Course Structure and Syllabus for

B.Tech.

MECHANICALENGINEERING (ME)

(Applicable for batches admitted from 2023-24)

DepartmentofMechanicalEngineering

DHANEKULA INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous, NAAC Accredited ISO 9001-2015 Certified Institution)

(ApprovedbyAICTE,AffiliatedtoJNTUK, Kakinada)

Ganguru, Vijayawada, AndhraPradesh-521139,INDIA.

www.diet.ac.in

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
Department of Mechanical Engineering
VISION – MISSION – PEOs

Institute Vision	Pioneering Professional Education through Quality
Institute Mission	Providing Quality Education through state-of-art infrastructure, laboratories and committed staff. Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect. Involving faculty members and students in research and development works for betterment of society.
Department Vision	To prepare mechanical engineers with global competency and desire to serve the society.
Department Mission	Transforming students as Mechanical Engineers with professional attitudes, industrial adoptability, and leadership abilities. Providing Quality Education with state-of-art facilities. Inculcating ethical values, ability to lifelong learning and social responsibilities.
Program Educational Objectives(PEOs)	Graduates of Mechanical Engineering will be able PEO1: To pursue successful careers or higher studies in Mechanical engineering through their solid foundation in mathematics, science, and engineering. PEO2: To analyze and design appropriate solutions for socially relevant problems by using current engineering techniques. PEO3: To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning. PEO4: To grab an opportunity to expand their horizon beyond Mechanical engineering.

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
Department of Mechanical Engineering
POs/PSOs
PROGRAM OUTCOMES(PO's)

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: Apply mechanical engineering knowledge to design and manufacture products relevant to society in an innovative and economical way.

PSO2: Ability to work in multidisciplinary areas such as automation, robotics, design, and simulation software etc.

PSO3: Qualify in national and international level competitive examinations for successful higher studies and employment.

B.Tech (ME)-COURSESTRUCTURE–DIET23
(Applicablefromthe academicyear2023-24onwards)

INDUCTIONPROGRAMME

S.No.	CourseName	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation,Plantation	MC	0-0-6-0
2	CareerCounselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools,etc.	MC	3-0-0-0
4	OrientationonadmittedBranch--correspondinglabs,tools and platforms	EC	2-0-3-0
5	ProficiencyModules&ProductivityTools	ES	2-1-2-0
6	Assessmentonbasicaptitudeandmathematicalskills	MC	2-0-3-0
7	RemedialTraininginFoundationCourses	MC	2-1-2-0
8	HumanValues&ProfessionalEthics	MC	3-0-0-0
9	Communication Skills -- focus on Listening,Speaking,Reading, Writing skills	BS	2-1-2-0
10	ConceptsofProgramming	ES	2-0-2-0

B.Tech.–I Year I Semester

S.No.	Category	Title	L/D	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Chemistry	3	0	0	3
3	BS&H	Linear Algebra & Calculus	3	0	0	3
4	EngineeringScience	Basic Civil & MechanicalEngineering	3	0	0	3
5	Engineering Science	IntroductiontoProgramming	3	0	0	3
6	BS&H	CommunicativeEnglishLab	0	0	2	1
7	BS&H	Engineering ChemistryLab	0	0	2	1
8	Engineering Science	EngineeringWorkshop	0	0	3	1.5
9	EngineeringScience	ComputerProgrammingLab	0	0	3	1.5
10	BS&H	Healthandwellness, YogaandSports	-	-	1	0.5
Total			**14**	**00**	**11**	**19.5**

B.Tech.–I Year II Semester

S.No.	Category	Title	L/D	T	P	Credits
1	BS&H	Engineering Physics	3	0	0	3
2	BS & H	Differential Equations & Vector Calculus	3	0	0	3
3	Engineering Science	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	Engineering Graphics	1	0	4	3
5	Engineering Science	IT Workshop	0	0	2	1
6	Professional Core	Engineering Mechanics	3	0	0	3
7	BS&H	Engineering Physics Lab	0	0	2	1
8	Engineering Science	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	Professional Core	Engineering MechanicsLab	0	0	3	1.5
10		NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total			**13**	**00**	**15**	**20.5**

COMMUNICATIVE ENGLISH

Course Category:	**BS**		Credits: 2		
Course Type:	**Theory**		Lecture-Tutorial-Practice:	2	0	0
Prerequisites	Basic reading skills		Continuous Evaluation		30M
			Semester End Evaluation		70M
			Total Marks		**100M**

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Employ suitable strategies for skimming and scanning to get a general idea of a text and locate specific information	Affective
CO2	Apply grammar rules to form sentences effectively	Affective
CO3	Use correct word forms to communicate effectively with enriching vocabulary	Affective
CO4	Recognize the theme of the given text and summarize and interpret the information	Affective
CO5	Report the information effectively in different formats using good writability	Affective

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3	3	3				3
CO2								3	3	3				3
CO3								3	3	3				3
CO4								3	3	3				3
CO5								3	3	3				3

COURSE CONTENT:

UNIT-1: Lesson: **HUMAN VALUES: Gift of Magi** (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT-2: Lesson: **NATURE: The Brook** by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT-3: Lesson: **BIOGRAPHY: Elon Musk**

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

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

Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs - tenses; subject-verb agreement; Compound words,

Collocations

Vocabulary: Compound words, Collocations

UNIT-4: 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, Resume,E-mailwriting,Coverletter,SOP

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

UNIT-5: Lesson: **MOTIVATION: The Power of Intrapersonal Communication** (An Essay)

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

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension. Writing: Writing structured essays on specific topics.

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

Vocabulary: Technical Jargons

TEXT BOOKS:

1. Pathfinder: Communicative English for Undergraduate Students, 1 st

Edition, Orient Black Swan, 2023 (Units 1,2 & 3)

1. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

REFERENCE BOOKS:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020

   Bailey, Stephen. Academic writing: A Handbook for International   Students. Routledge, 2014.

2. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019

3. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html

4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

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

ENGINEERING CHEMISTRY

Course Category:	BS/ES/PC/PE/OE/MC/SC	Credits : 3		
Course Type:	Theory / Tutorial /Practical	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Basic concepts of chemistry	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

	After Successful Completion of course, the student will be able to:	
CO No	**Course Outcome Description**	**K - Level**
CO1	Select the appropriate method of purification and softening by considering impurities or hardness present in water.	Applying
CO2	Describe the working of primary cells, and secondary cells and recognize control methods for standard types of corrosion.	Applying
CO3	Explain different types of polymers, applications, analysis of solid, liquid, alternative fuels and the calculation of calorific value	Applying
CO4	Elucidate the constituents, classification, functions, properties, and applications of modern engineering materials (composites, refractories, lubricants and building materials)	Applying
CO5	Summarize the concepts, preparation, and applications of colloids, nano metals, metal oxides and their stabilizing agents	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3														
CO2	3														
CO3	3														
CO4	3														
CO5	3														

COURSE CONTENT:

UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment – 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.

UNIT II Electrochemistry and Applications

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

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries-

working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and

working of hydrogen-oxygen Fuel cell.

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

UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth

polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene.

PVC Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers. Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

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

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

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

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

UNIT V Surface Chemistry and Nanomaterials

Surface Chemistry- Introduction, micelle formationColloids-Introduction, synthesis of colloids (Braggs Method), stabilization of colloids by stabilizing agents
Nanometals and Nanometal Oxides-introduction, chemical and biological methods of preparation of nanometals and metal oxides, stabilization of nanomaterials by stabilizing agents Adsorption Isotherm-Freundlich and Longmuir, BET equation (no derivation)
Applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

TEXT BOOKS:
1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.

2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:
1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.

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

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

E-RESOURCES/DIGITAL MATERIAL:
(a) *https://moodle.net*

(b) https://libguides.reading.ac.uk/chemistry/e-resources

LINEAR ALGEBRA AND CALCULUS

Course Category:	BS		Credits: 3			
Course Type:	Theory / Tutorial		Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Basics of Matrices, Differentiation & Integration. Convergence of a Series.		Continuous Evaluation	30M		
			Semester End Evaluation	70M		
			Total Marks	100M		

Course Objectives: To equip the students with standard concepts and tools at an intermediate to advancedlevel mathematics to develop the confidence and ability among the students to handlevariousreal-world problems and theirapplications.

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Test the Linear system's consistency and determine its solution.	4-Analyzing
CO2	Apply eigen values and eigen vectors to reduce a quadratic form to its canonical form.	3-Applying
CO3	Apply mean value theorems to obtain series expansions of single variable functions.	3-Applying
CO4	Utilize partial differentiation in optimizing multi variable functions.	3-Applying
CO5	Evaluate multiple integrals and find area / volume of bounded regions.	5-Evaluating

Note: K-Level is defined From Blooms Taxonomy

COURSE CONTENT:
UNIT-1:Matrices:

Rank of a matrix by echelon form, normal form.Cauchy–Binet formula (without proof).InverseofNon-singularmatricesbyGauss-Jordanmethod,Systemoflinearequations:Solvingsystem of Homogeneous and Non-Homogeneous equations by Gauss elimination method,Jacobiand Gauss Seidel Iteration Methods.

UNIT-2: Eigen values, Eigen Vectors and Orthogonal Transformation:

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamiltontheorem(withoutproof),findinginverseandpowerofamatrixbyCayley-HamiltonTheorem, Quadratic forms andNatureoftheQuadraticForms,ReductionofQuadraticformtocanonicalformsby Orthogonal transformation.

UNIT-3: Calculus

MeanValueTheorems:Rolle'sTheorem,Lagrange'smeanvaluetheoremwiththeirgeometrical

interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin's theoremswithremainders(withoutproof), Problemsand applicationson theabovetheorems.

UNIT-4: PartialdifferentiationandApplications(MultivariableCalculus):

Functionsofseveralvariables:ContinuityandDifferentiability,Partialderivatives,totalderivatives,chainrule ,Taylor'sandMaclaurin'sseriesexpansionoffunctionsoftwovariables.Jacobians,Functionaldependence,m aximaandminimaoffunctionsoftwo variables,methodofLagrangemultipliers.

UNIT-5: Multipleintegrals (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 (bydoubleintegrals andtripleintegrals).

TEXT BOOKS:

[1] HigherEngineeringMathematics,B.S.Grewal,KhannaPublishers,2017, 44th Edition
[2] AdvancedEngineeringMathematics,ErwinKreyszig,JohnWiley&Sons,2018,10thEdition.

REFERENCE BOOKS:

(i) Engineering Mathematics-I (Linear Algebra and Calculus) by T.K.V. Iyengar et.al., S Chand and Company Ltd

(ii) ThomasCalculus,GeorgeB.Thomas,MauriceD.WeirandJoelHass,PearsonPublishers, 2018, 14thEdition.

(iii)AdvancedEngineeringMathematics,DennisG.ZillandWarrenS.Wright,JonesandBartlett,2018.

(iv)AdvancedModernEngineeringMathematics,GlynJames,Pearsonpublishers,2018,5thEdition.

(v) AdvancedEngineeringMathematics,MichaelGreenberg,Pearsonpublishers,9thedition.

(vi) HigherEngineeringMathematics,H.KDas,Er.RajnishVerma,S.Chand Publications, 2014, Third Edition (Reprint 2021)

E-RESOURCES/DIGITAL MATERIAL:

(a) http://www.nptelvideos.com/mathematics/

(b) https://digimat.in/cgi-bin/search.cgi

BASIC CIVIL & MECHANICAL ENGINEERING

Course Category:	**Engineering Science (ES)**	Credits : 3			
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation		30M	
		Semester End Evaluation		70M	
		Total Marks		100M	

Course Outcomes:

After successful completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understand various disciplines of Civil Engineering including the basic construction materials and building elements.	K-2
CO2	Interpret the basic concepts of surveying and types and applications of soils, foundations and geosynthetics.	K-2
CO3	Realize the importance of Transportation in nation's economy and that of Water Storage and its conservation.	K-2
CO4	Identify the scope and importance of Mechanical Engineering in different sectors and industries	K-2
CO5	Understand the different manufacturing processes and explain the basics of thermal engineering and its applications	K-2
CO6	Describe the working of different mechanical power transmission systems and power plants and basics of robotics and its applications.	K-2

Note: K-Level is defined from Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO	PO	PO4	PO	PO6	PO7	PO	PO	PO	PO	PO	PSO	PSO
CO1	3	-	-	-	-	2	-	2	-	-	-	-	2	2
CO2	3	2	-	-	-	2	-	2	-	-	-	-	2	2
CO3	3	-	-	-	-	3	2	2	-	-	-	-	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	2
CO6	3	2	-	-	-	-	-	-	-	-	-	2	3	2

COURSE CONTENT:

UNIT-1:

Basics of Civil Engineering: Role of Civil Engineers in society- Various disciplines of Civil Engineering- Structural Engineering, Geotechnical Engineering, Transportation Engineering, Hydraulics and Water Resources Engineering, Environmental Engineering (Scope of each discipline) - Building Construction and Planning: Construction Materials–Cement, Aggregates, Bricks, Cement concrete and Steel (physical properties, classification, and uses/applications only) – list of building elements.

UNIT-2:

Surveying: Objectives of Surveying - Horizontal Measurements - Angular Measurements- Introduction to Bearings - Levelling instruments used for levelling - Contour mapping.

Geotechnical Engineering: Soils (types, origin and distribution) - Foundations and Geosynthetics (types and their applications).

UNIT-3:

Transportation Engineering Importance of Transportation in Nation's economic development - Types of Highway Pavements - difference between Flexible and Rigid Pavements. Introduction to Harbours, Tunnels, Airports, and Railways (functions and components only)

Water Resources and Environmental Engineering: Introduction, Sources of water - Quality of water - Specifications - Introduction to Hydrology – Rainwater Harvesting - Water Storage and Conveyance Structures (introduction to Dams and Reservoirs - purpose and classification according to use).

UNIT-4:

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

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

UNIT-5:

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

Thermal Engineering – Working principle of a boiler IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT-6:

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

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

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

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

TEXT BOOKS:

[1]. Basic Civil Engineering, M.S. Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
[2]. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

REFERENCE BOOKS:

1. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
2. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.
3. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
4. Geotechnical Engineering, C. Venkataramaiah, New Age Publishers, 2021, 7th Edition.
5. Irrigation and Water Power Engineering - Dr. B. C. Punmia, Dr. Pande B.B. Lal, Er. A.K. Jain, Laxmi Publications, 2021, 17th Edition.
6. Highway Engineering, S.K. Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
7. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
8. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
9. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
10. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

11. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
12. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.
13. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
14. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.

E-RESOURCES/DIGITAL MATERIAL:

a) https://archive.nptel.ac.in/courses/105/106/105106201/
b) https://onlinecourses.nptel.ac.in/noc23_ce80/preview

INTRODUCTION TO PROGRAMMING

Course Category:	**Engineering Science (ES)**	Credits: 3			
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites:	Basics Mathematics, Logical thinking and basics of Computers	Continuous Evaluation		30M	
		Semester End Evaluation		70M	
		Total Marks		100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Illustrate basics of computers, problem solving techniques and introduction to C programming	2
CO2	Develop C programs using control statements	3
CO3	Apply concepts like arrays and strings in C	3
CO4	Analyze pointer concepts, structures, unions in C	4
CO5	Examine functions and concepts of File I/O in C	4

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	-	3	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

UNIT-1:

Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using DiaTool), pseudo code, Introduction to Compilation and Execution, Primitive Data Types, Variables and Constants, Basic Input and Output, Operators, Type Conversion and Casting, formatted IO,

Problem solving techniques: Algorithmic approach, Characteristics of algorithm, Example Programs

UNIT-2:

Control Structures: Simple sequential programs, Conditional Statements (if, if-else, if else ladder, Nested if, switch), Nesting, Loops (for, while, do-while), Break and Continue, Example Programs.

UNIT-3:

Arrays and Strings: Arrays indexing, Array Declaration and Initialization, programs with array of integers, two dimensional arrays, Introduction to Strings, String handling functions, Example Programs.

UNIT-4:

Pointers &User Defined Data types: Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Dynamic Memory Allocation functions, User-defined data types-Structures and Unions, Example Programs.

UNIT-5:

Functions &File Handling: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, Recursion, modifying parameters inside functions using pointers, Arrays and Structures as parameters. Storage Class Modifiers, File Handling- Creation, Opening Modes, File IO

Textbooks:

1. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rdedition, 2011.
2. "The C Programming Language", Brian W.Kernighan and Dennis M.Ritchie, Prentice-Hall, 2015.
3. Schism's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996.
4. Let us C ,YaswanthKanetkar, 16th Edition, BPB Publication, 2020.

5. Programming in ANSI C, McGraw Hill, seventh edition by E.Balagurusamy .2017

Reference Books:

1. Programming in C, Reema The raja, Oxford,2016,2nd edition

2. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication, 2013

3. Problem solving using C , K Venugopal,3'd Edition, TMG Publication,2015

4. Anil B. Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury Learning & Information, 2020.

5. Paul J. Dietel and Harvey M. Deitel, "C: How to Program", Prentice Hall, 8th edition (Jan 19, 2021)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs01/preview

Websites:

- http://www.c4learn.com/
- http://www.geeksforgeeks.org/c/
- http://nptel.ac.in/courses/122104019/
- http://www.learn-c.org/
- https://www.tutorialspoint.com/cprogramming/

COMMUNICATIVE ENGLISH LAB

Course Category:	**BS**	Credits: 1			
Course Type:	**Lab**	Lecture-Tutorial-Practice:	0	0	2
Prerequisites	Basic understanding of LSRW Skills	Continuous Evaluation		30M	
		Semester End Evaluation		70M	
		Total Marks		**100M**	

Course Outcomes:

CO No:	After Successful Completion of course, the student will be able to:	
	Course Outcome Description	K - Level
CO1	Identify and pronounce consonants and vowel sounds as per the International Phonetic Alphabet	Cognitive
CO2	Speak fluently by practicing accent, rhythm, and intonation	Affective
CO3	Interact with others confidently on the phone or in person by using appropriate expressions	Psychomotor
CO4	Make oral presentations on different topics - individually or in groups with confidence, clarity and conviction.	Psychomotor

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO		PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PSO1	PSO2
CO1								3	3	3				3
CO2								3	3	3				3
CO3								3	3	3				3
CO4								3	3	3				3

COURSE CONTENT:

1Vowels & Consonants

2. Neutralization/Accent Rules

3. Communication Skills & JAM

4. Role Play or Conversational Practice

5. Self-Introduction, Introducing others, Non-verbal communication

6. Group Discussions-methods & practice

7. Debates - Methods & Practice

8. PPT Presentations

9. Poster Presentation

10. Interviews Skills

Suggested Software: • Walden Infotec

• 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 CHEMISTRY LAB

Course Category:	BS/ES/PC/PE/OE/MC/SC	Credits :1.5		
Course Type:	Theory / Tutorial /Practical	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	Basic Concepts of Chemistry Lab	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

	After Successful Completion of the course, the student will be able to:	
CO No	**Course Outcome Description**	**K - Level**
CO1	Handle Colorimeter, P^H Meter, viscometer, conductivity meter, and Oven for analysis of coal and materials using small quantities involved for quick and accurate results.	Applying
CO2	Carry out acid-base, complexometric, and redox titrations.	Applying
CO3	Prepare advanced materials like Bakelite, nanomaterials	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3					
CO2	3								3					
CO3	3								3					
CO4	3								3					
CO5	3								3					

COURSE CONTENT:
1. Determination of Hardness of a groundwater sample.

2. Estimation of Dissolved Oxygen by Winkler's method

3. Determination of Strength of an acid in Pb-Acid battery

4. Preparation of a polymer (Bakelite)

5. Determination of percentage of Iron in Cement sample by colorimetry

6. Estimation of Calcium in port land Cement

7. Preparation of nanomaterials by precipitation method.

8. Adsorption of acetic acid by charcoal

9. Determination of percentage Moisture content in a coal sample

10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1

11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2

12. Determination of Calorific value of gases by Junker's gas Calorimeter.

13. Estimation of Ferrous Iron by Dichrometry.

14. Determination of alkalinity of a sample containing Na_2CO_3 and $NaOH$.

15. Estimation of calcium carbonate content in toothpaste.

16. Determination of the concentration of acid in soft drinks (pH-metry method).

17. Conductometric titration of strong acid vs. strong base

Note: Of the above experiments at-least 10 assessment experiments should be completed in a semester.

TEXT BOOKS:
[1]A Textbook of Quantitative Analysis, Arthur J. Vogel.

ENGINEERING WORKSHOP

CourseCategory:	**Engineering Science (ES)**	Credits: 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0 0 3	
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

	After Successful Completion of course, the student will be able to:	
CO No:	Course Outcome Description	K - Level
CO1	Perform operations in carpentry, fitting, plumbing with appropriate tools	3
CO2	Develop prototypes with sheet metals	3
CO3	Perform electrical connections required for house wiring	3
CO4	design the patterns and core boxes for metal casting processes	3
CO5	Understand Arc Welding and Gas welding equipment for the fabrication of welded joints	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	3	3	2	-	2	3	2	-
CO2	3	2	-	-	-	-	-	3	3	2	-	2	3	2	-
CO3	3	2	-	-	-	-	-	3	3	2	-	2	3	2	-
CO4	3	2	-	-	-	-	-	3	3	2	-	2	3	2	-
CO5	3	2	-	-	-	-	-	3	3	2	-	2	3	2	-

COURSE CONTENT:

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

2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

    a. Half – Lap joint

    b. Mortise and Tenon joint

    c. Corner Dovetail joint or Bridle joint

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

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

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

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

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

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

9. Basic repairs of Two-wheeler vehicle – Demonstration of working of two-wheeler vehicle and its repairs.

10. **3D Printing** - Demonstration on 3D Printing

Textbooks:

[1]. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

[2]. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition

2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

E-Resources:

1. https://archive.nptel.ac.in/courses/112/107/112107219/

COMPUTER PROGRAMMING LAB

Course Category:	**Engineering Science (ES)**	Credits: 1.5		
Course Type:	Practical	Lecture-Tutorial-Practice:	0 0	3
Prerequisites	Basics Mathematics, Logical thinking and basics of Computers	Continuous Evaluation		30M
		Semester End Evaluation		70M
		Total Marks		100M

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Solve simple programs using basic C programming concepts	3
CO2	Develop simple programs using control statements	3
CO3	Build program solutions using arrays and strings	3
CO4	Apply pointers concepts in programming	3
CO5	Apply structure and union, files concepts to use memory in programs.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	3	-	-	-	3	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	3	-	-	3	3	3
CO3	3	-	-	-	3	-	-	-	3	-	-	3	3	3
CO4	3	-	-	-	3	-	-	-	3	-	-	3	3	3
CO5	3	-	-	-	3	-	-	-	3	-	-	3	3	3

COURSE CONTENT:

Exercise 1: 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()

Exercise 2: Converting algorithms/flowcharts into C Source code.

   i)   Sum and average of 3numbers

   ii) Conversion of Fahrenheit to Celsius and vice versa

iii) Simple interest calculation

Exercise 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.

Exercise 4: 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.

Exercise 5: Problems using control statements.

    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.

Exercise 6: Problems using control statements.

    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.

Exercise 7: Using arrays.

    i)   Find the min and max ofa1-D integer array.

    ii) Perform linear search on 1D array.

    iii) The reverse of a1D integer array

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

    v) Eliminate duplicate elements in an array.

Exercise 8: arrays and strings

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.

Exercise 9: Pointers

i) Demonstrate dynamic memory allocation functions with example program.

Exercise 10: Structures and union

i) Write a C program to find the total, average of n students using structures.

ii) Write a C program to illustrate Union.

Exercise 11: Using functions.

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.

Exercise 12: Using Recursion Function

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.

Exercise 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, upper case, digits, and other characters using pointers.

Exercise 14: File handling

i) Write a C program to write and read text into a file.

ii) Copy the contents of one file to another file.

iii) Find no. of lines, words, and characters in a file.

TEXT BOOKS:

1. Programming in ANSI C, McGrawHill, seventh edition by E.Balagurusamy, 2017

2. Programming in C, Reema Thareja, Second Edition, OXFORD, 2016.

3. How to solve it by Computer, R. G. Dromey, and Pearson Education.

4. Let us C, YaswanthKanetkar, 17th Edition, BPB Publication,2020.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India, Second Edition, Pearson Education, 2015.

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE,2011

3. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication,2013

4. Problem solving using C, K Venugopal,3'd Edition, TMG Publication,2015

5. Anil B. Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury Learning & Information, 2020.

6. Paul J. Dietel and Harvey M. Deitel, "C: How to Program", Prentice Hall, 8th edition (Jan 19, 2021)

E-RESOURCES/DIGITAL MATERIAL:

1. https://www.geeksforgeeks.org/c-programming-examples/

2. https://www.studytonight.com/c/programs/

3. http://www.w3schools.com/

4. http://www.learn-c.org/

5. https://www.tutorialsyoint.com/cprogramming/

6. https://www.hackerrank.com/

7. https://www.codechef.com/

8. https://www.topcoder.com/

HEALTH AND WELLNESS, YOGA AND SPORTS

Lecture – Tutorial:	0	Internal Marks:	10
Credits:	0.5	External Marks:	90

Prerequisites:	
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 : At the end of the course students 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.

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

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

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

Activities:
  i) Organizing health awareness programmes in community
  ii) Preparation of health profile

Preparation of chart for balance diet for all age groups

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

Activities:

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

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

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
   Practicing general and specific warm up, aerobics

ii) Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

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

B.Tech.–IYearIISemester

ENGINEERING PHYSICS

Course Category:	BS		Credits: 3			
Course Type:	Theory		Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Basic concepts of Physics		Continuous Evaluation		30M	
			Semester End Evaluation		70M	
			Total Marks		**100M**	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Distinguish the phenomena of Interference, Diffraction, Polarization and determine the wavelength of given light using these phenomena.	Analyzing
CO2	Analyze the crystalline structure by Bragg's X-ray diffractometer	Analyzing
CO3	Classify the magnetic materials and apply the magnetic, dielectric materials for given engineering applications	Analyzing
CO4	Calculate the energy of quantum particle at different energy levels.	Applying
CO5	Classify the semiconductors and identify the type of semiconductor using Hall effect	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2	3	3												
CO3	3	3												
CO4	3	2												
CO5	3	3												

COURSE CONTENT:

UNIT-1: Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings, Determination of wavelength and refractive index. Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-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 - Miller indices – separation between successive (hkl) planes.

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

UNIT-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 – General applications of dielectric materials

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

UNIT-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 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.

TEXT BOOKS:

[1] A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.

[2] Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

[3] Applied Physics- Dr. D. Tirupathi Naidu, M. Veeranjaneyulu- VGS Techno Series, 2021.

REFERENCE BOOKS:

    (i)   Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.

    (ii)   Engineering Physics-P. K. Palanisamy, SCITECH publications, 2014.

    (iii)   Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.

    (iv)   Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010.

    (v)   Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

E-RESOURCES/DIGITAL MATERIAL:

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

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Category:	BS		Credits: 3			
Course Type:	Theory / Tutorial		Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Basics of Differentiation, Integration& Vector Algebra		Continuous Evaluation	30M		
			Semester End Evaluation	70M		
			Total Marks	100M		

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariablecalculus.
- Tofurnishthelearnerswithbasicconceptsandtechniquesatplustwoleveltoleadthemintoadvanced level by handlingvariousreal-world applications.

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Solve differential equations of first order and first degree and apply to various engineering fields.	3-Applying
CO2	Solve linear differential equations of higher order with constant coefficients and apply to various engineering fields.	3-Applying
CO3	Solve linear partial differential equations.	3-Applying
CO4	Find gradient, divergence and curl of point functions and apply gradient to find directional derivative.	3-Applying
CO5	Apply vector integral theorems to find work done and flux.	3-Applying

Note: K-Level is defined From Blooms Taxonomy

COURSE CONTENT:

UNIT-1: Differentialequationsoffirstorderandfirstdegree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducibleto exact form.

Applications:Newton's Law of cooling – Law of natural growth and decay-Electricalcircuits.

UNIT-2: Linear differentialequationsofhigher order (Constant coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral (of $e^{ax}, sinax, cosax, x^m, e^{ax}V(x)$), Wronskian, Method of variation of parameters.

Simultaneous linear equations.
Applications: L-C-R Circuit, Simple Harmonic motion.

UNIT-3: Partial differential equations

IntroductionandformationofPartialDifferentialEquationsbyeliminationofarbitraryconstants and arbitrary functions, solutions of first order linear equations using Lagrange'smethod.HomogeneousLinear Partialdifferentialequationswith constantcoefficients with the RHS of the forms $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

UNIT-4: Vector differentiation

Scalar and vector point functions, vector operator Del, Del applied to scalar point functions - Gradient - Applications of Gradient - Directional derivative, Del applied to vector point functions -Divergence and Curl,vectoridentities.

UNIT-5: Vector integration

Line integral-circulation-workdone,Surfaceintegral-flux,Green'stheoremintheplane(withoutproof),Stoke'stheorem(withoutproof),Volumeintegral,Divergen cetheorem(withoutproof) andrelated problems.

TEXT BOOKS:

[1] HigherEngineeringMathematics,B.S.Grewal,KhannaPublishers,2017,44thEdition.
[2] AdvancedEngineeringMathematics,ErwinKreyszig,JohnWiley&Sons,2018,10thEdition.

REFERENCE BOOKS:

(vii)   Engineering Mathematics-II (Differential Equations and Vector Calculus) by T.K.V. Iyengar et.al., S Chand and Company Ltd.

(viii)   ThomasCalculus,GeorgeB.Thomas,MauriceD.WeirandJoelHass,PearsonPublishers,2018, 14th Edition.

(ix)AdvancedEngineeringMathematics,DennisG.ZillandWarrenS.Wright,JonesandBartlett,2018.

(x) AdvancedModernEngineeringMathematics,GlynJames,Pearsonpublishers,2018,5th Edition.

(xi)AdvancedEngineeringMathematics,R.K.JainandS.R.K.Iyengar,AlphaScienceInternationalLtd., 20215thEdition (9th reprint).

(xii)   HigherEngineeringMathematics,B.V.Ramana,McGraw HillEducation,2017.

E-RESOURCES/DIGITAL MATERIAL:

(a) http://www.nptelvideos.com/mathematics/
(b) https://digimat.in/cgi-bin/search.cgi

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Objectives

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

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

CO1. Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2)

CO2. Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2)

CO3. Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3)

CO4. Calculate electrical load and electricity bill of residential and commercial buildings. (L4)

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2	3	3												
CO3	3	3												
CO4	3	2												
CO5	3	3												

COURSE CONTENT:

UNIT I DC & AC Circuits

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

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

UNIT II Machines and Measuring Instruments

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

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

UNIT III Energy Resources, Electricity Bill & Safety Measures

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

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

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

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

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

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

Web Resources:

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

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

PART B: BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES:

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

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator.

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

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND,and XOR.

Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops.

Textbooks:

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:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

2. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.

3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,

Pearson Education,2009.

End examination pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.

iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

ENGINEERING GRAPHICS

Course Category:	**Engineering Science (ES)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	1 0 4	
Prerequisites	Basic mathematics	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understand the principles of engineering drawing, including engineering curves, scales.	3
CO2	Draw orthographic projections of the points and projections of lines inclined to one principal plane & inclined to both the planes	3
CO3	Draw Orthographic projections of planes, solids (simple position and inclined to both the planes)	3
CO4	Explain principles behind development of surfaces and Sections of solids in simple position only.	3
CO5	Draw orthographic and isometric views of different parts.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	2	2	-	-	-	-	-	-	3	-	2	2	2	2
CO2	3	2	2	-	-	-	-	-	-	3	-	2	2	2	2
CO3	3	2	2	-	-	-	-	-	-	3	-	2	2	2	2
CO4	3	2	2	-	-	-	-	-	-	3	-	2	2	2	2
CO5	3	2	2	-	3	-	-	-	-	3	-	2	2	2	2

COURSE CONTENT:

UNIT I

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

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

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

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

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

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

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane, Projection of Solids with axis inclined to one reference plane.

UNIT IV

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

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

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views for simple solids.

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-RESOURCES/DIGITAL MATERIAL:

a) https://nptel.ac.in/courses/112103019

b) https://archive.nptel.ac.in/courses/112/102/112102304/

IT WORKSHOP

Course Category:	**Engineering Science (ES)**	Credits: 1		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	2
Prerequisites		Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Identify, assemble the components of a computer	3
CO2	Configure, evaluate, and select hardware platforms for the implementation and execution of computer applications, services and systems	3
CO3	Make use of tools for converting pdf to word and vice versa	3
CO4	Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, FOSS, LaTeX	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	-	3	-	-	3	-	-	-	-	-	-	-	3	3
CO4	-	3	-	-	3	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

PC Hardware & Software Installation

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

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

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with Aviva.

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.

Task5: 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 are no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

Task3: 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 downloads to avoid viruses and/or worms.

Latex and Word

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

Task 2: Using LaTeX 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 LaTeX 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.

Task4: 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 stately 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, autofill, 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.

POWERPOINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, WordArt, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in 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 slotted, notes etc.), and Inserting–Background, textures, Design Templates, Hidden slides.

AITOOLS –ChatGPT

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

- Ex: Prompt: "Your area knowledge able AI. Please answer the following question: What is the capital of France?"

Task2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of ascend, and let the model generate their list 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 up wards. 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?'"

TEXTBOOKS:

1. Computer Fundamentals, Anita Goal, Pearson India Education,2017
2. Introduction to PC Hardware Trouble Shooting Made Easy, Mike Meyers, McGraw Hill Education, 2017

REFERENCE BOOKS:

1. Comdex Information Technology course toolkit, VikasGupta, WILEY Dreamtech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech,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), 2004
5. LaTeX Companion, Leslie Lamport, PHI/Pearson. 2nd Edition.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinsen and Ken Quamme. – CISCO Press, Pearson Education,3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education,3rd edition

ENGINEERING MECHANICS
(Common to Mechanical & Civil Engineering)

Course Category:	**Professional Core (PC)**	Credits : 3			
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Compute resultant of a forces in planer & spatial systems. Find out the Friction force in different cases	3
CO2	Analyze planar, spatial force systems with and without friction under static equilibrium by analytical & graphical method	3
CO3	locate centroid, center of gravity and mass moment of inertia of composite areas and composite bodies respectively	3
CO4	Analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse momentum	3
CO5	Solve the problems involving the translational and rotational motion of rigid bodies	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	3	3	3	-	2	-	-	-	-	-	2	3	3	-
CO3	3	3	3	3	-	2	-	-	-	-	-	2	3	3	-
CO4	3	3	3	3	-	2	-	-	-	-	-	2	3	3	-
CO5	3	3	3	3	-	2	-	-	-	-	-	2	3	3	-

COURSE CONTENT:

UNIT I

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications

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

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

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami'sTheorm, 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 III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures.

Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems

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

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

UNIT IV

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

UNIT V

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, BasudevBattachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition
6. Engineering Mechanics, Volume 2. Engineering Mechanics, Ferdinand Leon Singer ; Author, Ferdinand Leon Singer ; Edition, 2.
7. Vector Mechanics for Engineers : Statics. Boston, Beer, Ferdinand P. (Ferdinand Pierre), 1915-2003, McGraw-Hill, 2004.

E-RESOURCES/DIGITAL MATERIAL:

a) https://archive.nptel.ac.in/courses/112/106/112106286/

ENGINEERING PHYSICS LAB

Course Category:	**BS**	Credits: 1		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0 0	2
Prerequisites	Basic concepts of Physics and units of physical parameters	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Examine the physical properties of light using interference, diffraction and polarization phenomena.	Applying
CO2	Determine the acceleration due to gravity and rigidity modulus of the material by pendulum methods.	Applying
CO3	Measure the frequency response by resonance using electrical method.	Applying
CO4	Demonstrate the magnetic and dielectric behaviour of materials	Applying
CO5	Analyze the characteristics of semiconducting materials	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3				3					
CO2	3				3				3					
CO3	3				3				3					
CO4	3				3				3					
CO5	3				3				3					

COURSE CONTENT:

List of Engineering Physics Experiments

1. Determination of radius of curvature of given plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of acceleration due to gravity and radius of gyration by using compound pendulum.
4. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
5. Determination of frequency of electrically maintained tuning fork by Melde's experiment.
6. Determination of dielectric constant using charging and discharging method.
7. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
8. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
9. Determination of energy gap of a semiconductor using p-n junction diode
10. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

Additional Experiments:

11. Study frequency response of a LCR series resonance circuit.
12. Study the V-I characteristics of P-N junction diode.

References:

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

E-RESOURCES/DIGITAL MATERIAL

Web Resources

• www.vlab.co.in

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

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

Course Category:	Engineering Science (ES)	Credits : 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	Practical	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Objectives:

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

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Measure voltage, current and power in an electrical circuit. (L3)	
CO2	Measure of Resistance using Wheat stone bridge (L4)	
CO3	Discover critical field resistance and critical speed of DC shunt generators. (L4)	
CO4	Investigate the effect of reactive power and power factor in electrical loads. (L5)	

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc. Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter. Provide some exercises so that measuring instruments are learned to be used by the students.

Components:

2. Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

2. Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

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

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

ENGINEERING MECHANICS LAB

(Common to Mechanical & Civil Engineering)

Course Category:	**Professional Core (PC)**	Credits: 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	Practical	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

	After Successful Completion of course, the student will be able to:	
CO No:	Course Outcome Description	K - Level
CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller	2
CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever	3
CO3	Determine the Centre of gravity and Moment of Inertia of different configurations.	3
CO4	Verify the equilibrium conditions of a rigid body under the action of different force systems.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	3	3	-	-	-	3	2	-
CO2	3	2	2	-	-	-	-	3	3	-	-	-	3	2	-
CO3	3	2	2	-	-	-	-	3	3	-	-	-	3	2	-
CO4	3	2	2	-	-	-	-	3	3	-	-	-	3	2	-

COURSE CONTENT:

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.

Reference Books:

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

E-Resources:
a) https://archive.nptel.ac.in/courses/112/106/112106286/

NSS/NCC/ Scouts & Guides/Community Service

Lecture – Tutorial:	0	Internal Marks:	10
Credits:	0.5	External Marks:	90

Prerequisites:

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

Course Outcomes : At the end of the course students will be able to:

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

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

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

UNIT –I : Orientation

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

Activities:

    i)   Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills

    ii)   Conducting orientations programs for the students –future plans-activities-releasing road map etc.

    iii) Displaying success stories-motivational biopics- award winning movies on societal issues

etc.

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

UNIT –II : Nature &

Care Activities:

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

UNIT- III   : Community

Service Activities:

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

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

REFERENCE BOOKS:

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

B.Tech.
MECHANICAL ENGINEERING
(B.Tech 2nd Year Syllabus)

Department of Mechanical Engineering
(B.Tech. ME Programme Accredited by NBA)

DHANEKULA INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, Accredited by NBA, Affiliated to JNTUK, Kakinada)
Ganguru, Vijayawada
AndhraPradesh-521139,
INDIA.
www.diet.ac.in

VISION – MISSION - PEOs

Institute Vision	Pioneering Professional Education through Quality
Institute Mission	Providing Quality Education through state-of-art infrastructure, laboratories and committed staff. Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect. Involving faculty members and students in research and development works for betterment of society.
Department Vision	To prepare mechanical engineers with global competency and desire to serve the society.
Department Mission	Transforming students as Mechanical Engineers with professional attitudes, industrial adaptability, and leadership abilities. Providing Quality Education with state-of-art facilities. Inculcating ethical values, ability to lifelong learning and social responsibilities.
Program Educational Objectives(PEOs)	Graduates of Mechanical Engineering will: **PEO1:** To pursue successful careers or higher studies in Mechanical engineering through their strong foundation in mathematics, science, and engineering. **PEO2:** To analyze and design appropriate solutions for socially relevant problems by using current engineering techniques. **PEO3:** To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning. **PEO4:** To grab an opportunity to expand their horizon beyond mechanical engineering.

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
Department of Mechanical Engineering
POs/PSOs

List Program Outcomes

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

List Program Specific Outcomes

PSO1: Apply mechanical engineering knowledge to design and manufacture products relevant to society in an innovative and economical way.

PSO2: Ability to work in multidisciplinary areas such as automation, robotics, design, and simulation software etc.

PSO3: Qualify in national and international level competitive examinations for successful higher studies and employment.

B.Tech. – II Year I Semester

S.No.	Category	Title	L/D	T	P	Credits
1	BS	Numerical Methods and TransformTechniques	3	0	0	3
2	HSMC	Universal Human Values– Understanding Harmony& Ethical HumanConduct	2	1	0	3
3	Engineering Science	Thermo dynamics	2	0	0	2
4	Professional Core	Mechanics of Solids	3	0	0	3
5	Professional Core	Material Science and Metallurgy	3	0	0	3
6	Professional Core	Mechanics of Solids and Materials Science Lab	0	0	3	1.5
7	Professional Core	Computer-aided Machine Drawing	0	0	3	1.5
8	Engineering Science	Python programming Lab	0	0	2	1.0
9	Skill Enhancement Course	Embedded Systems and IoT	0	1	2	2
10	Audit Course	Environmental Science	2	0	0	-
		Total	**15**	**2**	**10**	**20**

B.Tech.–II Year II Semester

S.No.	Category	Title	L/D	T	P	Credits
1	Management Course- I	Industrial Management	2	0	0	2
2	Basic Science	Complex Variables, Probability and Statistics	3	0	0	3
3	Professional Core	Manufacturing processes	3	0	0	3
4	Professional Core	Fluid Mechanics & Hydraulic Machines	3	0	0	3
5	Professional Core	Theory of Machines	3	0	0	3
6	Professional Core	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
7	Professional Core	Manufacturing processes Lab	0	0	3	1.5
8	Skill Enhancement course	Soft Skills	0	1	2	2
9	Engineering Science	Design Thinking & Innovation (or) https://onlinecourses.swayam2.ac.in/aic23_ge17/preview	1	0	2	2
		Total	**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation						

NUMERICAL METHODS AND TRANSFORM TECHNIQUES

Course Category:	**Basic Science (BS)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Calculus, Algebra, and familiarity with differential equations.	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Apply iterative methods to solve algebraic equation and transcendental equations. Interpolate data using various interpolating techniques	3
CO2	Apply numerical techniques to find derivatives/ to find definite integral /to solve initial value problem of first order-first degree ODE.	3
CO3	Apply the Laplace transform for solving differential equations	3
CO4	Compute the Fourier series of periodic signals	3
CO5	Apply integral expressions for the forward and inverse Fourier transforms.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3

COURSE CONTENT:

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

UNIT – II: Numerical integration, Solution of ordinary differential equations with initial conditions:
Trapezoidal rule– Simpson's 1/3rd 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.

UNIT –III: Laplace Transforms:
Definition of Laplace transform - Laplace transforms of standard functions – Properties of Laplace Transforms – Shifting theorems–Transforms of derivatives and integrals – Unit step

function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) and integro differential equations using Laplace transforms.

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1) **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) **Steven C. Chapra**, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3) **M. K. Jain, S.R.K. Iyengar and R.K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4) **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press.

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY& ETHICAL HUMAN CONDUCT

Course Category:	**(HSMC)**		Credits: 3		
Course Type:		**Theory**	Lecture-Tutorial-Practice:	2	1	0
Prerequisites		-	Continuous Evaluation		30M
			Semester End Evaluation		70M
			Total Marks		100M

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Aspire continuous happiness and prosperity	2
CO2	Explore harmony in the human being, the co-existence of self and body.	2
CO3	Develop competence and value human-human relationship.	2
CO4	Perceive harmony at all levels of existence.	2
CO5	Validate definitiveness of ethical human conduct	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-
CO2	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-
CO3	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-
CO4	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-
CO5	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-
CO6	-	-	-	-	-	3	3	3	3	-	-	-	-	-	-

COURSE CONTENT:

COURSE CONTENT:

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

UNIT I   Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

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

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

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

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

Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

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

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

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

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

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

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

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

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

Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself
PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

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

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

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

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

Reference Books:

1. *JeevanVidya: EkParichaya,* A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth -* by Mohandas Karamchand Gandhi
5. *Small is Beautiful -* E. F Schumacher.
6. *Slow is Beautifu*l - Cecile Andrews
7. *Economy of Permanence -* J C Kumarappa
8. *Bharat Mein Angreji Raj* – PanditSunderlal
9. *Rediscovering India -* by Dharampal
10. *Hind Swaraj or Indian Home Rule -* by Mohandas K. Gandhi
11. *India Wins Freedom -* Maulana Abdul Kalam Azad
12. *Vivekananda -* Romain Rolland (English)
13. *Gandhi -* Romain Rolland (English)

E-Resources:

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

THERMO DYNAMICS

Course Category:	**Engineering Science (ES)**	Credits : 2		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	2	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.	3
CO2	Apply the Zeroeth and First Law of Thermodynamics.	3
CO3	Understand Second Law of Thermodynamics.	2
CO4	Analyze the Mollier charts, T-S and h-s diagrams, Steam calorimetry, Phase Transformations	4
CO5	Evaluate the COP of refrigerating systems and properties, processes of psychrometry and sensible and latent heat loads.	5

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	2	-	-	-	-	3	3	3	3
CO2	3	2	2	-	-	-	2	-	-	-	-	3	3	3	3
CO3	3	2	2	3	-	-	2	-	-	-	-	3	3	3	3
CO4	3	2	2	3	-	-	2	-	-	-	-	3	3	3	3
CO5	3	2	2	3	-	-	2	-	-	-	-	3	3	3	3

COURSE CONTENT:

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

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

Unit – III
Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of

Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

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

TEXT BOOKS:

[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:

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.

E-RESOURCES/DIGITAL MATERIAL:

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

MECHANICS OF SOLIDS

Course Category:	**Professional Core (PC)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
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	1
CO2	Analyse beams and draw correct and complete shear and bending moment diagrams for beams.	4
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.	3
CO4	Model &Analyze the behavior of basic structural members subjected to various loads	4
CO5	Design and analysis of Industrial components like pressure vessels.	6

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	2	-	-	-	2	2	3	3	3
CO2	3	3	3	2	-	-	2	-	-	-	2	2	3	3	3
CO3	3	3	3	2	-	-	2	-	-	-	2	2	3	3	3
CO4	3	3	3	2	-	2	2	-	-	-	2	2	3	3	3
CO5	3	3	3	2	-	2	2	-	-	-	2	2	3	3	3

COURSE CONTENT:

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

UNIT–II
SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of

these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of abeam.

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

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

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

TEXT BOOKS:

[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, NewDelhi, 2018.

REFERENCE BOOKS:
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 Pulications, 1990.
5. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.
6. R.K Bansal, Strength of materials Strength Of Materials (Mechanics of Solids) Fifth Edition.

E-RESOURCES/DIGITAL MATERIAL:
a) https://onlinecourses.nptel.ac.in/noc19_ce18/preview.
b) https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6.
c) https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
d) https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
e) https://www.coursera.org/learn/mechanics-1
f) https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-1-linear-elastic-behavior
g) https://archive.nptel.ac.in/courses/112/107/112107146/

MATERIAL SCIENCE & METALLURGY

Course Category:	**Professional Core (PC)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.	2
CO2	Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains.	1
CO3	Understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.	2
CO4	Grasp the methods of making of metal powders and applications of powder metallurgy.	3
CO5	Comprehend the properties and applications of ceramic, composites and other advanced methods.	4

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO2	3	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO3	3	3	3	2	-	2	-	-	-	-	-	2	3	2	2
CO4	3	-	2	2	-	2	-	-	-	-	-	2	3	2	2
CO5	3	-	2	2	-	2	-	-	-	-	-	2	3	2	2

COURSE CONTENT:

UNIT– I
Structure of Metals and Constitution of alloys: Crystallization of metals, Packing Factor - SC, BCC, FCC& HCP-line density, plane density. Grain and grain boundaries, effect of grain boundaries– determination of grain size. Imperfections, Slip and Twinning.
Necessity of alloying, types of solid solutions, Hume Rothery's rules, intermediate alloy phases, and electron compounds
Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe3C.
UNIT–II

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey castiron,Spheriodalgraphitecastiron,Alloycastiron.Classificationofsteels,structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

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

UNIT–III
Heat treatment of Steels: Effect of alloying elements on Fe-Fe3C system, annealing, normalizing, hardening, TTT diagrams, tempering, harden ability, surface - hardening methods, age hardening treatment, Cryogenic treatment.

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

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

TEXT BOOKS:

[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, 39/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.

E-RESOURCES/DIGITAL MATERIAL:
a) https://archive.nptel.ac.in/courses/113/106/113106032/
b) https://www.edx.org/learn/mechanics/massachusetts-institute-of-technology- mechanical-behavior-of-materials-part-3-time-dependent-behavior.
c) https://www.youtube.com/watch?v=9Sf278j1GTU
d) https://www.coursera.org/learn/fundamentals-of-materials-science
e) https://www.coursera.org/learn/material-behavior.

MECHANICS OF SOLIDS & MATERIALS SCIENCE LAB

Course Category:	**Professional Core (PC)**	Credits : 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0 0 3	
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understand the stress strain behavior of different materials.	2
CO2	Evaluate the hardness of different materials.	4
CO3	Explain the relation between elastic constants and hardness of materials.	1
CO4	Identify various microstructures of steels and cast irons.	3
CO5	Evaluate hardness of treated and untreated steels.	4

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	2	-	3	3	3	-	2	3	2	2
CO2	3	2	2	-	-	2	-	3	3	3	-	2	3	2	2
CO3	3	2	2	-	-	2	-	3	3	3	-	2	3	2	2
CO4	3	2	2	-	-	2	-	3	3	3	-	2	3	2	2
CO5	3	2	2	-	-	2	-	3	3	3	-	2	3	2	2

COURSE CONTENT:

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, andHigh 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.

TEXT BOOKS:

[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, 39/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.

E-RESOURCES/DIGITAL MATERIAL:

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

COMPUTER-AIDED MACHINE DRAWING

Course Category:	**Professional Core (PC)**	Credits : 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	Engineering Drawing	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Demonstrate the conventional representations of materials and machine components.	3
CO2	Model riveted, welded and key joints using CAD system.	6
CO3	Create solid models and sectional views of machine components.	6
CO4	Generate solid models of machine parts and assemble them.	5
CO5	Translate 3D assemblies into 2D drawings.	6

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	2	3	-	2	3	3	2
CO2	3	2	2	-	3	-	-	-	2	3	-	2	3	3	2
CO3	3	2	2	-	3	-	-	-	2	3	-	2	3	3	2
CO4	3	2	2	-	3	-	-	-	2	3	-	2	3	3	2
CO5	3	2	2	-	3	-	-	-	2	3	-	2	3	3	2

COURSE CONTENT:

The following are to be done by any 2D software package

Conventional representation of materials and components:

Detachable joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.
Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints.
Welded joints: Lap joint and T joint with fillet, butt joint with conventions.
Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key.
Couplings: rigid – Muff, flange; flexible – bushed pin-type flange coupling, universal coupling, Oldham's' coupling.

The following exercises are to be done by any 3D software package:
Sectional views:
Creating solid models of complex machine parts and sectional views.

Assembly drawings:(Any four of the following using solid model software)
Lathe tool post, tool head of shaping machine, tail-stock, machine vice, gate valve, carburetor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling.

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

TEXT BOOKS:

[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.

E-RESOURCES/DIGITAL MATERIAL:

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

PYTHON PROGRAMMING LAB

Course Category:	**Engineering Science (ES)**	Credits : 1.0			
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	2
Prerequisites	Basic Programming	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Develop a solid foundation in Python programming, covering essential syntax, semantics, and constructs.	3
CO2	Apply skills to handle and manipulate data using Python libraries like Pandas and NumPy	3
CO3	Apply problem-solving abilities by implementing various algorithms and data structures in Python.	3
CO4	Build software development skills, including version control, package management, and project documentation	3
CO5	Make use of advanced Python topics such as web scraping, API interaction, and database management.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT:

Experiment 1: Introduction to Python
- Objective: Install Python and set up the development environment.
Tasks:
- Install Python and an IDE (e.g., PyCharm, VSCode, or Jupyter Notebook).
- Write and run a simple "Hello, World!" program.
- Understand and demonstrate basic Python syntax and semantics.

Experiment 2: Basic Python Programming
- Objective: Learn basic programming constructs in Python.
Tasks:
- Create programs using variables, data types, and operators.
- Implement basic input and output functions.
- Write programs using control structures (if statements, for loops, while loops).

Experiment 3: Functions and Modules

- Objective: Understand functions and module usage in Python.

Tasks:

- Define and call functions with different types of arguments and return values.
- Explore and use built-in Python modules.
- Write a script that imports and utilizes at least two different standard library modules.

Experiment 4: Lists and Tuples

- Objective:Work with Python lists and tuples.

Tasks:

- Create, modify, and iterate over lists and tuples.
- Perform list comprehensions to create new lists.
- Demonstrate the immutability of tuples.

Experiment 5: Dictionaries and Sets

- Objective: Explore dictionaries and sets in Python.

Tasks:

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

Experiment 6: Strings and File I/O

- Objective: Manipulate strings and perform file I/O operations.

Tasks:

- Demonstrate various string methods.
- Write programs to read from and write to text files.
- Work with different file formats, including CSV and JSON.

Experiment 7: Error Handling and Exceptions

- Objective: Implement error handling in Python programs.

Tasks:

- Write programs using try, except, else, and finally blocks.
- Handle specific exceptions.
- Create and raise custom exceptions.

Experiment 8:Object-Oriented Programming (OOP)

- Objective: Understand and implement OOP concepts in Python.

Tasks:

- Define classes and create objects.
- Demonstrate inheritance and polymorphism.
- Use class and instance variables in programs.

Experiment 9:Libraries and Packages

- Objective: Utilize third-party libraries and create Python packages.

Tasks:

- Install and use libraries like NumPy and Pandas.
- Create a simple Python package and distribute it.
- Work with virtual environments to manage dependencies.

Experiment 10: Working with Data

-Objective: Perform data manipulation and visualization.

Tasks:

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

Experiment 11: Web Scraping and APIs

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

Tasks:

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

Experiment 12: Databases

- **Objective:** Work with databases in Python.

Tasks:

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

E-RESOURCES/DIGITAL MATERIAL:

a) https://www.udemy.com/course/python-the-complete-python-developer-course/?matchtype=e&msclkid=0584dfb54dc715f39c0bb9aaf74033be&utm_campaig n=BG-

b) Python_v.PROF_la.EN_cc.INDIA_ti.7380&utm_content=deal4584&utm_medium=u demyads&utm_source=bing&utm_term=_._ag_1220458320107116_._ad ._kw_Pyt hon+language_._de_c_._dm__._pl ._ti_kwd-76278984197882%3Aloc- 90_._li_116074_._pd ._&couponCode=IND21PM

c) https://www.w3schools.com/python/python_intro.asp

d) https://www.youtube.com/watch?v=eWRfhZUzrAc

e) https://onlinecourses.nptel.ac.in/noc20_cs83/preview

f) https://www.edx.org/learn/python

g) Virtual Labs - https://python-iitk.vlabs.ac.in/

h) Virtual Labs   - https://virtual-labs.github.io/exp-arithmetic-operations-iitk/

i) Virtual Labs - https://cse02-iiith.vlabs.ac.in/
https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/Python%20Lab%20Manua l.pdf

EMBEDDED SYSTEMS & IoT

Course Category:	**Skill Enhancement Course (SEC)**	Credits : 2		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	1	2
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Comprehend Microcontroller-Transducers Interface techniques.	4
CO2	Establish Serial Communication link with Arduino	6
CO3	Analyse basics of SPI interface.	4
CO4	Understand the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor.	2
CO5	Realize the revolution of internet in mobile devices, cloud and sensor networks	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	3	-	-	-	-	-	-	-	3	3	2
CO2	3	-	3	-	3	-	-	-	-	-	-	-	3	3	2
CO3	3	-	3	-	3	-	-	-	-	-	-	-	3	3	2
CO4	3	-	3	-	3	-	-	-	-	-	-	-	3	3	2
CO5	3	-	3	-	3	-	-	-	-	-	-	-	3	3	2

COURSE CONTENT:

Embedded Systems Experiments: (Any 5 experiments from the following)

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: 1. Arduino Duemilanove Board 2. Arduino Software IDE.

Internet of Things Experiments: (Any 5 experiments from the following)

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 through the use of public APIs and SDKs.
5. Study and Install IDE of Arduino and different types of Arduino.
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.

TEXT BOOKS:

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

E-RESOURCES/DIGITAL MATERIAL:

a) https://onlinecourses.nptel.ac.in/noc21_cs17/preview
b) https://onlinecourses.nptel.ac.in/noc20_ee98/preview
c) https://archive.nptel.ac.in/courses/108/105/108105057/
d) https://www.edx.org/learn/embedded-systems/the-university-of-texas-at-austin-   embedded-systems-shape-the-world microcontroller input output?index=product & objectID=course-785cf551-7f66-4350-b736-64a93427b4db&webview=false&campaign=Embedded+Systems+-
e) +Shape+The+World%3A+Microcontroller+Input%2F   Output &source=edX & product_category=course &
f) placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fembedded-systems
g) 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
h) https://www.edx.org/learn/iot-internet-of-things/curtin-university-iot-sensors-and-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_c ategory=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch
i) Virtual Labs - http://vlabs.iitkgp.ac.in/rtes/
j) Virtual Labs - https://cse02-iiith.vlabs.ac.in/
k) Virtual Labs - https://iotvirtuallab.github.io/vlab/Experiments/index.html

ENVIRONMENTAL SCIENCE

Course Category:	**Audit Course (AC)**	Credits : 0		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	2	0	0
Prerequisites	Science	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

	After Successful Completion of course, the student will be able to:	
CO No:	Course Outcome Description	K - Level
CO1	Understand multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	2
CO5	Illustrate the causes of population explosion, value education and welfare programmes.	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO5	-	3	-	-	-	-	-	-	-	-	-	-	3	3	-

COURSE CONTENT:

UNIT – I

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

UNIT – II

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

a.   Forest ecosystem.
b.   Grassland ecosystem
c.   Desert ecosystem
d.   Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

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

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

 a.   Air Pollution.
b.   Water pollution
c.   Soil pollution
d.   Marine pollution
e.   Noise pollution
f.   Thermal pollution
g.   Nuclear hazards

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

UNIT – IV

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

UNIT – V

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-RESOURCES/DIGITAL MATERIAL:

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

INDUSTRIAL MANAGEMENT

Course Category:	**Management Course- I (BS)**	Credits : 2		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	2	0	0
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Learn about how to design the optimal layout	1
CO2	Demonstrate work study methods	3
CO3	Explain Quality Control techniques	2
CO4	Discuss the financial management aspects	2
CO5	Understand the human resource management methods.	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	3	2	-	2	2	2	3	2	3	3	-
CO2	-	-	-	3	3	2	-	2	2	2	3	2	3	3	-
CO3	-	-	-	3	3	2	-	2	2	2	3	2	3	3	-
CO4	-	-	-	3	3	2	-	2	2	2	3	2	3	3	-
CO5	-	-	-	3	3	2	-	2	2	2	3	2	3	3	-

COURSE CONTENT:

UNIT– I

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

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

UNIT–II

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

UNIT–III

STATISTICAL QUALITY CONTROL: Quality control, Queuing assurance and its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – X and R – charts X and S charts and their applications, numerical examples.
TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications, ISO quality systems. Six Sigma–definition, basic concepts

UNIT– IV

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

UNIT–V

HUMAN RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job- evaluation, its importance and types, meritrating, quantitative methods, wage incentive plans, and types.
VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

TEXT BOOKS:

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

REFERENCE BOOKS:

1) Bhattacharya DK, Industrial Management,S.Chand, publishers, 2010.
2) J.G Monks, Operations Management,3/e, McGraw Hill Publishers1987.
3) T.R. Banga, S.C.Sharma, N. K. Agarwal, Industrial Engineering and Management Science, Khanna Publishers, 2008.
4) KoontzO' 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.

E-RESOURCES/DIGITAL MATERIAL:

a) https://onlinecourses.nptel.ac.in/noc21_me15/preview
b) https://onlinecourses.nptel.ac.in/noc20_mg43/preview
c) https://www.edx.org/learn/industrial-engineering
d) https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi
e) https://youtube.com/playlist?list=PLbjTnjt5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG 69hS3v2ll

COMPLEX VARIABLES, PROBABILITY AND STATISTICS

Course Category:	**Basic Science (BS)**	Credits : 3			
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	Familiarity with complex numbers and basic functions of complex variables, basic probability and statistics.	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Apply Cauchy Riemann equations to find derivatives and integrals of complex function	3
CO2	Write analytic function in power series and integrate complex function using Residue theorem	3
CO3	Apply discrete and continuous probability distributions.	3
CO4	Apply Sampling techniques to get estimates of the population	3
CO5	Test the hypothesis based on small and large sample tests.	4

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3	-	3	3

COURSE CONTENT:

UNIT– I: Functions of a complex variable and Complex integration:

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

UNIT – II: Series expansions and Residue Theorem:

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – Essential –Pole of order m– Residues – Residue theorem (without

proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$.

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

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

UNIT – V: Tests of Hypothesis:

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

TEXT BOOKS:

[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:

1) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 9/e, Mc-Graw Hill,2013.
2) S.C.Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics,11/e, Sultan Chand &Sons Publications,2012.
3) Jay l. 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.

E-RESOURCES/DIGITAL MATERIAL:

a) https://archive.nptel.ac.in/courses/111/103/111103070/
b) https://biet.ac.in/pdfs/PROBABILITY%20AND%20STATISTICS%20&%20COMPLEX%20VARIABLES.pdf
c) https://archive.nptel.ac.in/courses/111/105/111105090/
d) http://acl.digimat.in/nptel/courses/video/111102160/L23.html
e) https://onlinecourses.nptel.ac.in/noc21_ma57/preview

MANUFACTURING PROCESSES

Course Category:	**Professional Core (PC)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Design the patterns and core boxes for metal casting processes	6
CO2	Understand the different welding processes	2
CO3	Demonstrate the different types of bulk forming processes	3
CO4	Understand sheet metal forming processes	2
CO5	Learn about the different types of additive manufacturing processes	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	3	3	-	-	-	-	-	-	2	3	3	3
CO2	3	-	-	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	-	-	3	3	-	-	-	-	-	-	2	3	3	3
CO4	3	-	-	3	3	-	-	-	-	-	-	2	3	3	3
CO5	3	-	-	3	3	-	-	-	-	-	-	2	3	3	3

COURSE CONTENT:

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

UNIT–II
Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG & MIG welding. Electro–slag welding.
Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering &Brazing. Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.

UNIT–III

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

UNIT– IV

Sheet metal forming-Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.

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

UNIT -V

Additive manufacturing - Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM, and types of materials for AM, VAT photo polymerization AM Processes, Extrusion - Based AM Processes, Powder Bed Fusion AM Processes, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications

TEXT BOOKS:

[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:

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.

E-RESOURCES/DIGITAL MATERIAL:

a) https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology- fundamentals-of-manufacturing-processes
b) https://onlinecourses.nptel.ac.in/noc21_me81/preview
c) www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
d) https://archive.nptel.ac.in/courses/112/103/112103263/
e) https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-forming- technology/?v=c86ee0d9d7ed

FLUID MECHANICS & HYDRAULIC MACHINES

Course Category:	**Professional Core (PC)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understand the basic concepts of fluid properties.	2
CO2	Estimate the mechanics of fluids in static and dynamic conditions.	5
CO3	Apply the Boundary layer theory, flow separation and dimensional analysis.	3
CO4	Estimate the hydro dynamic forces of jet on vanes indifferent positions.	5
CO5	Understand the working Principles and performance evaluation of hydraulic pump and turbines.	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	2	2	-	-	-	-	2	3	-	3
CO2	3	3	2	-	-	2	2	-	-	-	-	2	3	-	3
CO3	3	3	2	-	-	2	2	-	-	-	-	2	3	-	3
CO4	3	3	2	-	-	2	2	-	-	-	-	2	3	-	3
CO5	3	3	2	-	-	2	2	-	-	-	-	2	3	-	3

COURSE CONTENT:

UNIT I
Fluid statics: Dimensions and units: physical properties of fluids - specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers - Piezometer, U-tube, inverted and differential manometers. Pascal's & hydrostatic laws.
Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II
Fluid Kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flownet, source and sink, double tand vortex flow.
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.

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

UNIT III
Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.
Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Non dimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem.

UNIT IV
Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.
Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube-theory-functions and efficiency.

UNIT V
Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.
Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.
Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

[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 Durgaiah, Fluid Mechanics and Machinery,1/e, New Age International, 2002.

E-RESOURCES/DIGITAL MATERIAL:

a) https://archive.nptel.ac.in/courses/112/105/112105206/
b) https://archive.nptel.ac.in/courses/112/104/112104118/
c) https://www.edx.org/learn/fluid-mechanics
d) https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in
e) www.coursera.org/learn/fluid-powerera

THEORY OF MACHINES

Course Category:	**Professional Core (PC)**	Credits : 3		
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3	0	0
Prerequisites	-	Continuous Evaluation	30M	
		Semester End Evaluation	70M	
		Total Marks	100M	

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understand different mechanisms and their inversions.	2
CO2	Calculate velocity and acceleration of different links in a mechanism	4
CO3	Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.	3
CO4	Evaluate unbalance mass in rotating machines.	5
CO5	Analyze free and forced vibrations of single degree freedom systems.	4

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	-	-	-	-	-	2	3	3	3
CO2	3	3	2	2	-	2	-	-	-	-	-	2	3	3	3
CO3	3	3	2	2	-	2	-	-	-	-	-	2	3	3	3
CO4	3	3	2	2	-	2	-	-	-	-	-	2	3	3	3
CO5	3	3	2	2	-	2	-	-	-	-	-	2	3	3	3

COURSE CONTENT:

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 – UniversalJoint – Rocker mechanisms.

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.

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.

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 motions – derivatives of follower motions- specified contour cams- circular and tangent cams –pressure angle and undercutting.

UNIT – V: Vibrations & Turning Moment Diagrams and Flywheels
Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations- under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility.
Turning Moment Diagrams and Flywheels: Turning moment diagrams for steam engine, I.C engine and Multi Cylinder Engine. Crank effort – coefficient of fluctuation of energy, coefficient of fluctuation of speed – Fly Wheel and their design, fly wheels for punching press.

TEXT BOOKS:

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

REFERENCE BOOKS:

1) F. Haidery, Dynamics of Machines, 5/e, 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

Course Category:	**Professional Core (PC)**	Credits : 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Demonstrate the devices used for measuring flow.	3
CO2	Compute major losses in pipes.	5
CO3	Illustrate the operating parameters of turbines.	2
CO4	Explain the working of different types of pumps.	2
CO5	Explain the devices used for measuring flow.	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO2	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO3	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO4	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO5	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-

List of Experiments

1) Impact of jets on Vanes.
2) Performance Test on Pelton Wheel.
3) Performance Test on Francis Turbine.
4) Performance Test on Kaplan Turbine.
5) Performance Test on Single Stage Centrifugal Pump.
6) Performance Test on Multi Stage Centrifugal Pump.
7) Performance Test on Reciprocating Pump.
8) Calibration of Venturimeter.
9) Calibration of 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.

E-RESOURCES/DIGITAL MATERIAL:

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

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

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

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

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

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

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

MANUFACTURING PROCESSES LAB

Course Category:	**Professional Core (PC)**	Credits : 1.5		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	0	3
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Make moulds for sand casting.	2
CO2	Fabricate different types of components using various manufacturing techniques.	5
CO3	Adapt unconventional manufacturing methods.	3
CO4	Develop Different Weld joints.	6
CO5	Explain different types of 3d Printing techniques.	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO2	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO3	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO4	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-
CO5	3	2	-	2	-	-	-	3	3	3	-	2	3	2	-

List of Experiments

1. Design and making of pattern
   i. Single piece pattern
   ii. Split pattern
2. Sand properties testing
   i. Sieve analysis(dry sand)
   ii. Clay content test
   iii. Moisture content test
   iv. Strength test(Compression test & Shear test)
   v. Permeability test
3. Mould preparation
   i. Straight pipe
   ii. Bent pipe
   iii. Dumble
   iv. Gear blank
4. Gas cutting and welding

5. Manual metal arc welding
    i. Lap joint
    ii. Butt joint
6. Injection Molding
7. Blow Molding
8. Simple models using sheet metal operations
9. 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.

E-RESOURCES/DIGITAL MATERIAL:

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

SOFT SKILLS

Course Category:	**Skill Enhancement course (SEC)**	Credits : 2		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0	1	2
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Assimilate and understood the meaning and importance of soft skills and learn how to develop them.	1
CO2	Understand the significance of soft skills in the working environment for professional excellence.	2
CO3	Prepare to undergo the placement process with confidence and clarity.	3
CO4	Ready to face any situation in life and equip themselves to handle them effectively.	6
CO5	Understand and learn the importance of etiquette in both professional and personal life	2

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-
CO4	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-

COURSE CONTENT:

UNIT – 1: INTRODUCTION

Introduction- Emergence of life skills, 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:

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:

Importance-Communications skills-Functions of language, Group discussions,Debate, Team Work, managerial skills,Negotiation skills- Leadership skills, corporate etiquettes.

UNIT – IV: Verbal communication:

Listening skills, need- types, advantages, Importance-Improving Tips for Listening, Speaking, need- types, advantages, Importance- Improving Tips, Reading-Short passages,Reading comprehension Writing Skills, Report, Resume, statement of purpose, need- types, advantages, Importance-Improving Tips .

UNIT – V: Non Verbal communication & Interview skills

 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.

TEXT BOOKS:

[1].Sherfield, M. Robert at al, Cornerstone Developing Soft Skills, 4/e, PearsonPublication, New Delhi, 2014.

[2].Alka Wadkar, Life Skills for Success, 1/e, Sage Publications India Private Limited,2016.

REFERENCE BOOKS:

1) Sambaiah.M. Technical English, Wiley publishers India. New Delhi. 2014.
2) Gangadhar Joshi, From Campus to Corporate, SAGE TEXT.
3) Alex.K, Soft Skills, 3rd ed. S. Chand Publication, New Delhi, 2014.
4) Meenakshi Raman and Sangita Sharma, Technical Communication: 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.

E-RESOURCES/DIGITAL MATERIAL:

a) https://onlinecourses.nptel.ac.in/noc20_hs60/preview
b) http://www.youtube.com/@softskillsdevelopment6210
c) https://youtube.com/playlist?list=PLLy_2iUCG87CQhELCytvXh0E_ybOO1_q&si=Fs05Xh8ZrOPsR8F 4
d) https://www.coursera.org/learn/people-soft-skills-assessment?language=English
e) https://www.edx.org/learn/soft-skills

Design Thinking & Innovation

Course Category:	**Engineering Science (ES)**	Credits : 2		
Course Type:	**Practical**	Lecture-Tutorial-Practice:	1	0	2
Prerequisites	-	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Define the concepts related to design thinking.	1
CO2	Explain the fundamentals of Design Thinking and innovation.	2
CO3	Apply the design thinking techniques for solving problems in various sectors.	3
CO4	Analyse to work in a multidisciplinary environment.	4
CO5	Evaluate the value of creativity.	5

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO2	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO3	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO4	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO5	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-

COURSE CONTENT:

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

UNIT - II   Design Thinking Process
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

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

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

UNIT - IV   Product Design

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

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

UNIT – V   Design Thinking in Business Processes

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-RESOURCES/DIGITAL MATERIAL:

a) https://nptel.ac.in/courses/110/106/110106124/
b) https://nptel.ac.in/courses/109/104/109104109/
c) https://swayam.gov.in/nd1_noc19_mg60/preview
d) https://onlinecourses.nptel.ac.in/noc22_de16/preview