs.ac.in/>
8. https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/Python%20Lab%20Manual.pdf

Embedded Systems and IoT			
Subject Code	23MEXXS3090	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-02			
Course Objectives:			
1	To comprehend Microcontroller-Transducers Interface techniques		
2	To establish Serial Communication link with Arduino		
3	To analyse basics of SPI interface		
4	To interface Stepper Motor with Arduino		
5	To analyse Accelerometer interface techniques		
6	To introduce the Raspberry PI platform, that is widely used in IoT applications		
7	To introduce the implementation of distance sensor on IoT devices.		
List of Experiments (Any six experiments must be conducted)			
Embedded Systems Experiments: (Any 5 experiments from the following)			
<ol style="list-style-type: none"> 1. Measure Analog signal from Temperature Sensor. 2. Generate PWM output. 3. Drive single character generation on Hyper Terminal. 4. Drive a given string on Hyper Terminal. 5. Full duplex Link establishment using Hyper terminal. 6. Drive a given value on a 8 bit DAC consisting of SPI. 7. Drive Stepper motor using Analog GPIOs. 8. Drive Accelerometer and Display the readings on Hyper Terminal. 			
COMPONENTS/ BOARDS:			
<ol style="list-style-type: none"> 1. Arduino Duemilanove Board 2. Arduino Software IDE. 			
Internet of Things Experiments: (Any 5 experiments from the following)			
<ol style="list-style-type: none"> 1. Getting started with Raspberry Pi, Install Raspian on your SD card. 2. Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device. 3. Using Raspberry pi a. Calculate the distance using distance sensor. b. Basic LED functionality. 4. Raspberry Pi interact with online services using public APIs and SDKs. 5. Study and Install IDE of Arduino and different types of Arduinos. 6. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi. 7. Calculate the distance using distance sensor Using Arduino. 8. Basic LED functionality Using Arduino. 9. Calculate temperature using temperature sensor Using Arduino. 10. Calculate the distance using distance sensor Using Node MCU. 11. Basic LED functionality Using Node MCU. 			
Course Outcomes: After completion of this course, the student will be able to:			BTL

CO 1	Comprehend Microcontroller-Transducers Interface techniques.	L4
CO 2	Establish Serial Communication link with Arduino	L6
CO 3	Analyse basics of SPI interface	L4
CO 4	Understand the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor.	L2
CO 5	Realize the revolution of internet in mobile devices, cloud and sensor networks	L3

CO PO Mapping :

Textbooks:

1. Arsheep Bahga & Vijay Madiseti, Internet of Things - A Hands-on Approach, 1/e, Orient Blackswan Private Limited - New Delhi, 2015.
2. Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,.

Reference Books:

1. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
3. <https://archive.nptel.ac.in/courses/108/105/108105057/>
4. [https://www.edx.org/learn/embedded-systems/the-university-of-texas-at-austinembedded-systems-shape-the-world-microcontroller-input-output?index=product & objectID=course-785cf551-7f66-4350-b736-64a93427b4db & webview=false & campaign=Embedded+Systems+-+Shape+The+World%3A+Microcontroller+Input%2FOutput&source= edX& product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fembedded-systems](https://www.edx.org/learn/embedded-systems/the-university-of-texas-at-austinembedded-systems-shape-the-world-microcontroller-input-output?index=product&objectID=course-785cf551-7f66-4350-b736-64a93427b4db&webview=false&campaign=Embedded+Systems+-+Shape+The+World%3A+Microcontroller+Input%2FOutput&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fembedded-systems)
5. https://www.edx.org/learn/iot-internet-of-things/universitat-politecnica-de-valencia-introduction-to-the-internet-of-things?index=product&queryID=e1322674dcb3d246be981d0669265399&position=4&linked_from=autocomplete&c=autocomplete
6. https://www.edx.org/learn/iot-internet-of-things/curtin-university-iot-sensorsand-devices?index=product&queryID=94ff5bcb80b8e4f427a0985bb2a5e07f&position=3 & results_level=first-level-results&term=IOT&objectID=course-967eee29-87e8-4f2d-9257a1b38ec07e85&campaign=IoT+Sensors+and+Devices&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch
7. Virtual Labs - <http://vlabs.iitkgp.ac.in/rtes/>
8. Virtual Labs - <https://cse02-iiith.vlabs.ac.in/>
9. Virtual Labs - <https://iotvirtuallab.github.io/vlab/Experiments/index.html>

Environmental Science			
Subject Code	23CMCEN3090	IA Marks	30
Number of Lecture Hours/ Week	02	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -00			
Course Objectives:			
1.	To make the students to get awareness on environment		
2.	To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life		
3.	To save earth from the inventions by the engineers.		
4.	To understand pollution control equipment's		
5.	To make the students to get awareness on social issues.		
Unit I			
<p>Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance– Need for Public Awareness.</p> <p>Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people –Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams–benefits and problems – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, – Energy resources</p>			08 Hrs
Unit II			
<p>Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:</p> <ol style="list-style-type: none"> a. Forest ecosystem. b. Grass land ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) <p>Biodiversity and Its Conservation: Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels–India as a mega-</p>			08 Hrs

diversity nation–Hot-sports of biodiversity–Threats to biodiversity: habitat loss, poaching of wild life, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.		
Unit III		
Environmental Pollution: Definition, Cause, effects and control measures of: <ul style="list-style-type: none"> a. Air Pollution. b. Water pollution c. Soil pollution d. Noise pollution e. Thermal pollution f. Nuclear hazards Solid Waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution – Pollution case studies		08 Hrs
Unit IV		
Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, – 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– 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.		08 Hrs
Unit V		
Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programs. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies. Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.		08 Hrs
Course Outcome:		BTL
CO1	Grasp multi-disciplinary nature of environmental studies and various renewable and non-renewable resources.	L2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	L2

CO3	Understand various causes of pollution and solid waste management and Related preventive measures.	L2
CO4	Understand the rainwater harvesting, watershed management, ozone Layer depletion and waste land reclamation.	L2
CO5	Illustrate the causes of population explosion, value education and welfare Programmes.	L3

Question Paper Pattern:

1. Question paper consists of 6 questions and all questions are compulsory.
2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.
3. There shall be 2 short answer questions from each unit.
4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question.

Textbooks:

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

Reference Books:

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

Web Resources:

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

INDUSTRIAL MANAGEMENT			
Subject Code	23MEMST4010	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -02			
Course Objectives: The objectives of the course are to			
1.	Introduce the scope and role of industrial engineering and the techniques for optimal design of layouts		
2.	Illustrate how work study is used to improve productivity		
3.	Explain TQM and quality control techniques		
4.	Introduce financial management aspects and		
5.	Discuss human resource management and value analysis.		
Unit I			
<p>INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.</p> <p>PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and break down maintenance.</p>			10 Hrs
Unit II			
<p>WORK STUDY: Importance, types of production, applications, work study, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs.</p>			08 Hrs
Unit III			
<p>STATISTICAL QUALITY CONTROL: Quality control, Queuing assurance and its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – X and R –charts X and S charts and their applications, numerical examples.</p> <p>TOTALQUALITYMANAGEMENT: zero defect concept, quality circles,</p>			10 Hrs

implementation, applications, ISO quality systems. Six Sigma–definition, basic concepts		
Unit IV		
FINANCIAL MANAGEMENT: Scope and nature of financial management, Sources of finance, Ratio analysis, Management of working capital, estimation of working capital requirements, stock management, Cost accounting and control, budget and budgetary control, Capital budgeting – Nature of Investment Decisions – Investment Evaluation criteria- NPV, IRR, PI, Payback Period, and ARR, numerical problems.		10 Hrs
Unit V		
HUMAN RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Jobevaluation, its importance and types, meritrating, quantitative methods, wage incentive plans, and types.		10 Hrs
VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.		
Course Outcome:		BTL
CO1	Learn about how to design the optimal layout	L1
CO2	Demonstrate work study methods	L3
CO3	Explain Quality Control techniques	L2
CO4	Discuss the financial management aspects	L2
CO5	Understand the human resource management methods.	L2
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. O.P Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd, 2018. 2. Mart and Telsang, Industrial Engineering and Production Management,S.Chand&Company Ltd. NewDelhi, 2006. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Bhattacharya DK, Industrial Management,S.Chand, publishers, 2010. 2. J.G Monks, Operations Management,3/e, McGraw Hill Publishers1987. 3. T.R. Banga, S.C.Sharma, N. K. Agarwal, Industrial Engineering and Management Science, 		

Khanna Publishers, 2008.

4. Koontz O' Donnell, Principles of Management, 4/e, McGraw Hill Publishers, 1968.
5. R.C. Gupta, Statistical Quality Control, Khanna Publishers, 1998.
6. NVS Raju, Industrial Engineering and Management, 1/e, Cengage India Private Limited, 2013.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc21_me15/preview
2. https://onlinecourses.nptel.ac.in/noc20_mg43/preview
3. <https://www.edx.org/learn/industrial-engineering>
4. <https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi>
5. https://youtube.com/playlist?list=PLbjTnjt5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG69hS3v2ll

COMPLEX VARIABLES, STATISTICAL METHODS			
Subject Code	23MEMAT4020	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives:			
1.	To familiarize the complex variables.		
2.	To familiarize the students with the foundations of probability and statistical methods.		
3.	To equip the students to solve application problems in their disciplines.		
4.			
5.			
Unit I-Functions of a complex variable and Complex integration:			
Introduction–Continuity –Differentiability–Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates–Harmonic and conjugate harmonic functions– Milne– Thompson method. Complex integration: Line integral –Cauchy’s integral theorem –Cauchy’s integral formula–Generalized integral formula (all without proofs) and problems on above theorems.			10 Hrs
Unit II -Series expansions and Residue Theorem:			
Radius of convergence – Expansion in Taylor’s series, Maclaurin’s series and Laurent series. Types of Singularities: Isolated – Essential –Pole of order m - Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta \text{ and } \int_{-\infty}^{\infty} f(x) dx$			08 Hrs
Unit III -Probability and Distributions			
Review of probability and Baye’s theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.			10 Hrs
Unit IV- Sampling Theory:			
Introduction – Population and Samples – Sampling distribution of Means and			10

Variance (definition only)–Central limit theorem (without proof)–Representation of the normal theory distributions		Hrs
Unit V- Tests of Hypothesis:		
Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means –Tests on proportions using Large and Small samples (Students t, χ^2 , F-tests)		10 Hrs
Course Outcome:		BTL
CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic	L3
CO2	Make use of the Cauchy residue theorem to evaluate certain integrals	L3
CO3	Infer the statistical inferential methods based on small and large sampling tests	L4
CO4	Find the differentiation and integration of complex functions used in engineering problems	L5
CO5	Design the components of a classical hypothesis test	L6
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers. 2. Miller and Freund's, Probability and Statistics for Engineers,7/e,Pearson,2008. 		
Reference Books:		
<ol style="list-style-type: none"> 1. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 9/e,Mc-GrawHill,2013. 2. S.C.Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics,11/e,Sultan Chand & Sons Publications,2012. 3. Jay I. Devore, Probability and Statistics for Engineering and the Sciences,8/e, Cengage. 4. ShronL. Myers, KeyingYe, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8/e,Pearson 2007. 5. Sheldon, M.Ross, Introduction to probability and statistics Engineers and the Scientists, 4/e, Academic Foundation,2011. 		

Web Resources:

- <https://archive.nptel.ac.in/courses/111/103/111103070/>
- <https://biet.ac.in/pdfs/PROBABILITY%20AND%20STATISTICS%20&%20COMPLEX%20VARIABLES.pdf>
- <https://archive.nptel.ac.in/courses/111/105/111105090/>
- <http://acl.digimat.in/nptel/courses/video/111102160/L23.html>
- https://onlinecourses.nptel.ac.in/noc21_ma57/preview

MANUFACTURING PROCESSES			
Subject Code	23MEMET4030	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives: The objectives of the course are to			
1.	Know the working principle of different metal casting processes and gating system.		
2.	Classify the welding processes, working of different types of welding processes and welding defects.		
3.	Know the nature of plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes.		
4.	Understand the principles of forging, tools and dies, working of forging processes.		
5.	Know about the Additive manufacturing		
Unit I			
<p>Casting: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding, different types of cores , Principles of Gating, Risers, casting design considerations. Methods of melting and types of furnaces, Solidification of castings and casting defects- causes and remedies. Basic principles and Applications of special casting processes - Centrifugal casting, Die casting, Investment casting and shell molding.</p>			10 Hrs
Unit II			
<p>Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG & MIG</p> <p>welding. Electro–slag welding. Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering & Brazing.</p> <p>Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.</p>			08 Hrs
Unit III			
<p>Bulk Forming: Plastic deformation in metals and alloys-recovery, recrystallization and grain growth. Hot working and Cold working-Strain hardening and Annealing. Bulk forming processes: Forging-Types of Forging, forging defects and remedies; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power</p>			10 Hrs

requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.		
Unit IV		
Sheet metal forming-Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools. High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations		10 Hrs
Unit V		
Additive Manufacturing - Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM, and types of materials for AM, VAT photo polymerization AM Processes, Extrusion - Based AM Processes, Powder Bed Fusion AM Processes, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications		10 Hrs
Course Outcome:		BTL
CO1	Design the patterns and core boxes for metal casting processes	L6
CO2	Understand the different welding processes	L2
CO3	Demonstrate the different types of bulk forming processes	L3
CO4	Understand sheet metal forming processes	L2
CO5	Learn about the different types of additive manufacturing processes	L2
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. Kalpakjain S and Steven R Schmid, Manufacturing Processes for Engineering Materials, 5/e, Pearson Publications, 2007. 2. P.N. Rao, Manufacturing Technology -Vol I, 5/e, McGraw Hill Education, 2018. 		
Reference Books:		
<ol style="list-style-type: none"> 1. A.Ghosh & A.K.Malik, Manufacturing Science, East West Press Pvt. Ltd, 2010. 2. Lindberg and Roy, Processes and materials of manufacture, 4/e, Prentice Hall India Learning Private Limited, 1990. 3. R.K. Jain, Production Technology, Khanna Publishers, 2022. 4. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014. 		

5. H.S. Shaun, Manufacturing Processes, 1/e, Pearson Publishers, 2012.
6. WAJ Chapman , Workshop Technology, 5/e, CBS Publishers & Distributors Pvt. Ltd,2001.
7. Hindustan Machine Tools, Production Technology, Tata McGraw Hill Publishers,2017.
8. Ian Gibson, David W Rosen, Brent Stucker., Additive Manufacturing Technologies:3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2/e, Springer, 2015.

Web Resources:

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

FLUID MECHANICS & HYDRAULIC MACHINES			
Subject Code	23MEMET4040	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives: The students completing this course are expected to			
1.	Understand the properties of fluids, manometry, hydrostatic forces acting on different surfaces		
2.	Understand the kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations.		
3.	Understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.		
Unit I			
<p>Fluid statics: Dimensions and units: physical properties of fluids - specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers - Piezometer, U-tube, inverted and differential manometers. Pascal's & hydrostatic laws.</p> <p>Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.</p>			10 Hrs
Unit II			
<p>Fluid Kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flownet, source and sink, double tand vortex flow.</p> <p>Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a streamline, momentum equation and its applications, force on pipe bend.</p> <p>Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel total energy line hydraulic gradient line.</p>			08 Hrs
Unit III			
<p>Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of</p>			10 Hrs

velocity profiles.		
Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Non dimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem.		
Unit IV		
Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.		10 Hrs
Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube-theory-functions and efficiency.		
Unit V		
Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.		10 Hrs
Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH. Reciprocating pumps: Working, Discharge, slip, indicator diagrams.		
Course Outcome:		BTL
CO1	Understand the basic concepts of fluid properties.	L2
CO2	Estimate the mechanics of fluids in static and dynamic conditions.	L5
CO3	Apply the Boundary layer theory, flow separation and dimensional analysis.	L3
CO4	Estimate the hydro dynamic forces of jet on vanes indifferent positions.	L5
CO5	Understand the working Principles and performance evaluation of hydraulic pump and turbines.	L2
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		

Textbooks:

1. Y.A. Cengel, J.M.Cimbala, Fluid Mechanics, Fundamentals and Applications,6/e,McGraw Hill Publications, 2019.
2. Dixon, Fluid Mechanics and Thermodynamics of Turbo machinery, 7/e, Elsevier Publishers, 2014.

Reference Books:

1. P N Modi and S M Seth, Hydraulics & Fluid Mechanics including Hydraulics Machines, Standard Book House, 2017.
2. RK Bansal, Fluid Mechanics and Hydraulic Machines, 10/e, Laxmi Publications (P)Ltd, 2019.
3. Rajput, Fluid Mechanics and Hydraulic Machines, S Chand & Company, 2016.
4. D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, S K Kataria & Sons, 2013.
5. D. Rama Durgaiyah, Fluid Mechanics and Machinery,1/e, New Age International,2002.

Web Resources:

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

THEORY OF MACHINES			
Subject Code	23MEMET4050	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -03			
Course Objectives:			
1.	Introduce various basic mechanisms and their applications.		
2.	Explain importance of degree of freedom.		
3.	Familiarize velocity and acceleration in mechanisms.		
4.	Describe the cams and follower motions.		
5.	Explain the importance of gyroscopic couples.		
6.	Introduce the equation of motion for single degree of freedom system.		
Unit I- Simple Mechanisms			
Simple Mechanisms: Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, mobility – Grashof's law, kinematic inversions of four bar chain and slider crank chains- Limit positions – Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line mechanisms – Universal Joint – Rocker mechanisms.			10 Hrs
Unit II- Plane and motion analysis			
Plane and motion analysis: Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations – kinematic analysis of simple mechanisms – slider crank mechanism dynamics – Coincident points – Coriolis component of acceleration.			08 Hrs
Unit III - Gyroscope & Gear Profile			
Gyroscope: Principle of gyroscope, gyroscopic effect in an aeroplane, ship, car and two wheeler, simple problems Gear Profile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting – helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.			10 Hrs
Unit IV- Balancing of Rotating masses & Cams			
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			10 Hrs

motions – derivatives of follower motions- specified contour cams- circular and tangent cams –pressure angle and undercutting		
Unit V- Vibrations & Turning Moment Diagrams and Flywheels		
<p>Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations- under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility.</p> <p>Turning Moment Diagrams and Flywheels: Turning moment diagrams for steam engine, I.C engine and Multi Cylinder Engine. Crank effort – coefficient of fluctuation of energy, coefficient of fluctuation of speed – Fly Wheel and their design, fly wheels for punching press.</p>		10 Hrs
Course Outcome:		BTL
CO1	Understand different mechanisms and their inversions.	L2
CO2	Calculate velocity and acceleration of different links in a mechanism	L4
CO3	Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.	L3
CO4	Evaluate unbalance mass in rotating machines.	L5
CO5	Analyze free and forced vibrations of single degree freedom systems.	L4
Question Paper Pattern:		
<ol style="list-style-type: none"> 1. Question paper consists of 6 questions and all questions are compulsory. 2. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. 3. There shall be 2 short answer questions from each unit. 4. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them. 5. The questions from 2 to 6, shall be set by covering one unit of the syllabus for each question. 		
Textbooks:		
<ol style="list-style-type: none"> 1. S.S.Rattan, Theory of Machines, 4/e, Tata Mc-Graw Hill, 2014. 2. P.L.Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers, Delhi, 2003. 		
Reference Books:		
<ol style="list-style-type: none"> 1. F. Haidery, Dynamics of Machines, 5/e, NiraliPrakashan, Pune, 2003. 2. J.E.Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014. 3. G.K.Groover, Mechanical Vibrations, 8/e, Nemchand Bros, 2009. 4. Norton, R.L., Design of Machinery – An Introduction to Synthesis and Analysis of Mechanisms and Machines, 2/e, McGraw Hill, New York, 2000. 5. William T. Thomson, Theory of vibration with applications, 4/e, Englewood Cliffs, N.J.: Prentice Hall, 1993. 		

FLUID MECHANICS & HYDRAULIC MACHINES LAB			
Subject Code	23MEMEL4060	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
1	To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps		
2			
3			
4			
5			
List of Experiments(Any six experiments must be conducted)			
<ol style="list-style-type: none"> 1. Impact of jets on Vanes. 2. Performance Test on Pelton Wheel. 3. Performance Test on Francis Turbine. 4. Performance Test on Kaplan Turbine. 5. Performance Test on Single Stage Centrifugal Pump. 6. Performance Test on Multi Stage Centrifugal Pump. 7. Performance Test on Reciprocating Pump. 8. Calibration of Venturimeter. 9. Calibration of Orificemeter. 10. Determination of friction factor for a given pipeline. 11. Determination of loss of head due to sudden contraction in a pipeline. 12. Turbine flow meter. 			
Course Outcomes: After completion of this course, the student will be able to:			BTL
CO 1	Demonstrate the devices used for measuring flow.		L3
CO 2	Compute major losses in pipes.		L5
CO 3	Illustrate the operating parameters of turbines.		L2
CO 4	Explain the working of different types of pumps.		L2
CO 5	Explain the devices used for measuring flow.		L2
Textbooks:			
Reference Books:			
<ol style="list-style-type: none"> 1. To study different patterns of a flow through a pipe and correlate them with the Reynolds number of the flow. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/reynolds/introduction.html) 2. To calculate Total Energy at different points of venture meter. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/introduction.html). 3. To calculate the flow (or point) velocity at center of the given tube using different flow rates. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/pitot/introduction.html) 4. To determine the hydrostatic force on a plane surface under partial submerge and full submerge condition. 			

(<https://me.iitp.ac.in/Virtual-Fluid-Laboratory/cop/introduction.html>).

5. To determine the discharge coefficient of a triangular notch.

(<https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/introduction.html>)

6. To determine the coefficient of impact of jet on vanes.

(<https://fmnitk.vlabs.ac.in/exp/impact-of-jet>).

7. To determine friction in pipes.

(<https://fm-nitk.vlabs.ac.in/exp/friction-inpipes/index.html>).

MANUFACTURING PROCESSES LAB			
Subject Code	23MEMEL4070	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	36	Exam Hours	03
Credits-1.5			
Course Objectives:			
1	Acquire practical knowledge on Metal Casting, Welding, Press Working and Processing of Plastics.		
2			
3			
4			
5			
List of Experiments (Any six experiments must be conducted)			
<ol style="list-style-type: none"> 1. Design and making of pattern <ol style="list-style-type: none"> i. Single piece pattern ii. Split pattern 2. Sand properties testing <ol style="list-style-type: none"> i. Sieve analysis (dry sand) ii. Clay content test iii. Moisture content test iv. Strength test (Compression test & Shear test) v. Permeability test 3. Mould preparation <ol style="list-style-type: none"> i. Straight pipe ii. Bent pipe iii. Dumble iv. Gear blank 4. Gas cutting and welding 5. Manual metal arc welding <ol style="list-style-type: none"> i. Lap joint ii. Butt joint 6. Injection Molding 7. Blow Molding 8. Simple models using sheet metal operations 9. Study of deep drawing and extrusion operations 10. To make weldments using TIG/MIG welding 11. To weld using Spot welding machine 12. To join using Brazing and Soldering 13. To make simple parts on a 3D printing machine 14. Demonstration of metal casting. 			
Course Outcomes: After completion of this course, the student will be able to:			BTL

CO 1	Make moulds for sand casting.	L2
CO 2	Fabricate different types of components using various manufacturing techniques.	L5
CO 3	Adapt unconventional manufacturing methods.	L3
CO 4	Develop Different Weld joints.	L6
CO 5	Explain different types of 3d Printing techniques.	L2

Textbooks:

Reference Books:

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

SOFT SKILLS			
Subject Code	23MEXXS4080	IA Marks	30
Number of Lecture Hours/Week		Exam Marks	70
Total Number of Lecture Hours		Exam Hours	03
Credits-2			
Course Objectives:			
1	To prepare to face global competition for employment and excellence in profession		
2	To help the students understand and build interpersonal and interpersonal skills that will enable them to lead meaningful professional life.		
3			
4			
5			
Unit I- INTRODUCTION			
Introduction- Emergence of life skills, Definition & Meaning, Importance & need, reasons for skill gap, Analysis--Soft Skills vs Hard skills, Linkage between industry and soft skills, Challenges, Personality Developments. Soft Skills, Soft Skills vs English – Improving Techniques.			
Unit II - Intra-Personal:			
Definition-Meaning – Importance-SWOT analysis, Johari windows - Goal Setting- quotient skills - Emotional Intelligence- Attitudinal skills - Right thinking- Problem Solving-Time management, stress management.			
Unit III - Inter-Personal:			
Definition – Meaning – Importance-Communications skills- Team Work, managerial skills -Negotiation skills- Leadership skills, corporate etiquettes.			
Unit IV- Verbal Skills:			
Definition and Meaning-Listening skills, need- types, advantages, Importance-Improving Tips for Listening, Speaking, need- types, advantages, Importance-Improving Tips, Reading- Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance-Improving Tips .			
Unit V- Non Verbal Skills& Interview skills			
Definition and Meaning – Importance- Facial Expressions- Eye Contact – Proxemics- Haptics -Posture, cross cultural body language, body language in interview room, appearance and dress code – Kinetics- Para Language - tone, pitch, pause, neutralization of accent, use of appropriate language, Interview skills, interview methods and questions.			
Course Outcomes: After completion of this course, the student will be able to:			BTL
CO 1	Assimilate and understood the meaning and importance of soft skills and learn how to develop them.		L1
CO 2	Understand the significance of soft skills in the working environment		L2

	for professional excellence.	
CO 3	Prepare to undergo the placement process with confidence and clarity.	L3
CO 4	Ready to face any situation in life and equip themselves to handle them effectively.	L6
CO 5	Understand and learn the importance of etiquette in both professional and personal life	L2

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_hs60/preview
2. <http://www.youtube.com/@softskillsdevelopment6210>
3. https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCyvXh0E_ybOO1_q&si=Fs05Xh8ZrOPsR8F4
4. <https://www.coursera.org/learn/people-soft-skills-assessment?language=English>
5. <https://www.edx.org/learn/soft-skills>

Reference Books:

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

DESIGN THINKING & INNOVATION			
Subject Code	23MEMST4090	IA Marks	30
Number of Lecture Hours/ Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exams Hours	03
Credits -02			
Course Objectives:			
1.	Bring awareness on innovative design and new product development		
2.	Explain the basics of design thinking		
3.	Familiarize the role of reverse engineering in product development		
4.	Train how to identify the needs of society and convert into demand.		
5.	Introduce product planning and product development process.		
Unit I- Introduction to Design Thinking			
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.			10 Hrs
Unit II- Design Thinking Process			
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.			08 Hrs
Unit III - Innovation			
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation			10 Hrs

Unit IV- Product Design		
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.		10 Hrs
Activity: Importance of modeling, how to set specifications, Explaining their own product design.		
Unit V- Design Thinking in Business Processes		
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.		10 Hrs
Activity: How to market our own product, about maintenance, Reliability and plan for startup.		
Course Outcome:		BTL
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment	L4
CO5	Evaluate the value of creativity.	L5
Textbooks:		
<ol style="list-style-type: none"> 1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009. 2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014. 		
Reference Books:		
<ol style="list-style-type: none"> 1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018. 2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018. 3. William lidwell, Kritinaholden, & Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010. 4. Chesbrough.H, The era of open innovation, 2003. 		
Web Resources:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/110/106/110106124/ 2. https://nptel.ac.in/courses/109/104/109104109/ 3. https://swayam.gov.in/nd1_noc19_mg60/preview 4. https://onlinecourses.nptel.ac.in/noc22_de16/preview 		

