Jawaharlal Nehru Technological University Anantapur College of Engineering Pulivendula

(Accredited by NAAC with 'A' Grade)

Pulivendula –516 390 (A.P) India

B.Tech. in Mechanical Engineering

Course Structure and Syllabi Under R23 Regulations

Effective from AY 2023-24

MECHANICAL ENGINEERING

Semester –0			
S.No	**Course Name**	**Category**	**L-T-P-C**
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-0-0
5	Proficiency Modules & Productivity Tools	ES	2-0-0-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-0-3-0
8	Human Values & Professional Ethics	MC	3-0-3-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-0-2-0
10	Concepts of Programming	ES	2-0-0-0

B.Tech I Year I Semester

Semester –1					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23ABS05	Linear Algebra & Calculus	BS	3-0-0	3
2	23ABS01	Engineering Physics	BS	3-0-0	3
3	23ACS01	Introduction to Programming	ES	3-0-0	3
4	23ABEE01	Basic Electrical & Electronics Engineering	ES	3-0-0	3
5	23AME01	Engineering Graphics	ES	1-0-4	3
6	23ACS03	IT Workshop	ES	0-0-2	1
7	23ABS02	Engineering Physics Lab	BS	0-0-2	1
8	23ABEE02	Electrical & Electronics Engineering Workshop	ES	0-0-3	1.5
9	23ACS02	Computer Programming Lab	ES	0-0-3	1.5
10	23ABS07	NSS/NCC/Scouts &Guides/Community service	HM	0-0-1	0.5
				Total	**20.5**

B.Tech I Year II Semester

Semester – 2					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23ABS08	Differential Equations &Vector Calculus	BS	3-0-0	3
2	23ABS09	Engineering Chemistry	BS	3-0-0	3
3	23AHS01	Communicative English	HM	2-0-0	2
4	23ACME01	Basic Civil & Mechanical Engineering	ES	3-0-0	3
5	23AME03	Engineering Mechanics	ES	3-0-0	3
6	23ABS10	Engineering Chemistry Lab	BS	0-0-2	1
7	23AHS02	Communicative English Lab	HM	0-0-2	1
8	20AME02	Engineering Workshop	ES	0-0-3	1.5
9	23AME04	Engineering Mechanics Lab	ES	0-0-3	1.5
10	23ABS06	Health and wellness, Yoga and Sports	HM	0-0-1	0.5
				Total	**19.5**

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B.Tech II Year I Semester

Semester – 3					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23ABS33	Numerical Methods &Transform Techniques	BS	3-0-0	3
2	23AHS31	Universal Human Values– Understanding Harmony & Ethical Human Conduct	HM	2-1-0	3
3	23AME31	Thermodynamics	PC	2-0-0	2
4	23AME32	Mechanics of Solids	PC	3-0-0	3
5	23AME33	Material Science And Metallurgy	PC	3-0-0	3
6	23AME36	Mechanics of Solids And Materials Science Lab	PC	0-0-3	1.5
7	23AME37	Computer-Aided Machine Drawing	PC	0-0-3	1.5
8	23AME38	Embedded Systems And IOT Lab	PC	0-0-2	1
9	23ACS49	Python Programming (Skill Oriented Course – I)	SC	0-1-2	2
10	23AMC31	Environmental Science (Audit Course)	MC	2-0-0	0
				Total	**20**

B.Tech II Year II Semester

Semester – 4					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23AME41	Manufacturing Processes	PC	3-0-0	3
2	23AME42	Fluid Mechanics & Hydraulic Machines	PC	3-0-0	3
3	23AME43	Machine Tools And Metrology	PC	3-0-0	3
4	23ABS41	Complex Variables, Probability And Statistics	BS	3-0-0	3
5		**Managcmcnt Course-I**	HM	2-0-0	2
	23AHS03A	Managerial Economics And Financial Analysis			
	23AHS03B	Organizational Behavior			
	23AHS03C	Business Environment			
	23AHS03d	Industrial Management			
6	23AME47	Fluid Mechanics & Hydraulic Machines Lab	PC	0-0-3	1.5
7	23AME48	Manufacturing Processes Lab	PC	0-0-3	1.5
8	23AME49	Geometric Dimensioning and Toleranceing (Skill Oriented Course – II)	SC	0-1-2	2
9	23AMC41	Design Thinking & Product Innovation	HM	1-0-2	2
				Total	**21**
Mandatory Community Service Project/ Internship during Summer Vacation					

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B.Tech III Year I Semester

Semester - 5					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23AME51	Theory of Machines	PC	3-0-0	3
2	23AME52	Thermal Engineering	PC	3-0-0	3
3	23AME53	Design of Machine Members	PC	3-0-0	3
4	23AMC51	Introduction To Quantum Technologies and Applications	PC	3-0-0	3
5		**Professional Elective-I**	PE	3-0-0	3
	23AME54a	Power Plant Engineering			
	23AME54b	Finite Element Methods			
	23AME54c	Design For Manufacturing			
	23AME54d	Unconventional Machining Processes			
	23AME54e	Additive Manufacturing			
5	23AME55	**Open Elective- I**	OE	3-0-0	3
6	23AHS56	Soft Skills (Skill Enhancement Course-III)	SC	0-1-2	2
7	23AME57	Thermal Engineering Lab	PC	0-0-3	1.5
8	23AME58	Machine Tools & Metrology Lab	PC	0-0-3	1.5
9	23AME59	Tinkering Lab	PC	0-0-2	1
10	23AME50	Evaluation of Community Service Internship	PR	-------	2
				Total	**26**

Open Elective I (Interdisciplinary)

Branch	Subject Code	Subject
CE	23ACE55a	Green Buildings
	23ACE55b	Construction Technology and Management
EEE	23AEE55a	Electrical Safety Practices and Standards
ECE	23AEC55a	Electronic Circuits
CSE	23ACS55a	Java Programming
	23ACS55b	Fundamentals of Artificial Intelligence
	23ACS55c	Quantum Technologies and Applications
Mathematics	23ABS55a	Mathematics For Machine Learning and AI
Physics	23ABS55b	Materials Characterization Techniques
Chemistry	23ABS55c	Chemistry of Energy Systems
H&S	23AHS55a	English For Competitive Examinations
	23AHS55b	Entrepreneurship and New Venture Creation

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B.Tech III Year II Semester

Semester - 6					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23AME61	Heat Transfer	PC	3-0-0	3
2	23AME62	Artificial Intelligence And Machine Learning	PC	3-0-0	3
3	23AME63	Control Systems	PC	3-0-0	3
4	**Professional Elective-II**		PE	3-0-0	3
	23AME64a	Automobile Engineering			
	23AME64b	Mechanical Vibrations			
	23AME64c	Non-Destructive Evaluation			
	23AME64d	Statistical Quality Control			
	23AME64e	Composite Materials			
5	**Professional Elective-III**		PE	3-0-0	3
	23AME66a	Refrigeration & Air-Conditioning			
	23AME66b	Mechatronics			
	23AME66c	Industrial Robotics			
	23AME66d	Smart Manufacturing			
	23AME66e	Mechanical Measurements			
6	23AME65	**Open Elective- II**	OE	3-0-0	3
7	23AME69	Artificial Intelligence And Machine Learning Algorithms (Skill Enhancement Course-IV)	SC	0-1-2	2
8	23AME67	Theory of Machines Lab	PC	0-0-3	1.5
9	23AME68	Control Systems Lab	PC	0-0-3	1.5
10	23AHS61	Technical Paper Writing & IPR (Audit Course)	MC	2-0-0	--
11	23AME60	Department Specific Workshop		0-0-0	0
				Total	**23**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation					

Open Elective-II

Branch	Subject Code	Subject
CE	23ACE65a	Disaster Management
	23ACE65b	Sustainability In Engineering Practices
EEE	23AEE65a	Renewable Energy Sources
ECE	23AEC65a	Digital Electronics
CSE	23ACS65a	Operating Systems
	23ACS65b	Machine Learning
Mathematics	23ABS65a	Optimization Techniques for Engineers
	23ABS65d	Mathematical Foundation of Quantum Technologies
Physics	23ABS65b	Physics of Electronic Materials And Devices
Chemistry	23ABS65c	Chemistry of Polymers And Applications
H&S	23AHS65a	Academic Writing and Public Speaking

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B.Tech IV Year I Semester

Semester - 7					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	23AME71	CAD/CAM	PC	2-0-0	2
2	**MANAGEMENT COURSE – II**		HM	2-0-0	2
	23AHS71A	Business Ethics And Corporate Governance			
	23AHS71B	E-Business			
	23AHS71C	Management Science			
	23AHS71D	Operations Research			
3		**PROFESSIONAL ELECTIVE-IV**	PE	3-0-0	3
	23AME72A	Hydrogen And Fuel Cell Technology			
	23AME72B	Condition Monitoring			
	23AME72C	Industrial Hydraulics And Pneumatics			
	23AME72D	Smart Materials			
	23AME72E	Supply Chain Management			
4		**PROFESSIONAL ELECTIVE-V**	PE	3-0-0	3
	23AME73A	Cryogenics			
	23AME73B	Gas Turbines And Jet Propulsion			
	23AME73C	Electric And Hybrid Vehicles			
	23AME73D	Automation In Manufacturing			
	23AME73E	Introduction To Tool Design			
5	23AME74	**OPEN ELECTIVE – III**	OE	3-0-0	3
6	23AME75	**OPEN ELECTIVE – IV**	OE	3-0-0	3
7	23AME76	CAD/CAM Lab (Skill Enhancement Course-V)	SC	0-1-2	2
8	23AME77	Heat Transfer Lab	PC	0-0-2	1
9	23AMC72	Constitution Of India (Audit Course)	MC	2-0-0	0
10	20AME70	Evaluation Of Industry Internship	PR	-------	2
					21

Open Elective-III

Branch	Subject Code	Subject
CE	23ACE74a	Building Materials and Services
	23ACE74b	Environmental Impact Assessment
EEE	23AEE74a	Smart Grid Technologies
ECE	23AEC74a	Microprocessors and Microcontrollers
CSE	23ACS74a	Data Base Management Systems
	23ACS74b	Cyber Security
Mathematics	23ABS74a	Wavelet transforms and its Applications
Physics	23ABS74b	Smart Materials And Devices
	23ABS74e	Introduction to Quantum Mechanics
Chemistry	23ABS74c	Green Chemistry And Catalysis For Sustainable Environment
H&S	23AHS74a	Employability Skills

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Open Elective-IV

Branch	Subject Code	Subject
CE	23ACE75a	Geo-Spatial Technologies
	23ACE75b	Solid Waste Management
EEE	23AEE75a	Electric Vehicles
ECE	23AEC75a	Transducers and Sensors
CSE	23ACS75a	Computer Networks
	23ACS75b	Internet of Things
	23ACS75c	Quantum Computing
Mathematics	23ABS75a	Financial Mathematics
Physics	23ABS75b	Sensors And Actuators For Engineering Applications
Chemistry	23ABS75c	Chemistry of Nanomaterials and Applications
H&S	23AHS75a	Literary Vibes

B.Tech IV Year II Semester

S.No	Course No	Course Name	Category	L-T-P	Credits
1	23AME89	Full Internship	PR	------	4
2	23AME99	Project Work			8
				Total	**12**

COURSES OFFERED FOR HONOURS DEGREE IN MECHANICAL ENGINEERING

S.No	Course Code	Course Title	Category	L-T-P	Credits
1	23AMEH01	Advanced Automotive Electronics	PC	3-0-0	3
2	23AMEH02	Application of Computational Fluid Dynamics	PC	3-0-0	3
3	23AMEH03	Mechanics And Manufacturing of Composite Materials	PC	3-0-0	3
4	23AMEH04	Application of Optimization Techniques	PC	3-0-0	3
5	23AMEH05	Advanced Mechanical Vibrations	PC	3-0-0	3
6	23AMEH06	Honor's Degree Project Work	PC	3-0-0	3
				Total	**18**

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MINOR DEGREE COURSES OFFERED TO MECHANICAL ENGINEERING

S.No.	Minor Title	Offered Branch	Subject Code	Course Name	Category	L-T-P	Credits
1	Building Planning & Construction Technology	Civil	23ACEM01	Construction Materials	PC	3-0-0	3
2			23ACEM02	Construction Methods	PC	3-0-0	3
3			23ACEM03	Building Planning And Drawing	PC	3-0-0	3
4			23ACEM04	Surveying	PC	3-0-0	3
5			23ACEM05	Concrete Technology	PC	3-0-0	3
6			23ACEM06	Concrete Technology Lab	PC	0-0-3	1.5
7			23ACEM07	Surveying Lab	PC	0-0-3	1.5
1	Energy Systems	EEE	23AEEM01	Energy Audit and Management	PC	3-0-0	3
2			23AEEM02	Energy Management in Building	PC	3-0-0	3
3			23AEEM03	Energy Storage Technologies	PC	3-0-0	3
4			23AEEM04	Energy Scenario and Energy Policy	PC	3-0-0	3
5			23AEEM05	Waste Energy Management	PC	3-0-0	3
6			23AEEM06	Project in Energy Systems	PC	0-0-6	3
1	Electronic and Communication Engineering	ECE	23AECM01	Electronic Circuits	PC	3-0-0	3
2			23AECM02	Digital Electronics	PC	3-0-0	3
3			23AECM03	Principles of Communication Engineering	PC	3-0-0	3
4			23AECM04	Electronic Instrumentation	PC	3-0-0	3
5			23AECM05	Microprocessors and Microcontrollers	PC	3-0-0	3
6			23AECM06	Electronic Circuits and Digital Electronics Lab	PC	0-0-3	1.5
7			23AECM07	Microprocessors and Microcontrollers Lab	PC	0-0-3	1.5
1	Computer Science and Engineering	CSE	23ACSM01	Data Structures And Algorithms	PC	3-0-0	3
2			23ACSM02	Software Engineering	PC	3-0-0	3
3			23ACSM03	Computer Organization	PC	3-0-0	3
4			23ACSM04	Web Technologies	PC	3-0-0	3
5			23ACSM05	Computer Networks	PC	3-0-0	3
6			23ACSM06	Data Structures and Algorithms Lab	PC	0-0-3	1.5
7			23ACSM07	Web Technologies Lab	PC	0-0-3	1.5
1	Cyber Security	CSE	23ACSM08	Introduction to Cyber Security	PC	3-0-0	3
2			23ACSM09	Cyber Crimes & Digital Forensics	PC	3-0-0	3
3			23ACSM10	Cryptography & Network Security (Pre-requisite: Computer Networks)	PC	3-0-0	3
4			23ACSM11	Cyber Laws and Security Policies	PC	3-0-0	3
5			23ACSM12	Blockchain Technology	PC	3-0-0	3
6			23ACSM13	Cyber Security Lab	PC	0-0-3	1.5
7			23ACSM14	Cryptography & Network Security Lab	PC	0-0-3	1.5
1	Internet of Things	CSE	23ACSM15	Introduction to IOT	PC	3-0-0	3
2			23ACSM16	Wireless Sensor Networks	PC	3-0-0	3
3			23ACSM17	Communication Protocols for IOT	PC	3-0-0	3
4			23ACSM18	Industrial IOT	PC	3-0-0	3
5			23ACSM19	Cloud Computing	PC	3-0-0	3
6			23ACSM20	IOT Lab	PC	0-0-3	1.5
7			23ACSM21	Cloud Computing Lab	PC	0-0-3	1.5
1	Data Science	CSE	23ACSM22	Introduction to Data Science	PC	3-0-0	3
2			23ACSM23	Statistical Learning for Data Science	PC	3-0-0	3
3			23ACSM24	Data Engineering	PC	3-0-0	3
4			23ACSM25	Machine learning fundamentals	PC	3-0-0	3
5			23ACSM26	Data Science applications	PC	3-0-0	3
6			23ACSM27	Data Science Practice Lab (R/Python)	PC	0-0-3	1.5

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7			23ACSM28	Statistical Learning & ML Lab	PC	0-0-3	1.5
1	Artificial Intelligence & Machine Learning	CSE	23ACSM29	Introduction to Artificial Intelligence	PC	3-0-0	3
2			23ACSM30	Machine Learning Fundamentals	PC	3-0-0	3
3			23ACSM31	Deep Learning & Neural Networks	PC	3-0-0	3
4			23ACSM32	Natural Language Processing	PC	3-0-0	3
5			23ACSM33	Computer Vision	PC	3-0-0	3
6			23ACSM34	AI & ML Lab	PC	0-0-3	1.5
7			23ACSM35	NLP & Computer Vision Lab	PC	0-0-3	1.5
1	Data Analytics	CSE	23ACSM36	Introduction to Data Analytics	PC	3-0-0	3
2			23ACSM37	Data Engineering	PC	3-0-0	3
3			23ACSM38	Predictive Analytics	PC	3-0-0	3
4			23ACSM39	Big Data Analytics (Hadoop,Spark)	PC	3-0-0	3
5			23ACSM40	Data Analytics with Power BI/Tableau/Matplotlib	PC	3-0-0	3
6			23ACSM41	Data Analytics Tools Lab	PC	0-0-3	1.5
7			23ACSM42	Big Data &NoSQL Lab	PC	0-0-3	1.5
1	Data Science and Analytics	CSE	23ACSM43	Introduction to Data Science	PC	3-0-0	3
2			23ACSM44	Statistical Learning for Data Science	PC	3-0-0	3
3			23ACSM45	Data Visualization & Exploratory Data Analysis	PC	3-0-0	3
4			23ACSM46	Big Data Analytics	PC	3-0-0	3
5			23ACSM47	Recommender Systems	PC	3-0-0	3
6			23ACSM48	Data Visualization & EDA Lab	PC	0-0-3	1.5
7			23ACSM49	Recommender System Lab	PC	0-0-3	1.5
1	Programming & Computational Intelligence	CSE	23ACSM50	Python for AI & Data Science	PC	3-0-0	3
2			23ACSM51	Data Structures & Algorithms for AI	PC	3-0-0	3
3			23ACSM52	Reinforcement Learning	PC	3-0-0	3
4			23ACSM53	Quantum Computing for AI	PC	3-0-0	3
5			23ACSM54	Edge AI & IOT	PC	3-0-0	3
6			23ACSM55	Python & DS Lab	PC	0-0-3	1.5
7			23ACSM56	RL & Quantum AI Lab	PC	0-0-3	1.5
1	AI Applications & Emerging Technologies	CSE	23ACSM57	AI in Finance & Business Analytics	PC	3-0-0	3
2			23ACSM58	Ethical AI & Responsible AI	PC	3-0-0	3
3			23ACSM59	Generative AI & Prompt Engineering	PC	3-0-0	3
4			23ACSM60	AI in Cyber security	PC	3-0-0	3
5			23ACSM61	AI in HealthCare	PC	3-0-0	3
6			23ACSM62	Generative AI Lab	PC	0-0-3	1.5
7			23ACSM63	AI Applications Lab	PC	0-0-3	1.5
1	Quantum Computing	CSE	23ACSM64	Introduction to Quantum Computing	PC	3-0-0	3
2			23ACSM65	Mathematical Foundations for Quantum Computing	PC	3-0-0	3
3			23ACSM66	Quantum Algorithms	PC	3-0-0	3
4			23ACSM67	Quantum Information and Communication	PC	3-0-0	3
5			23ACSM68	Quantum Machine Learning (QML)	PC	3-0-0	3
6			23ACSM69	Quantum Algorithms Lab	PC	0-0-3	1.5
7			23ACSM70	Quantum Programming and Simulation Lab	PC	0-0-3	1.5
1	Quantum Technologies	CSE	23ACSM71	Foundations of Quantum Technologies	PC	3-0-0	3
2			23ACSM72	Solid State Physics for Quantum Technologies	PC	3-0-0	3
3			23ACSM73	Quantum Optics Prerequisites for Quantum Technologies	PC	3-0-0	3
4			23ACSM74	Introduction to Quantum Communication	PC	3-0-0	3
5			23ACSM75	Introduction to Quantum Sensing	PC	3-0-0	3
6			23ACSM76	Quantum Communication and Sensing Lab	PC	0-0-3	1.5
7			23ACSM77	Quantum Devices and Materials Lab	PC	0-0-3	1.5

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L	T	P	C
3	0	0	3

LINEAR ALGEBRA & CALCULUS

(Common to All Branches of Engineering)

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

CO2: Utilize mean value theorems to real life problems.

CO3: Familiarize with functions of several variables which is useful in optimization.CO4: Learn important tools of calculus in higher dimensions.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT -1: Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (with out proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT -2 Linear Transformation and Orthogonal Transformation:

Eigen values, Eigenvectors and their properties, Diogonalisation of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT -3:Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT -4 : Partial differentiation and Applications (Multi variable calculus)

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

Prof. K. Seshachalam

UNIT -5 : Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text Books:

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

Reference Books:

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

Prof. K. Sule Mahesware

ENGINEERING PHYSICS

(Common for all branches of Engineering)

L T P C

3 0 0 3

Course Objectives:

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

Course Outcomes:

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction. (L3)

CO2: Familiarize with the basics of crystals and their structures. (L1)

CO3: Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles. (L2)

CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials. (L2)

CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids. (L2)

CO6: Identify the type of semiconductor using Hall effect. (L4)

Syllabus

UNIT I: Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

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

UNIT II: 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 III: 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 IV: Dielectric and Magnetic Materials

Prof. K. Selvaraju

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss, 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, applications of magnetic materials.

UNIT V: Semiconductors and Superconductors

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.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_C superconductors – Applications of superconductors.

Learning Resources:

Textbooks:

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

Reference Books:

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

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

Prof. K. Selvamohan

L	T	P	C
3	0	0	3

INTRODUCTION TO PROGRAMMING

(Common to All branches of Engineering)

Course Objectives:

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

Course Outcomes: A student after completion of the course will be able to

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyse a problem and develop an algorithm to solve it.
CO3: Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1									1	1	1	
CO2	1	2	1										1	1	
CO3	2	2	1										1	1	
CO4	2	1	1										1	1	
CO5	2	2	1										1	1	

UNIT I Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II Control Structures

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

UNIT III Arrays and Strings

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

UNIT IV Pointers & User Defined Data types

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

UNIT V Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, **Command line arguments,**

Basics of File Handling: why files, file opening and closing a data files, reading and writing a data file, processing data files.

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

Textbooks:

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

Reference Books:

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

L	T	P	C
3	0	0	3

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to All branches of 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

Course Outcomes:

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.

CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

CO4: Analyze different electrical circuits, performance of machines and measuring instruments.

CO5: Evaluate different circuit configurations, Machine performance and Power systems operation.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

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

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept

Department of ECE, JNTUACEP

ECE Subjects in 1st and 2nd Semester:

Year / Semester	Category	Name of the Subject	Branch	No. of credits
I B.Tech I Sem	Engineering Science	Basic Electrical & Electronics Engineering	ECE, CIVIL, MECH	3
I B.Tech I Sem	Engineering Science	Electrical & Electronics Engineering Workshop	ECE, CIVIL, MECH	1.5
I B.Tech II Sem	Professional Core	Network Analysis	ECE	3
I B.Tech II Sem	Professional Core	Network Analysis and Simulation Laboratory	ECE	1.5
I B.Tech II Sem	Engineering Science	Basic Electrical & Electronics Engineering	EEE, CSE	3
I B.Tech II Sem	Engineering Science	Electrical & Electronics Engineering Workshop	EEE, CSE	1.5

Web Resources:

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

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

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

Course Outcomes:

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.
CO2: Explain the characteristics of diodes and transistors.
CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.
C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

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

of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II Machines and Measuring Instruments

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

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

UNIT III Energy Resources, Electricity Bill & Safety Measures

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

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

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

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.

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1	0	4	3

ENGINEERING GRAPHICS

(Common to All Branches of Engineering)

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

- Understand the basic principles and conventions of engineering drawing use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students to draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces and draw different sections and development of surfaces of solids.
- Represent and convert isometric views to orthographic views and vice versa.

Course Outcomes: On completion of the course, the student should be able to:

- Understand the principles of engineering drawing, including engineering curves, orthographic and isometric projections.
- Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
- Understand and apply concepts of sectional views to represent and draw the details of solids in different positions and to draw their sectional views.
- Gain a clear understanding of the principles behind development of surfaces and to draw how to unfold basic geometric shapes into flat patterns.
- Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.

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, Cycloids, Involutes, Normal and tangent to Curves.

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

UNIT II

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

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; 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 and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

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 regular solids - cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

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

Textbook:

1. Engineering Drawing, N.D.Bhatt and Panchal, Charotar Publishing House, 2016.
2. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
3. Engineering Drawing + AUTO CAD, K.Venugopal and V.Prabhu Raja, 6th Edition, New Age International Publisher.

Reference Books:

1. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
2. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

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IT WORKSHOP

(Common to all branches of Engineering)

Course Objectives:

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

Course Outcomes:

CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1												
CO2															
CO3		1												2	
CO4			2		2									2	
CO5	1													2	

PC Hardware & Software Installation

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

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

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

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

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

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

LaTeX and WORD

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

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

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

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

EXCEL

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

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

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

LOOKUP/VLOOKUP

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

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

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

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

AI TOOLS – ChatGPT

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

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

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

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

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

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

GitHub: Basic Git Workflow,Installation & Setup of Git,Commits & Working with branches,GitHub Basics, Setting up Remote Repository,Fork and Pull Requests,Syncing Local and Remote Repositories.

Reference Books:

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

ENGINEERING PHYSICS LAB

(Common for all branches of Engineering)

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

Course Outcomes: The students will be able to

- Operate optical instruments like travelling microscope and spectrometer. (L3)
- Estimate the wavelengths of different colors using diffraction grating.(L3)
- Plot the intensity of the magnetic field of circular coil carrying current with distance. (L2)
- Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively. (L3)
- Calculate the band gap of a given semiconductor. (L4)
- Identify the type of semiconductor using Hall effect. (L3)

List of Experiments:

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

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

References:

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

Web resources

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

Prof K. Selvakumar

3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING 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.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

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

L	T	P	C
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COMPUTER PROGRAMMING LAB
(Common to All branches of Engineering)

Course Objectives:

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

Course Outcomes:
CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1									1	1	1	
CO2	1	2	1										1	1	
CO3	2	2	1										1	1	
CO4	2	1	1										1	1	
CO5	2	2	1										1	1	

UNIT I

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT II

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

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

i) Evaluate the following expressions.
    a. A+B*C+(D*E) + F*G
    b. A/B*C-B+A*D/3
    c. A+++B---A
    d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

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

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

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

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

ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6
Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series
i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

UNIT III

WEEK 7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial 7: 1 D Arrays: searching.
Lab 7:1D Array manipulation, linear search
i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort
i) Addition of two matrices
ii) Multiplication two matrices

iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK9:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

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

WEEK 10:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

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

UNIT V

WEEK 11:
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

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

WEEK 12:
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions
i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.
i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

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

Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: File operations
i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file

vi) Write a C program to print last n characters of a given file.

Textbooks:

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

Reference Books:

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year I Semester

23ABS07 - NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common to all branches)

L	T	P	C
0	0	1	0.5

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.
- To help the students understand and build interpersonal and interpersonal skills that will enable them to lead meaningful professional life.

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

CO1: Understand the importance of discipline, character and service motto. (L1)

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques. (L2)

CO3: Explore human relationships by analyzing social problems. (L3)

CO4: Determine to extend their help for the fellow beings and downtrodden people. (L4)

CO5: Develop leadership skills and civic responsibilities. (L5)

UNIT – 1: Orientation — **04 Hrs**

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

Activities:

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

UNIT – II: *Nature & Care* — **04 Hrs**

Activities:

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

UNIT – III: Community Service — **04 Hrs**

Activities:

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

2. Conducting awareness programs on Health-related issues such as General Health.Mental health, Spiritual Health, HIV/AIDS,
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
5. 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*
2. Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6).
3. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
4. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
5. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2/e 2007
6. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

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

Evaluation Guidelines:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

I B.Tech - II Sem (R23)

L	T	P	C
3	0	0	3

Differential Equations and Vector calculus
(Common to All Branches of Engineering)

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and vector calculus
2	To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

COURSE OUTCOMES	
CO1	Solve the linear differential equations related to various engineering fields
CO2	Solve the differential equations reducible to linear, and finds the relevant applications.
CO3	Identify solution methods for partial differential equations that model physical processes
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO5	Estimate the work done against a field, circulation and flux using vector calculus and also to establish the relations between them using vector integral theorems.

UNIT –I: Differential equations of first order and first degree
Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits

UNIT –II: Linear differential equations of higher order (Constant Coefficients)
Definitions: homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian. Linear Differential Equations of second Higher Order with constant coefficients with RHS terms of the type e^{ax+b},$\sin(ax+b)$,$\cos(ax+b)$, polynomials in x, $e^{ax}V(x)$,$xV(x)$where $V(x)$is a function of x, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III: Partial Differential Equations
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of PDE of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT-IV: Vector differentiation
Scalar and vector point functions, vector differential operator Del, Del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT –V: Vector integration
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Text Books:

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

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
3. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson

Prof. K. Selvaraj

L T P C

3 0 0 3

ENGINEERING CHEMISTRY

(Common to Civil and Mechanical Engineering)

Course Objectives:

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

Course Outcomes:

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

CO1: Demonstrate the corrosion prevention methods and factors affecting corrosion.
CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting plastics, elastomers & conducting polymers.
CO3: Define & Summarize calorific values, octane number and refining of petroleum.
CO4: Examine, Anlyse the setting and hardening of cement.
CO5: Summarize and compare the properties and applications of colloids, micelle and nanomaterials.

UNIT I Water Technology (6 Hrs)

Hard water and soft water , Estimation of hardness of water by complexometry (EDTA Method), Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement,- Purification of water: Ion-exchange processes - desalination of brackish water by Reverse Osmosis (RO) and electrodialysis; Specifications for safe drinking water as per the Bureau of Indian Standards (BIS)and World Health Organization (WHO) standards, Industrial water treatment.

UNIT II Electrochemistry (11 Hrs)

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.Primary cells – Zinc-air battery, Na-Air Battery, Secondary cells – Nickel-Cadmium (Ni-Cd) and lithium ion batteries- working principle of the batteries including cell reactions;

Fuel cells-Basic Concepts,the principle and working of hydrogen-oxygen Fuel cell.
Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electroless plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry (9 Hrs)

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growthpolymerization, Polydispersity Index(PDI).

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Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of polystyrene, PVC, Nylon 6,6 and Bakelite.
Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.
Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-biodiesel.

UNIT IV Modern Engineering Materials (8 Hrs)
Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforcedcomposites, 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, saphonification number andapplications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement (Chemical reactions involved).

UNIT V Surface Chemistry and Nanomaterials (11 Hrs)
Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents.
Adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.
3. **K. Sesha Maheswaramma,** Mridula Chugh, "**Engineering Chemistry**", Pearson Publications Pvt., Ltd., 2016 (ISBN 978-93-325-7118-1).

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

Prof. K. Sesha Maheswaramma

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year I Semester

23AHS01 - COMMUNICATIVE ENGLISH

(Common to all Branches)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

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

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

- **CO1**: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.. (L1)
- **CO2:** Apply grammatical structures to formulate sentences and correct word forms. (L2)
- **CO3:** Analyze discourse markers to speak clearly on a specific topic in informal discussions. (L3)
- **CO4:** Evaluate reading / listening texts and to write summaries based on globalcomprehension of these texts. (L4)
- **CO5:** Create a coherent paragraph, essay, and resume. (L5)

UNIT – 1 **09 Hrs**

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

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

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

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

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

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

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

UNIT – II **09 Hrs**

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

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

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

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe ideas in a paragraph together.

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

Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.**Vocabulary:** Homonyms, Homophones, Homographs.

UNIT – III	09 Hrs

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 isdiscussed.

Reading: Readinga text in detail by making basic inferences -recognizing and interpretingspecific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing.

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

Vocabulary: Compound words, Collocations.

UNIT – IV	09 Hrs

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes.

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

Vocabulary: Words often confused, Jargons.

UNIT – V	09 Hrs

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

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

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

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

Vocabulary: Technical Jargons.

Text Books:

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

Reference Books:

1. **Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020**
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

Online Learning 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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year II Semester

23ACME01 –BASIC CIVIL AND MECHANICAL ENGINEERING

(ME, CE& ECE)

L	T	P	C
3	0	0	3

Part A – BASIC CIVIL ENGINEERING

Course Objectives: The objectives of the course are to make the students learn about

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

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

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

UNIT – I: **8 Hrs**

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT – II: **10Hrs**

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

UNIT – III: **8 Hrs**

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

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

Text Books:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.

2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives: The objectives of the course are to make the students learn about

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

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

CO1: Understand the different manufacturing processes.
CO2: Explain the basics of thermal engineering and its applications.
CO3: Describe the working of different mechanical power transmission systems and power plants.
CO4: Describe the basics of robotics and its applications.

UNIT – I: **8 Hrs**

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT – II: **10Hrs**

Manufacturing Processes: Principles of Casting, Forming, Machining, Joining processes Introduction to CNC machines, 3D Printing, and Smart manufacturing.
Thermal Engineering – IC Engines, Otto cycle, Diesel cycle, 2-Stroke and 4-Stroke engines, SI & CI Engines, Working principle of Boilers, Refrigeration and Air-Conditioning cycles, Components of Electric and Hybrid Vehicles.

UNIT – III: **8 Hrs**

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. An Introduction to Mechanical Engineering, Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.
2. Elements of Mechanical Engineering, Dr.Sadhu Singh, S.Chand & Co Ltd.
3. Basic Civil and Mechanical Engineering, P.Selvaraj, M.Periyaswamy and S.Selvakumar, Scitech Publications,

Reference Books:

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year II Semester

23AME03 – ENGINEERING MECHANICS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

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

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

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

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

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

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

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

UNIT – I: **8 Hrs**

Introduction to Engineering Mechanics – Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Forces and its Applications – Couple 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, Application – Screw Friction and Wedge Friction.

UNIT – II: **10Hrs**

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach,

Trusses: Analysis of Plane Trusses – Method of Joints and Method of Sections.

UNIT – III: **8 Hrs**

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: **8Hrs**

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: **8Hrs**
Rigid body Motion: Principal of Virtual Work, with simple examples, Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.
Text Books:
1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education, 2017.
2. Engineering Mechanics, S.S.Bhavikatti, 7th Edition, New Age Publishers, 2019.
3. Engineering Mechanics: Statics and Dynamics, A.K.Tayal, 14th Edition, Engineering and Technology Books.
Reference Books:
1. ' Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022
2. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education.
3. Engineering Mechanics, Statics and Dynamics, I.H. Shames., 4th Edition, PHI, 2002.
Online Learning Resources:
• chrome-extension://kdpelmjpfafjppnhbloffcjpcomlnpah/https://www.pw.live/exams/wp-content/uploads/2023/11/6_Engineering-Mechanics_1-9.pdf
• https://archive.nptel.ac.in/courses/112/106/112106286/
• https://www.youtube.com/watch?v=6nguX-cEsvw
• https://archive.nptel.ac.in/courses/112/106/112106180/
• https://onlinecourses.nptel.ac.in/noc21_me70/preview

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year I Semester

23AHS02 - COMMUNICATIVE ENGLISH LAB

(Common to all Branches)

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

- The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning.
- The students will get trained in basic communication skills and also make them ready to face job interviews.

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

- CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills. (L1)
- CO2: Apply communication skills through various language learning activities. (L2)
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. (L3)
- CO4: Evaluate and exhibit professionalism in participating in debates and group discussions. (L4)
- CO5: Create effective Course Objectives: (L5)

UNIT – 1 **09 Hrs**

List of Topics:

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

Text Books:

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

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013.
3. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
4. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.

Online Learning Resources:

Suggested Software:

- Walden Infotech
- Young India Films

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

L	T	P	C
0	0	3	1.5

ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting operations and electrical house wiring skills, foundry operations, welding work and plumbing operations.

Course Outcomes:

- Identify workshop tools and their operational capabilities.
- Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
- Apply fitting operations in various applications.
- Apply basic electrical engineering knowledge for House Wiring Practice.
- Identify plumbing practice tools and apply plumbing operations.

SYLLABUS

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint d) Job on Wood working lathe

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) Brazing d) Non metal sheet cutting and joining of glass, fibre glass and ceramic e) Riveting joint of two sheets/ Plates.

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:** a)Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns b) Job on 3D printing Machine.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019.
2. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edition. 2015.
3. Workshop practice manual by K.Venkat Reddy, 6th Edition, BS Publications, 2022.

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.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year II Semester

23AME04 - ENGINEERING MECHANICS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Verify the Law of Parallelogram, Triangle of forces and law of polygon for coplanar concurrent forces.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Analyse the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.
- Verify law of moment using rotating disc and conditions of equilibrium of a rigid body of a simply supported beam.
- Verify the Law of Parallelogram, Triangle of forces and law of polygon for coplanar concurrent forces.

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

CO1: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.

CO2: Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.

CO3: Determine the Centre of gravity and Moment of Inertia of different configurations.

CO4: Verify the equilibrium conditions of a rigid body under the action of different force systems.

Students have to perform any 10 of the following Experiments:

List of Experiments:

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static, Rolling and Wedge Friction.
5. Determination of Centroid, Centre of Gravity of different shaped Plane Lamina/ Solid.
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. Engineering Mechanics, K.L.Kumar and Veenu Kumar, 4th Edition, Tata McGraw Hill Education, 2017.
2. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education, 2017.
3. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, PearsonEducation, Inc., New Delhi, 2022

Online Learning Resources:
• https://kdm-iitkgp.vlabs.ac.in/List%20of%20experiments.html
• https://www.youtube.com/watch?v=3E-L55GHbY4
• https://www.youtube.com/watch?v=nTEW1zvAwxQ
• http://kcl.digimat.in/nptel/courses/video/112104252/L32.html
• https://www.youtube.com/watch?v=alHUJ-jvrpU

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech I Year I Semester

23ABS06 - HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to all branches)

L	T	P	C
0	0	1	0.5

Course Objectives:

1. The main objective of introducing this course is to make the students maintain their mental andphysical wellness by balancing emotions in their life.
2. It mainly enhances the essential traits required for the development of the personality.

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

CO1: Understand the importance of yoga and sports for Physical fitness and sound health. (L1)

CO2: Demonstrate an understanding of health-related fitness components. (L2)

CO3: Compare and contrast various activities that help enhance their health. (L3)

CO4: Assess current personal fitness levels. (L4)

CO5: Develop Positive Personality. (L5)

UNIT – 1: **4 Hrs**

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

Activities:

i) Organizing health awareness programmes in community.
ii) Preparation of health profile.
iii) **Preparation of chart for balance diet for all age groups.**

UNIT – II **4 Hrs**

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 **4 Hrs**

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

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 SurvivingAnywhere Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014.

General Guidelines:

1) Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2) Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3) Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AHS31 - UNIVERSAL HUMAN VALUES

(Common to all branches)

L	T	P	C
2	1	0	3

Course Objectives:

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

Course Outcomes:

At the end of this Course the student will be able to

Course Outcomes:		**Blooms Level**
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	L1
CO2	Identify one's self, and one`s surroundings (family, society nature)	L2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	Relate human values with human relationship and human society.	L4
CO5	Justify the need for universal human values and harmonious existence	L5

UNIT I Introduction to Value Education (6 lectures and 3 tutorials for practice session)	**09 Hrs**

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)	**09 Hrs**
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)	**09 Hrs**
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 fulfill Human Goal.	
UNIT – IV : Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)	**06 Hrs**
Lecture 19: Understanding Harmony in the Nature. Lecture 20: Interconnectedness, self-regulation and Mutual Fulfillment 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.	

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME31 – THERMODYNAMICS

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize concepts of heat, work, energy and governing rules for conversion of one form to other.
- Explain relationships between properties of matter and basic laws of thermodynamics.
- Teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- Introduce the concept of available energy for maximum work conversion.
- Provide fundamental concepts of Refrigeration and Psychrometry.

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

CO1: Explain the importance of thermodynamic properties related to conversion of heat energy into work.

CO2: Apply the Zeroeth and First Law of Thermodynamics.

CO3: Understand Second Law of Thermodynamics.

CO4: Analyze the Mollier charts, T-S and h-s diagrams, Steam calorimetry, Phase Transformations.

CO5: Evaluate the COP of refrigerating systems and properties, processes of psychrometry and sensible and latent heat loads.

UNIT – I: **8 Hrs**

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: **10Hrs**

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: **8 Hrs**

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: **8Hrs**

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: **8Hrs**

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

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME32 – MECHANICS OF SOLIDS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

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

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

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.

CO2: Aanalyze beams and draw correct and complete shear and bending moment diagrams for beams.

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.

CO4: Model &Analyze the behavior of basic structural members subjected to various loads.

CO5: Design and analysis of Industrial components like pressure vessels.

UNIT – I: **8 Hrs**

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: **10Hrs**

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, uniformly distributed loads, 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: **8 Hrs**

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: **8Hrs**

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: **8Hrs**

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, New Delhi, 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.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc19_ce18/preview.
• https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6.
• https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
• https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
• https://www.coursera.org/learn/mechanics-1

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME33 – MATERIAL SCIENCE AND METALLURGY

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.
- Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains
- Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
- Grasp the methods of making of metal powders and applications of powder metallurgy
- Comprehend the properties and applications of ceramic, composites and other advanced methods

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

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

CO2: Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains.

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

CO4: Grasp the methods of making of metal powders and applications of powder metallurgy.

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

UNIT – I: **8 Hrs**

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-Fe_3C.

UNIT – II: **10Hrs**

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast iron. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

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

UNIT – III: **8 Hrs**

Heat treatment of Steels: Effect of alloying elements on Fe-Fe_3C system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, age hardening treatment, Cryogenic treatment.

UNIT – IV: **8Hrs**

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: **8Hrs**

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Ceramic and Advanced materials: Crystalline ceramics, glasses, cermets, abrasive materials, Introduction to Nanomaterials and smart materials. **Composites:** Introduction, Structure of Reinforced Plastics, Properties of Reinforced Plastics, Applications of Reinforced Plastics, Metal – Matrix Composites, Ceramic – Matrix Composites.
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.
Online Learning Resources:
• https://archive.nptel.ac.in/courses/113/106/113106032/
• https://www.edx.org/learn/mechanics/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-3-time-dependent-behavior.
• https://www.youtube.com/watch?v=9Sf278j1GTU
• https://www.coursera.org/learn/fundamentals-of-materials-science
• https://www.coursera.org/learn/material-behavior.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME36 – MECHANICS OF SOLIDS AND MATERIAL SCIENCE LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Evaluate the values of yield stress, ultimate stress and bending stress of the given specimen under tension test and bending test
- Conduct the torsion test to determine the modulus of rigidity of given specimen.
- Justify the Rockwell hardness test over with Brinell hardness and measure the hardness of the given specimen.
- Examine the stiffness of the open coil and closed coil spring and grade them.
- Analyze the microstructure and characteristics of ferrous and non ferrous alloy specimens.

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

CO1: Understand the stress strain behavior of different materials.

CO2: Evaluate the hardness of different materials.

CO3: Explain the relation between elastic constants and hardness of materials.

CO4: Identify various microstructures of steels and cast irons.

CO5: Evaluate hardness of treated and untreated steels.

NOTE: Any 6 experiments from each section A and B.

A) MECHANICS OF SOLIDS LAB:

1. Tensile test
2. Bending test on
   a) Simply supported beam
   b) Cantilever beam
3. Torsion test
4. Hardness test
   a) Brinell's hardness test
   b) Rockwell hardness test
   c) Vickers hardness test
5. Test on springs
6. Impact test
   a) Charpy test
   b) Izod test
7. Punch shear test
8. Liquid penetration test

B) MATERIAL SCIENCE LAB:

1. Preparation and study of the Microstructure of pure metals.
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, and High carbon steels.
3. Study of the Microstructures of Cast Irons.
4. Study of the Microstructures of Non-Ferrous alloys.
5. Study of the Microstructures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.

Online Learning Resources:

1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress. (https://virtual-labs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)

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2. To find the impact resistance of mild steel and cast iron.(https://sm-nitk.vlabs.ac.in/exp/izod-impact-test).
3. To find the impact resistance of mild steel.(https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/index.html)
4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel etc. (https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)
5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine. (https://sm-nitk.vlabs.ac.in/exp/vickers-hardness-test).

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME37 – COMPUTER-AIDED MACHINE DRAWING

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Introduce conventional representations of material and machine components.
- Train to use software for 2D and 3D modeling.
- Familiarize with thread profiles, riveted, welded and key joints.
- Teach solid modeling of machine parts and their sections.
- Explain creation of 2D and 3D assembly drawings and familiarize with limits, fits, and tolerances in mating components

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

CO1: Demonstrate the conventional representations of materials and machine components.

CO2: Model riveted, welded and key joints using CAD system.

CO3: Create solid models and sectional views of machine components.

CO4: Generate solid models of machine parts and assemble them.

CO5: Translate 3D assemblies into 2D drawings.

UNIT – I: **8 Hrs**

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.
3. Narayana K.L., Kannaiah P., K.Venkata Reddy, Production Drawing, 3/e, New Age International 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.

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

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year I Semester

23AME38 – EMBEDDED SYSTEMS & IoT LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

- To comprehend Microcontroller-Transducers Interface techniques
- To establish Serial Communication link with Arduino
- To analyze basics of SPI interface.
- To interface Stepper Motor with Arduino
- To analyze Accelerometer interface techniques

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

CO1: Comprehend Microcontroller-Transducers Interface techniques.

CO2: Establish Serial Communication link with Arduino

CO3: Analyze basics of SPI interface.

CO4: Understand the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor.

CO5: Realize the revolution of internet in mobile devices, cloud and sensor networks

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 and Node MCU.
9. Calculate the moisture content in the soil using Arduino and Node MCU.
10. Calculate the distance using distance sensor Using Node MCU.
11. Basic LED functionality Using Node MCU.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.
3. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
4. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.
5. Arsheep Bahga & Vijay Madisetti, Internet of Things - A Hands-on Approach, 1/e, Orient Blackswan Private Limited - New Delhi, 2015.
6. Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
7. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,

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

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IIYearB.Tech.CSE–ISemester

L	T	P	C
0	1	2	2

(23ACS49)PYTHONPROGRAMMING (SKILL ENHANCEMENT COURSE)

CourseObjectives: Themainobjectivesofthecourseareto

- IntroducecoreprogrammingconceptsofPythonprogramminglanguage.
- DemonstrateaboutPythondatastructureslikeLists,Tuples,Setsanddictionaries
- ImplementFunctions,ModulesandRegularExpressionsinPythonProgramming and to create practical and contemporary applications using these

CourseOutcomes: Aftercompletionofthecourse,studentswillbeableto

- ClassifydatastructuresofPython(L4)
- Apply Python programming concepts to solve a variety of computational problems (L3)
- Understand the principles of object-oriented programming (OOP) in Python,including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
- Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
- Exhibitcompetenceinimplementingandmanipulatingfundamental datastructures such as lists, tuples, sets, dictionaries (L3)
- Proposenewsolutionstocomputationalproblems(L6)

UNTI-I: History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.
Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

SampleExperiments:

1. Writeaprogramtofindthelargestelementamongthree Numbers.
2. WriteaProgramtodisplayallprime numberswithinaninterval
3. Writeaprogramtoswaptwonumberswithoutusingatemporaryvariable.
4. DemonstratethefollowingOperatorsinPythonwithsuitableexamples.
   i)ArithmeticOperatorsii)RelationalOperatorsiii)AssignmentOperatorsiv)Logical Operatorsv)BitwiseOperatorsvi)TernaryOperatorvii)MembershipOperators viii)IdentityOperators
5. Writeaprogramtoaddandmultiplycomplexnumbers
6. Writeaprogramtoprint multiplicationtableofagivennumber.

UNIT-II: Functions: Built-InFunctions, CommonlyUsedModules, FunctionDefinitionand Calling the function, return Statement and void Function, Scope and Lifetime of Variables,Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. **Strings:**CreatingandStoringStrings,BasicStringOperations,AccessingCharactersin String by Index Number, String Slicing and Joining, String Methods, Formatting Strings. **Lists**: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-InFunctions Used on Lists, List Methods, del Statement.

SampleExperiments:

7. Writeaprogramtodefineafunctionwithmultiplereturnvalues.
8. Writeaprogramtodefineafunctionusingdefaultarguments.
9. Writeaprogramtofindthelengthofthestringwithoutusinganylibraryfunctions.
10. Writeaprogramtocheckifthesubstringispresentinagivenstringornot.
11. Writeaprogramtoperformthegivenoperationsonalist:
    i. Addition ii.Insertion iii.slicing
12. Writeaprogramtoperformany5 built-infunctionsbytakinganylist.

UNIT-III: Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. **Tuples and Sets:** Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

SampleExperiments:

13. Writeaprogramto createtuples(name, age, address, college) for at least twomembers and concatenate the tuples and print the concatenated tuples.
14. Writeaprogramtocountthenumberofvowelsinastring(Nocontrolflowallowed).
15. Writeaprogramtocheckifagivenkeyexists inadictionaryornot.
16. Writeaprogramtoaddanewkey-valuepairtoanexistingdictionary.
17. Writeaprogramtosumalltheitems inagivendictionary.

UNIT-IV:Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance,Polymorphism.

<SampleExperiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Pythonprogramtoprint eachlineofafileinreverseorder.
20. Pythonprogramtocomputethenumberofcharacters,wordsandlinesina file.
21. Write a program to create, display, append, insert and reverse the order of the itemsin the array.
22. Writeaprogramtoadd,transposeand multiplytwomatrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate itsareaandperimeter.Implement subclassesfordifferent shapeslikecircle, triangle, and square.

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B.Tech II Year II Semester

23AME341 – MANUFACTURING PROCESSES

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Know the working principle of different metal casting processes and gating system.
- Classify the welding processes, working of different types of welding processes and welding defects.
- Know the nature of plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes.
- Understand the principles of forging, tools and dies, working of forging processes.
- Know about the Additive manufacturing.

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

CO1: Design the patterns and core boxes for metal casting processes

CO2: Understand the different welding processes

CO3: Demonstrate the different types of bulk forming processes

CO4: Understand sheet metal forming processes

CO5: Learn about the different types of additive manufacturing processes

UNIT – I: **8 Hrs**

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: **10Hrs**

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: **8 Hrs**

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: **8Hrs**

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.

UNIT – V: **8Hrs**

Additive manufacturing - Steps in Additive Manufacturing (AM), Classification of AM processes, Advantages of AM and materials for AM, AM Processes – Fused Deposition Modelling, Stereolithography Apparatus, Selective Laser Sintering, Post Processing Methods.

Fabrication of Microelectronic Devices: Introduction, Semiconductors and Silicon, Crystal Growing and Wafer Preparation, Film Deposition, Oxidation, Lithography, Etching, Diffusion and Ion Implantation, Metallization and Testing, Bonding and Packing, Yield and Reliability, Printed Circuit Boards.

Text Books:
1. Kalpak jain 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.
Online Learning Resources:
• https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology-fundamentals-of-manufacturing-processes
• https://onlinecourses.nptel.ac.in/noc21_me81/preview
• www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
• https://archive.nptel.ac.in/courses/112/103/112103263/
• https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-forming-technology/?v=c86ee0d9d7ed

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AME42 – FLUID MECHANICS &HYDRAULIC MACHINES

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Understand the properties of fluids, manometry, hydrostatic forces acting on different surfaces
- Understand the kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations.
- Understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

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

CO1: Understand the basic concepts of fluid properties.

CO2: Estimate the mechanics of fluids in static and dynamic conditions.

CO3: Apply the Boundary layer theory, flow separation and dimensional analysis.

CO4: Estimate the hydrodynamic forces of jet on vanes in different positions.

CO5: Understand the working Principles and performance evaluation of hydraulic pump and turbines.

UNIT – I: **8 Hrs**

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 meta center height. Stability analysis and applications.

UNIT – II: **10Hrs**

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, doublet and 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: **8 Hrs**

Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluffbody 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: **8Hrs**

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: **8Hrs**

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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 – lossesand 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 Turbomachinery,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. R.K.Bansal, Fluid Mechanics and Hydraulic Machines, 10/e, Laxmi Publications (P) Ltd, 2019.
3. R.K.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, NewAge International, 2002.
Online Learning Resources:
• https://archive.nptel.ac.in/courses/112/105/112105206/
• https://archive.nptel.ac.in/courses/112/104/112104118/
• https://www.edx.org/learn/fluid-mechanics
• https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in
• www.coursera.org/learn/fluid-powerera

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AME43 – MACHINE TOOLS AND METROLOGY

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn the fundamental knowledge and principles of material removal processes.
- To understand the basic principles of lathe, shaping, slotting and planning machines.
- To demonstrate the fundamentals of drilling, milling and boring processes.
- To discuss the concepts of super finishing processes and limits and fits.
- To understand the concepts of surface roughness and optical measuring instruments.

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

CO1: Learn the fundamental knowledge and principals in material removal process.

CO2: Acquire the knowledge on operations in conventional, automatic, Capstan and turret lathes.

CO3: Capable of understanding the working principles and operations of shaping, slotting, planning, drilling and boring machines.

CO4: Able to make gear and keyway in milling machines and understand the indexing mechanisms

CO5: Understand the different types of Surface roughness and Optical measuring instruments

UNIT – I: **8 Hrs**

FUNDAMENTAL OF MACHINING: Elementary treatment of metal cutting theory – element of cutting process – Single point cutting tools, nomenclature of single point cutting tool, tool signature, tool angles, mechanism of metal cutting, types of chips and chip formation – built up edge and its effects, chip breakers, mechanics of orthogonal and oblique cutting –Merchant's force diagram, cutting forces, velocity ratio, cutting speeds, feed, depth of cut, tool life, Taylor's tool life equation, simple problems - Tool wear, tool wear mechanisms, machinability, economics of machining, coolants, tool materials and properties.

UNIT – II: **10Hrs**

LATHE MACHINES: Introduction- types of lathe - Engine lathe – principle of working - construction - specification of lathe - work holders and tool holders – accessories and attachments – lathe operations – taper turning methods and thread cutting – drilling on lathes – cutting speed and feed-depth of cut- machining time calculations.

SHAPING, SLOTTING AND PLANNING MACHINES: Introduction - principle of working – principle parts – specifications - operations performed - slider crank mechanism - machining time calculations.

UNIT – III: **8 Hrs**

DRILLING & BORING MACHINES: Introduction – construction of drilling machines – types of drilling machines - principles of working – specifications- types of drills – geometry of twist drill - operations performed –cutting speed and feed – machining time calculations - Boring Machines – fine Boring Machines – jig boring machines - deep hole Drilling Machines.

MILLING MACHINES: Introduction - principle of working – specifications – milling methods - classification of Milling Machines –types of cutters - geometry of milling cutters – methods of indexing, accessories to milling machines - cutting speed and feed – machining time calculations

UNIT – IV: **8Hrs**

FINISHING PROCESSES: Introduction - theory of grinding – classification of grinding machines- cylindrical and surface grinding machines- tool and cutter grinding machines- different types of abrasives- bonds, specification and selection of a grinding wheel-lapping, Honing & Broaching operations - comparison to grinding.

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, different types of fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, deterministic & statistical tolerances, selective assembly- International standard system of tolerances, selection of limits and tolerances for correct functioning, simple problems related to limits and fits, Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges – inspection of gauges.
UNIT – V: **8Hrs**
SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, simple problems - method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish. **OPTICAL MEASURING INSTRUMENTS:** Tools maker's microscope, Autocollimators, Optical projector, Optical flats-working principle, construction, merits, demerits and their uses. optical comparators.
Text Books:
1. Manufacturing Processes / JP Kaushish/ PHI Publishers-2nd Edition
2. Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill
3. Engineering Metrology – R.K. Jain/Khanna Publishers
Reference Books:
1. Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
2. Production Technology / H.M.T. Hand Book (Hindustan Machine Tools).
3. Production Engineering/K.C Jain & A.K Chitaley/PHI Publishers
4. Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
5. Manufacturing Processes for Engineering Materials-Kalpak Jian S & Steven R Schmid/Pearson Publications 5th Edition
Online Learning Resources:
• https://archive.nptel.ac.in/courses/112/105/112105233/
• **https://archive.nptel.ac.in/courses/112/105/112105306/**
• https://onlinecourses.nptel.ac.in/noc21_me04/preview
• https://archive.nptel.ac.in/courses/112/104/112104250/
• https://nptel.ac.in/courses/112106179

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AHS03d – INDUSTRIAL MANAGEMENT

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

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

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

CO1: Learn about how to design the optimal layout

CO2: Demonstrate work study methods

CO3: Explain Quality Control techniques

CO4: Discuss the financial management aspects and

CO5: Understand the human resource management methods.

UNIT – I: **8 Hrs**

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.

Forecasting: Introduction, Statistical Forecasting Techniques, Moving Averages, Exponential Smoothing Technique, Errors in Forecasting and Evaluation of Forecasting Techniques.

UNIT – II: **10Hrs**

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques foroptimaldesignoflayouts,plantmaintenance,preventiveandbreakdown maintenance.

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: **8 Hrs**

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: **8Hrs**

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: **8Hrs**

HUMAN RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, and types.

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

Text Books:

1. O.P Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd, 2018.
2. Mart and Telsang, Industrial Engineering and Production Management, S.Chand & Company Ltd. New Delhi, 2006.
Reference Books:
1. Bhattacharya DK, Industrial Management, S.Chand, publishers, 2010.
2. J.G Monks, Operations Management,3/e, McGraw Hill Publishers1987.
3. T.R. Banga, S.C.Sharma, N. K. Agarwal,Industrial Engineering and Management Science, Khanna Publishers, 2008.
4. Koontz O'Donnell, Principles of Management, 4/e, McGraw Hill Publishers, 1968.
5. R.C.Gupta, Statistical Quality Control, Khanna Publishers, 1998.
6. NVS Raju, Industrial Engineering and Management,1/e, Cengage India Private Limited, 2013.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc21_me15/preview
• https://onlinecourses.nptel.ac.in/noc20_mg43/preview
• https://www.edx.org/learn/industrial-engineering
• https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi
• https://youtube.com/playlist?list=PLbjTnj-t5Gkl0z3OHOGK5RB9mvNYvnlmW&si=oaX_5RG69hS3v2ll

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AHS03B - ORGANIZATIONAL BEHAVIOR

(Common to all branches)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

1. To enable student's comprehension of organizational behavior.
2. To offer knowledge to students on self-motivation, leadership and management.
3. To facilitate them to become powerful leaders.
4. To Impart knowledge about group dynamics.
5. To make them understand the importance of change and development

Course Outcomes: At the end of this Course the student will be able to

1. Understand the nature and concept of Organizational behaviour. (L1)
2. Analyse the different theories of leadership. (L2)
3. Apply theories of motivation to analyse the performance problems. (L3)
4. Evaluate group dynamics. (L4)
5. Develop as powerful leader. (L5)

UNIT –I : Introduction to Organizational Behavior — 09 Hrs

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.

UNIT – II: Motivation and Leading — 09 Hrs

Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

UNIT – III Organizational Culture — 09 Hrs

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

UNIT – IV Group Dynamics — 09 Hrs

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution.

UNIT – V Organizational Change and Development	09 Hrs
Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development.	
Text Books:	
1. Luthans, Fred, OrganisationalBehaviour, McGraw-Hill, 12 Th edition.	
2. P Subba Ran, OrganisationalBehaviour, Himalya Publishing House.	
Reference Books:	
1. McShane, Organizational Behaviour, TMH.	
2. Nelson, OrganisationalBehaviour, Thomson.	
3. Robbins, P. Stephen, Timothy A. Judge, OrganisationalBehaviour, Pearson.	
4. Aswathappa, OrganisationalBehaviour, Himalaya.	
Online Learning Resources: https://www.slideshare.net/Knight1040/organizational-culture 9608857 https://www.slideshare.net/AbhayRajpoot3/motivation-165556714 https://www.slideshare.net/harshrastogi1/group-dynamics-159412405 https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951	

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AHS03C - BUSINESS ENVIRONMENT

(Common to all Branches)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

To make the student understand about the business environment.

To enable them in knowing the importance of fiscal and monitory policy.

Course Outcomes: At the end of this Course the student will be able to

Apply the knowledge of Money markets in future investment. (L1)

Analyze India's Trade Policy. (L2)

Evaluate fiscal and monitory policy. (L3)

Develop a personal synthesis and approach for identifying business opportunities. (L4)

Understand various types of business environment. (L5)

UNIT – I: Overview of Business Environment **08 Hrs**

Introduction – meaning Nature, Scope, significance, functions and advantages. Types- Internal &External, Micro and Macro. Competitive structure of industries - Environmental analysis- advantages & limitations of environmental analysis.

UNIT – II: FISCAL & MONETARY POLICY **08 Hrs**

FISCAL POLICY - Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - Highlights of Budget - **MONETARY POLICY** - Demand and Supply of Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance Commission.

UNIT – III: TRADE POLICY **08 Hrs**

INDIA'S TRADE POLICY - Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - **BALANCE OF PAYMENTS** – Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

UNIT – IV: WORLD TRADE ORGANIZATION **08 Hrs**

WORLD TRADE ORGANIZATION - Nature and Scope - Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT – V: MARKETS **08 Hrs**

MONEY MARKETS AND CAPITAL MARKETS - Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor

protection and role of SEBI.

Text Books:

1. Francis Cherunilam (2009), "International Business": Text and Cases, Prentice Hall of India.
2. K. Aswathappa, "Essentials of Business Environment": Texts and Cases & Exercises 13th Revised Edition.HPH2016.

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AME47 – FLUID MECHANICS & HYDRAULIC MACHINERY LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

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

CO1: Demonstrate the devices used for measuring flow.

CO2: Compute major losses in pipes.

CO3: Illustrate the operating parameters of turbines.

CO4: Explain the working of different types of pumps.

CO5: Explain the devices used for measuring flow.

List of Experiments

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Determination of friction factor for a given pipeline.
4. Determination of loss of head due to sudden contraction in a pipeline.
5. Impact of jets on Vanes.
6. Performance Test on Pelton Wheel.
7. Performance Test on Francis Turbine.
8. Performance Test on Kaplan Turbine.
9. Turbine flow meter.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

Online Learning Resources:

1. To study different patterns of a flow through a pipe and correlate them with the Reynolds number of the flow. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/reynolds/introduction.html)
2. To calculate Total Energy at different points of venture meter. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/introduction.html).
3. To calculate the flow (or point) velocity at center of the given tube using different flow rates. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/pitot/introduction.html)
4. To determine the hydrostatic force on a plane surface under partial submerge and full submerge condition. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/cop/introduction.html).
5. To determine the discharge coefficient of a triangular notch. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/introduction.html)
6. To determine the coefficient of impact of jet on vanes. (https://fm-nitk.vlabs.ac.in/exp/impact-of-jet).
7. To determine friction in pipes. (https://fm-nitk.vlabs.ac.in/exp/friction-in-pipes/index.html).

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AME48 – MANUFACTURING PROCESSES LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Acquire practical knowledge on Metal Casting, Welding, Press Working and Processing of Plastics.

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

CO1: Make moulds for sand casting.

CO2: Fabricate different types of components using various manufacturing techniques.

CO3: Adapt unconventional manufacturing methods.

CO4: Develop Different Weld joints.

CO5: Explain different types of 3d Printing techniques.

List of Experiments

1. Designandmakingof pattern
   i. Single piece pattern
   ii. Split pattern
2. Sandproperties 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. BlowMolding
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.

Online Learning Resources:

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)
4. (https://3dpdei.vlabs.ac.in/exp/simulation-modelling-process)
5. https://altair.com/inspire-mold/

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AME49 – GEOMETRIC DIMENSIONING AND TOLERANCING

(Skill Enhancement Course-II)

L	T	P	C
0	1	2	2

Course Objectives: The objectives of the course are to make the students learn about

- Teach the basics of the geometric dimensioning and tolerances.
- Discuss the creation and selection of datum elements, the calculation of allowances and bonus tolerances and develop skills in creating Feature Control Frames (FCFs) and understanding Feature of Size (FOS) conditions.
- Explain the concepts of MMC, LMC, RFS and the principles of restraining degrees of freedom, the use of simulators.
- Explain orientation and form tolerances, their types, specifications and apply RFS, MMC, and LMC concepts to form and orientation tolerances.
- Introduce location tolerances, their types, specifications, interpretations and discuss profile tolerances for lines and surfaces, with or without datums.

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

CO1: Understand Basic GD&T Concepts, fundamental principles of Geometric Dimensioning and Tolerancing (GD&T) and its importance in modern engineering and manufacturing processes.

CO2: Utilize geometric characteristic symbols such as straightness, flatness, circularity, cylindricity, parallelism, perpendicularity, and angularity in engineering drawings and Implement fits and tolerances in the design of mechanical components.

CO3: Understand about Selection appropriate datum elements and targets for complex features in mechanical components and create and interpret Feature Control Frames (FCFs) and apply them to ensure proper alignment and orientation of parts.

CO4: Measure and evaluate form and orientation tolerances, including straightness, flatness, roundness, parallelism, and angularity. Verify location, runout, and profile tolerances using appropriate measurement techniques.

CO5: Design and develop 3D components with various dimensioning methods, apply GD&T principles in practical experiments to reinforce theoretical knowledge

UNIT – I: Basic Concepts **8 Hrs**

Introduction to GD&T: Importance and applications - Geometric characteristic symbols (e.g., straightness, flatness) and its representation methods - Types of fits (clearance, interference, transition) - Tolerance zones for surfaces and features - Datum elements and their selection – calculation of Bonus tolerance and Feature Control frame and Feature of size conditions.

Sample Experiments:

1. Design and develop a 3D component to represent different dimensions methods (Framed, Cumulated, Stacked, Coordinate, Curvilinear and Generative Dimensions).
2. Design geometric shapes such as cubes, cylinders etc., to define the datum elements and datum targets.

UNIT – II: MMC, LMC & RFS and Size Control Forms10Hrs

Restraining degrees of freedom (DOF) – simulators - MMC, LMC, and RFS definitions, its uses and applications - Rules #1 and #2 in GD&T - Reading Feature Control Frames - Taylor's principle and gauging size limits.

Sample Experiments:

1. Design a part and apply MMC, LMC or RFS annotations.
2. Implement Taylor's principle on a part/product to ensure that parts function correctly within specified size limits.

UNIT – III: Form and Orientation Tolerances **8 Hrs**

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Form tolerance types, specifications and interpretations - measurement and evaluation of straightness, flatness and roundness - Orientation tolerances types, specifications and interpretations, and verification of orientation tolerances - applying RFS, MMC, and LMC concepts to form and orientation tolerances.

Sample Experiments:

1. Apply form tolerance annotations on a specific feature/part (cylinder for straightness, a plane for flatness, a circular profile for roundness)
2. Create parts with features that require orientation tolerances, such as edges, surfaces or hole axes and select appropriate features to apply parallelism or angularity tolerances using GD&T annotation tools.
3. Design part features with varying sizes and apply RFS, MMC and LMC annotations.

UNIT – IV: Location, Runout and Profile Tolerances **8Hrs**

Types of location tolerances (position, concentricity), specifications and interpretations - Types of runout tolerances (circular, total) - Profile tolerances for lines and surfaces, Verification techniques - Applying RFS, MMC, and LMC concepts to location, runout and profile tolerances.

Sample Experiments:

1. Create a block with multiple holes to apply position tolerance to the holes relative to datum features.
2. Apply and verify circular runout and total runout tolerances on multiple cylindrical and planar surfaces.
3. Verification of tolerances under RFS (Regardless of feature size) and perform tolerance analysis considering MMC and LMC on the part containing thins walls, holes and shafts.

UNIT – V: GD&T in Assembly **8Hrs**

GD&T in Assembly: Creating datums and datum targets - Datum reference frames for alignment and orientation - product Functional tolerancing and annotations - Deviation analysis and tolerance stack-up analysis in assemblies

Sample Experiments:

1. Define the datum targets on the critical surfaces of the assembly to control orientation and location of features.
2. Assemble the multiple parts to define datum reference frames for alignment and orientation.
3. Perform tolerance stack-up analysis on the critical components of the assembly using datum reference frames.
4. Design a multi-component assembly and apply Functional Tolerancing and Annotations to ensure proper fit and function.

Note: Any CAD software can be used for design of parts and assemblies.

Text Books:

1. Drake, P. J., Dimensioning and Tolerance Handbook, McGraw-Hill, Inc., New York. 1999.
2. Meadows, J. D., Geometric Dimensioning and Tolerancing: Applications and Techniques for use in Design, Manufacturing and Inspection, Marcel Dekker, Inc., New York. 1995.
3. Gill, P. S., Geometric Dimensioning and Tolerancing, S. K. Kataria & Sons, New Delhi, 2/e, 2013.

Reference Books:

1. Alex Krulikowski, Fundamentals of geometric dimensioning and tolerancing, Cengage Learning, 3/e, 2012.
2. James D Meadows, —Measurement of Geometric Tolerances in Manufacturing, CRC Press, 1/e, 1998
3. Gupta, I. C., A Text book of Engineering Metrology, Dhanpat Rai Publications, New Delhi, 2018.
4. Galyer, J. F. W. and C. R. Shotbolt, Metrology for Engineers, Cassell Publishers, London, 5/e, 1990.
5. Henzold, G., Handbook of Geometrical Tolerancing: Design, Manufacturing and Inspection, John Wiley & Sons, Chichester, 2/e, 2006.
6. Muralikrishnan, B. and J. Raja, Computational Surface and Roundness Metrology, Springer USA, 1/e, 2010.
7. David A. Madsen, David P. Madsen, Geometric Dimensioning and tolerancing based on ASME Y14.5-2009, 9/e, 2013. ADDA Approved Publications.

Online Learning Resources:

- https://nptel.ac.in/courses/112/106/112106179/
- https://www.youtube.com/watch?v=X_VepJhq_vk

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech II Year II Semester

23AMC41 – DESIGN THINKING & INNOVATION

L	T	P	C
1	0	2	2

Course Objectives: The objectives of the course are to make the students learn about

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

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

CO1: Define the concepts related to design thinking.

CO2: Explain the fundamentals of Design Thinking and innovation.

CO3: Apply the design thinking techniques for solving problems in various sectors.

CO4: Analyze to work in a multidisciplinary environment.

CO5: Evaluate the value of creativity.

UNIT – I: **8 Hrs**

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: **10Hrs**

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: **8 Hrs**

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: **8Hrs**

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: **8Hrs**

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

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

Text Books:

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

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.

3. William lidwell, Kritinaholden, & Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.
Online Learning Resources:
• https://nptel.ac.in/courses/110/106/110106124/
• https://nptel.ac.in/courses/109/104/109104109/
• https://swayam.gov.in/nd1_noc19_mg60/preview
• https://onlinecourses.nptel.ac.in/noc22_de16/preview

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME51 – THEORY OF MACHINES

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce various basic mechanisms and their applications.
- Explain importance of degree of freedom.
- Familiarize velocity and acceleration in mechanisms.
- Describe the cams and follower motions.
- Explain the importance of gyroscopic couples.

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

CO1: Understand different mechanisms and their inversions.

CO2: Calculate velocity and acceleration of different links in a mechanism.

CO3: Apply the effects of gyroscopic couple in ships, aero planes and road vehicles.

CO4: Evaluate unbalance mass in rotating machines.

CO5: Analyze free and forced vibrations of single degree freedom systems.

UNIT – I: **8 Hrs**

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, steering mechanisms, Rocker mechanisms, and Universal Joint.

UNIT – II: **8Hrs**

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: **8 Hrs**

Gyroscope: Principle of gyroscope, gyroscopic effect in an aeroplane, ship, two wheeler, and car -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: **8 Hrs**

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.

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UNIT – V:	12 Hrs
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. **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.	
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.	
6. Bevan Thomas, The Theory of Machines, 3/e, Pearson Education India,2009.	
Online Learning Resources:	
• https://nptel.ac.in/courses/112105268	
• https://tudelft.open.kit.edu/run/kntsim	
• https://ocw.mit.edu/courses/2-003sc-engineering-dynamics-fall-2011/	
• https://youtu.be/GXqg-U86zy0	
• https://vlab.co.in/broad-area-mechanical-engineering	

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME52 – THERMAL ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To familiarize the developments in IC engines.
- To teach combustion process in SI and CI engines.
- To introduce different types of compressors.
- To familiarize concepts of thermodynamics cycles used in steam power plants and gas turbines
- To impart knowledge on the working of nozzles, turbines, refrigeration and air conditioning.

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

CO1: Explain working of IC engines with combustion process.

CO2: Select compressors for different applications.

CO3: Use T-s diagram in vapour power and gas power cycles

CO4: Explain the basic principles of steam turbines.

CO5: Select appropriate refrigerant for different applications.

UNIT – I: **10 Hrs**

IC Engines: Working and classification of IC engines, comparison of two stroke and four stroke engines, comparison of SI and CI Engines.

Combustion in IC Engines: SI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting delay period and knocking, pre-ignition. CI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting delay period and knocking. Fuel requirements and fuel rating.

Testing and Performance of IC Engines: Methods of testing IC Engines, performance analysis of IC Engines.

UNIT – II: **8 Hrs**

Classification of Air compressors

Reciprocating Compressor: Single stage reciprocating compressors, work done, effect of clearance in compressors, volumetric efficiency, multi stage compressor, effect of inter cooling in multi stage compressors, compressor performance.

Rotary Compressor: Working principle of a rolling piston type compressor (fixed vane type), multi vane type compressors, characteristics of rotary vane type compressor.

UNIT – III: **10 Hrs**

Vapour Power Cycles: Vapour power cycle, simple Rankine cycle, mean temp of heat addition thermodynamic variables effecting efficiency and output of Rankine cycle

Gas power Cycle: Simple gas turbine plant, Brayton cycle, closed cycle and open cycle for gas turbines, condition for maximum pressure ratio and optimum pressure ratio, actual cycle. Methods to improve performance: regeneration, intercooling and reheating.

Introduction to jet propulsion: working principle of various jet engines - ramjet, turbojet, turbofan, turboprop and pulse jet engines.

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UNIT – IV:	8Hrs
Nozzles: Type of nozzles - air and steam nozzles. Compressible flow through nozzle- condition for maximum discharge - nozzle efficiency. **Steam Turbines:** Classification of steam turbines - impulse turbine and reaction turbine -compounding in turbines - velocity diagrams in impulse and reaction turbines, efficiency, degree of reaction - governing of turbines.	
UNIT – V:	**8Hrs**
Refrigeration: Bell-Coleman cycle - vapour compression cycle, effect of vapour condition on COP of VCR, -vapour absorption cycle, properties of common refrigerants **Principles of Psychrometry and Air Conditioning:** Psychometric terms, psychometric processes and air conditioning systems.	
Text Books:	
1. Ganesan V, Internal Combustion Engines, Tata McGraw Hill, 2017.	
2. M.L.Mathur and F.S.Mehta, Thermal Engineering, Jain brothers,2014.	
3. K.K.Ramalingam, Thermal Engineering, 2/e, Scitech Publications (India) Pvt Ltd,2011.	
Reference Books:	
1. Cengel Y.A and Boles M.A, Thermodynamics: An Engineering Approach, 5/e, McGraw-	
2. Yahya, S. M., Turbines, Compressors and Fans, 4/e, Tata McGraw Hill, 2010.	
3. Nag P.K, Engineering Thermodynamics, 4/e, Tata McGraw-Hill, 2008.	
4. Onkar Singh, Thermal Turbomachines, 3/e, Wiley India, 2014.	
5. P.L.Ballaney, Thermal Engineering, 2/e, Khanna, 2005.	
Online Learning Resources:	
• https://nptel.ac.in/courses/112106138	
• https://nptel.ac.in/courses/112105129	
• https://ocw.mit.edu/courses/16-50-introduction-to-propulsion-spring-2012/	
• https://youtu.be/f8-AUwG4Z7E	
• https://youtu.be/baP7CYDzGGY	

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME53 – DESIGN OF MACHINE MEMBERS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Provide an introduction to design of machine elements.
- Familiarize with fundamental approaches to failure prevention for static and dynamic loading.
- Explain design procedures to different types of joints.
- Teach principles of clutches and brakes and design procedures.
- Instruct different types of bearings and design procedures.

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

CO1: Estimate safety factors of machine members subjected to static and dynamic loads.

CO2: Design the fasteners subjected to variety of loads.

CO3: Select of standard machine elements such as keys, shafts, couplings, springs and bearings.

CO4: Design of clutches, brakes and springs.

CO5: Design of bearing and gears.

UNIT – I: **10 Hrs**

Mechanical Engineering Design: Design process, design considerations, codes and standards of designation of materials, selection of materials.

Design for Static Loads: Modes of failure, design of components subjected to axial, bending, torsional and impact loads. Theories of failure for static loads.

Design for Dynamic Loads: Endurance limit, fatigue strength under axial, bending and torsion, stress concentration, notch sensitivity. Types of fluctuating loads, fatigue design for infinite life. Soderberg, Goodman and modified Goodman criterion for fatigue failure. Fatigue design under combined stresses.

UNIT – II: **10Hrs**

Bolted Joints: Threaded fasteners, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, gasketed joints and eccentrically loaded bolted joints.

Welded Joints: Strength of lap and butt welds, Joints subjected to bending and torsion. Eccentrically loaded welded joints.

UNIT – III: **8 Hrs**

Power Transmission Shafts: Design of shafts subjected to bending, torsion and axial loading. Shafts subjected to fluctuating loads using shock factors.

Couplings: Design of flange and bushed pin couplings, universal coupling.

UNIT – IV: **8Hrs**

Friction Clutches: Torque transmitting capacity of disc and centrifugal clutches. Uniform wear theory and uniform pressure theory.

Brakes: Different types of brakes. Concept of self-energizing and self-locking of brake. Band and block brakes, disc brakes.

Springs: Design of helical compression, tension, torsion and leaf springs.

UNIT – V: **10 Hrs**

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Design of Sliding Contact Bearings: Lubrication modes, bearing modulus, McKee's equations, design of journal bearing, Bearing Failures.

Design of Rolling Contact Bearings: Static and dynamic load capacity, Stribeck's Equation, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue.

Design of Spur Gears: Spur gears, beam strength, Lewis equation, design for dynamic and wear loads.

Text Books:

1. R.L. Norton, Machine Design an Integrated approach, 2/e, Pearson Education, 2004.
2. V.B.Bhandari, Design of Machine Elements, 3/e, Tata McGraw Hill, 2010.
3. Dr. N. C. Pandya &Dr. C. S. Shah, Machine design, 17/e, Charotar Publishing House Pvt. Ltd, 2009

Reference Books:

1. R.K. Jain, Machine Design, Khanna Publications, 1978.
2. J.E. Shigley, Mechanical Engineering Design, 2/e, Tata McGraw Hill, 1986.
3. M.F.Spotts and T.E.Shoup, Design of Machine Elements, 3/e, Prentice Hall (Pearson Education), 2013.
4. K. Mahadevan & K. Balaveera Reddy, Design data handbook, CBS Publications, 4/e, 2018.

Online Learning Resources:

- https://www.yumpu.com/en/document/view/18818306/lesson-3-course-name-design-ofmachine-elements-1-nptel
- https://www.digimat.in/nptel/courses/video/112105124/L01.html
- https://dokumen.tips/documents/nptel-design-of-machine-elements-1.html
- https://archive.nptel.ac.in/courses/112/105/112105125/
- https://www.coursera.org/learn/machine-design1

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INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

(Qualitative Treatment) L T P C

3 0 0 3

Course Objectives (COBJ):

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

Course Outcomes (CO):

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology.

Unit 1: Introduction to Quantum Theory and Technologies

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

Unit 2: Theoretical Structure of Quantum Information Systems

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (nonengineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

Unit 3: Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

Unit 4: Quantum Communication and Computing – Theoretical Perspective

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global

Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real World Importance and Future Potential

Unit 5: Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum,Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization,Emerging careers in quantum: roles, skillsets, and preparation pathways,Educational and research landscape – India's opportunity in the global quantum race

Textbooks:

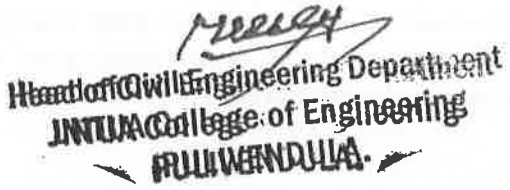
1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

Online Learning Resources:

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum



JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME54A - POWER PLANT ENGINEERING

(PROFESSIONAL ELECTIVE-I(A))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- Explain renewable energy sources; characteristics, working principle, classify types, layouts, and plant operations.
- Impart types of nuclear power plants, and outline working principle and advantages and hazards.

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

CO1: Outline sources of energy, power plant economics, and environmental aspects.

CO2: Describe working components of a steam power plant.

CO3: Illustrate the working mechanism of Diesel and Gas turbine power plants.

CO4: Summarize types of renewable energy sources and their working principle.

CO5: Demonstrate the working principle of nuclear power plants.

UNIT – I:

Introduction to the Sources of Energy - Resources and Development of Power in India. Layouts of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles - Comparison and Selection.

Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

UNIT – II:

Steam Power Plant : Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.

Steam Power Plant : Combustion Process- Properties of Coal - Overfeed and Under Feed Fuel Beds, Travelling Grate Stokers, Spreader Stokers, Retort Stokers, Pulverized Fuel Burning System And Its Components, Combustion Needs and Draught System, Cyclone Furnace, Design and Construction, Dust Collectors, Cooling Towers And Heat Rejection. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO2 Recorders

UNIT – III:

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Diesel Power Plant: Diesel Power Plant: Introduction - IC Engines, Types, Construction- Plant Layout with Auxiliaries - Fuel Storage

GAS TURBINE PLANT: Introduction - Classification - Construction - Layout with Auxiliaries - Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

UNIT – IV:

Hydro Electric Power Plant: Water Power - Hydrological Cycle / Flow Measurement - Drainage Area Characteristics - Hydrographs - Storage and Pondage - Classification of Dams and Spill Ways.

Hydro Projects & Plant: Classification - Typical Layouts - Plant Auxiliaries - Plant Operation Pumped Storage Plants.

UNIT – V:

Power From Non-Conventional Sources: Utilization of Solar Collectors- Principle of its Working, Wind Energy - Types of Turbines - HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel - Nuclear Fission, Chain Reaction, Breeding and Fertile Materials - Nuclear Reactor -Reactor Operation.

Types of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding - Radioactive Waste Disposal.

Text Books:

1. P.K. Nag, Power Plant Engineering, 3/e, TMH, 2013.
2. Arora and S. Domkundwar, A course in Power Plant Engineering, Dhanpat Rai & Co (P) Ltd, 2014.

Reference Books:

1. Rajput, A Text Book of Power Plant Engineering, 4/e, Laxmi Publications, 2012.
2. Ramalingam, Power plant Engineering, SciTech Publishers, 2013.
3. P.C. Sharma, Power Plant Engineering, S.K. Kataria Publications, 2012.

Online Learning Resources:

- https://www.iare.ac.in/sites/default/files/lecture_notes/PPE_LECTURE_NOTES.pdf
- http://www.digimat.in/nptel/courses/video/112107291/L21.html
- https://onlinecourses.nptel.ac.in/noc19_me63/preview
- https://www.youtube.com/watch?v=iWWyI8CZhUw
- https://www.youtube.com/watch?v=D0i1E_lE_TE

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME54B – FINITE ELEMENT METHODS

(PROFESSIONAL ELECTIVE – I (B))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn basic principles of finite element analysis procedure.
- To learn the theory and characteristics of finite elements that represent engineering structures.
- To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.
- Learn to model complex geometry problems and solution techniques.

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

CO1: Understand the concepts behind variational methods and weighted residual methods in FEM.

CO2: Identify the application and characteristics of FEA elements such as bars, beams, and isoparametric elements, and 3-D element.

CO3: Develop element characteristic equation procedure and generation of global stiffness equation will be applied.

CO4: Apply suitable boundary conditions to a global structural equation, and reduce it to a solvable form.

CO5: Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.

UNIT – I:

Introduction to finite element methods for solving field problems, Stress and equilibrium, Boundary conditions, Strain-Displacement relations, Stress- strain relations for 2D and 3D Elastic problems.Potential energy and equilibrium, The Rayleigh-Ritz method, Formulation of Finite Element Equations.

One dimensional problems: Finite element modeling coordinates and shape functions. Assembly of global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II:

Analysis of trusses: Stiffness Matrix for plane truss element. Stress Calculations and Problems.

Analysis of beams: Element Stiffness Matrix for two noded, two degrees of freedom per node beam element and simple problems.

UNIT – III:

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of load Vector, Stresses. Finite element modeling of Axi-symmetric solids subjected to axi-symmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and problems.

UNIT – IV:

Steady state heat transfer analysis: One dimensional analysis of slab and fin, two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V:

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Dynamic analysis: Formulation of finite element model,element –mass matrices,evaluation of Eigen values and Eigen vectors for a stepped bar truss. 3D Problems:Finite Elementformulation for stress analysis, Convergence requirements, mesh generation, techniques such as semi automatic and fully automatic use of software's such as ANSYS,NISA,NASTRAN.
Text Books:
1. Chandraputla, Ashok &Belegundu,Introduction to Finite Element in Engineering, Prentice Hall.
2. S.S.Rao, The Finite Element Methods in Engineering,Elsevier Butterworth -Heinemann 2nd Edition, 2011.
Reference Books:
1. J N Reddy, An introduction to the Finite Element Method, McGraw – Hill, New York, 1993.
2. R D Cook, D S Malkus and M E Plesha, Concepts and Applications of Finite Element Analysis, 3rd Edition, John Wiley, New York, 1989.
3. K J Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs,1982.
4. T J R Hughes, the Finite Element Method, Prentice-Hall, Englewood Cliffs, NJ, 1986.
5. C Zienkiewicz and R L Taylor, the Finite Element Method, 3rd Edition. McGraw-Hill, 1989.
Online Learning Resources:
• https://archive.nptel.ac.in/courses/112/104/112104193/
• https://archive.nptel.ac.in/courses/112/105/112105308/
• https://nptel.ac.in/courses/112104116
• https://archive.nptel.ac.in/courses/112/103/112103295/

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME54C – DESIGN FOR MANUFACTURING

(PROFESSIONAL ELECTIVE – I (C))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Explain the product development cycle and manufacturing issues to be considered in design.
- Familiarize manufacturing consideration in cast, forged, and weld components.
- Describe the manufacture of sheet metal components.
- Impart knowledge plastics as substitution to metallic parts.

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

CO1: Design mechanical components with economical consideration.

CO2: Select materials and machining processes.

CO3: Identify the necessity for redesigning components out of manufacturing considerations.

CO4: Consider the manufacturing considerations while designing cast, forged weld and sheet metal components.

CO5: Design plastic parts with manufacturing considerations.

UNIT – I:

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design.

Materials: Selection of materials for design-developments in material technology-criteria for material selection-material selection interrelationship with process selection-process selection charts.

UNIT – II:

Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining – ease –redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT – III:

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints.

UNIT – IV:

Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

UNIT – V:

Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Text Books:

1. George E Dieter and Linda Schmidt, Engineering Design, 4/e, McGraw Hill, 2015.
2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, 5/e, PHI Learning 2011.
3. David M Anderson, Design for Manufacturability, CRC Press, 2013.

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Reference Books:
1. James G Bralla, Design For Manufacturability Handbook, 2/e, McGraw Hill, 2004.
2. Dr.P.C.Sharma, Production Technology, S.Chand & Company, 2009.
3. G. Boothroyd, Product Design for Manufacture & Assembly, CRC Press, 3/e, 2010
Online Learning Resources:
• https://nptel.ac.in/courses/112/101/112101005/
• https://www.iare.ac.in/sites/default/files/lecture_notes/DFMA_LECTURE_NOTES.pdf
• https://ocw.mit.edu/courses/mechanical-engineering/2-008-design-and-manufacturing-ii-spring-2004/lecture-notes/
• https://dokumen.tips/documents/design-for-manufacturing-and-assembly-1-lecture-notes-on-design-for-manufacturing.html
• https://www.youtube.com/watch?v=ofmbhbVCUqI
• https://onlinecourses.nptel.ac.in/noc21_me66/preview

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME54D – UNCONVENTIONAL MACHINING PROCESSES

(PROFESSIONAL ELECTIVE – I (D))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Define various Modern Machining Processes.
- Acquire knowledge in the elementary mechanism and machinability of materials with different Modern Machining Processes.
- Determine basic principles of operation for each process and their applications.
- State various parameters influencing MRR in Non – Traditional Machining Process.

Classify and understand the working of Additive Manufacturing Processes

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

CO1: Illustrate advanced machining processes, cutting tools and cutting fluids for a specific material and part features.

CO2: Classify the mechanism of Mechanical Energy based machining processes, its applications and limitations.

CO3: Differentiate Electrical Energy Based machining processes, mechanism of metal removal, machine tool selection.

CO4: Interpret Electro Chemical machining process, economic aspects of ECM and problems on estimation of metal removal rate.

CO5: Understand the working, effect of process parameters, applications of Electron Beam Machining, Laser Beam Machining.

UNIT – I:

Non – Traditional Machining Processes: Introduction, Need, Classification and Brief Overview, Considerations in Process selection, Materials, Applications.

Mechanical Energy Based Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultra Sonic Machining – Working Principle, Description of Equipment, Process Parameters, Metal Removal Rate, Applications, Advantages and Limitations.

UNIT – II:

Electrical Energy Based Processes: Electric Discharge Machining – Working Principles, Description of Equipment, Process Parameters, Surface Finish and MRR, Electrode / Tool, Power and Control Circuits, Tool Wear, Dielectric Fluid, Flushing, Advantages, Limitations and Applications. Wire cut EDM – Working Principle and Applications.

UNIT – III:

Chemical and Electro Chemical Energy Based Processes: Chemical Machining and Electro Chemical Machining – Working Principle, Description of Equipment, Etchants, Maskants, Techniques of Applying Maskants, Process Parameters, Surface Finish and MRR, Electro Chemical Grinding, Electro Chemical Honing, Applications, Advantages and Limitations.

UNIT – IV:

Thermal Energy Based Processes: Laser Beam Machining and Drilling, Plasma Arc Machining, Electron Beam Machining – Working Principle, Description of Equipment, Process Parameters, Applications, Advantages and Limitations.

UNIT – V:

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Nano Finishing Process: Abrasive flow machining, Chemo – mechanical polishing, Magnetic Abrasive finishing, Magneto rheological finishing, Magneto rheological abrasive flow finishing – Working Principle, equipments, effect of process parameters, applications, advantages and limitations
Text Books:
1. Jain V.K., Advanced Machining Processes, 1st Edition, Allied Publishers Pvt. Ltd., New Delhi, 2007.
2. Pandey P.C and Shan H.S., Modern Machining Processes, 1st Edition, McGraw Hill, New Delhi, 2007.
3. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st Edition, Springer, 2010.
Reference Books:
1. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2nd Edition, World Scientific Publishers, 2003.
2. Benedict G.F., Nontraditional Manufacturing Processes, 1st Edition, CRC Press, 1987.
3. Mishra P.K., Nonconventional Manufacturing, 1st Edition, Narosa Publishing House, New Delhi, 2014.
4. McGeough J.A., Advanced Methods of Machining, 1st Edition, Springer, 1988.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc24_me72/preview
• https://nptel.ac.in/courses/112105212
• https://onlinecourses.nptel.ac.in/noc24_me154/preview
• https://www.youtube.com/watch?v=sd4lQdzRbUo
• https://www.youtube.com/watch?v=Sfj8_9oRCNk

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME54E – ADDITIVE MANUFACTURING

(PROFESSIONAL ELECTIVE – I (E))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Basics of Additive Manufacturing / Rapid Prototyping and its applications in various fields, reverse engineering techniques.
- Classification and different processes in Additive Manufacturing.
- Mechanical Properties and Geometric Issues relating to specific Additive Manufacturing Applications.

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

CO1: Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping Technologies.

CO2: Describe different Additive Manufacturing techniques.

CO3: Discuss fundamentals of Reverse Engineering.

CO4: Explain Stereolithography (SLA)

CO5: Understand the Powder Based AM and other AM Systems

UNIT – I:

Introduction to Additive Manufacturing (AM) Systems: History and Development of AM, Need of AM, Difference between AM and CNC, Classification of AM Processes: Based on Layering Techniques, Raw Materials and Energy Sources, AM Process Chain, Benefits and Applications of AM, Representation of 3D model in STL format, RP data formats: SLC, CLI, RPI, LEAF, IGES, CT, STEP, HP/GL.

UNIT – II:

CAD & Reverse Engineering: Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: CAD model preparation, Part Orientation and support generation, Model Slicing, Tool path Generation, Software's for Additive Manufacturing Technology: MIMICS, MAGICS. Reverse Engineering (RE) – Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT – III:

Solid and Liquid Based AM Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

UNIT – IV:

Powder Based AM Systems: Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

UNIT – V:

Other Additive Manufacturing Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

Text Books:

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1. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st Edition, Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2nd Edition, World Scientific Publishers, 2003.
3. Liou W. Liou, Frank W., Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.
Reference Books:
1. Pham D.T. and Dimov S.S., Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling, Springer, London 2001.
2. Gebhardt A., Rapid prototyping, Hanser Gardener Publications, 2003.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2005.
4. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc24_me130/preview
• https://onlinecourses.nptel.ac.in/noc21_me115/preview
• https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/additive-manufacturing-technologies-for-practicing-engineers/?v=c86ee0d9d7ed
• https://onlinecourses.nptel.ac.in/noc25_me94/preview
• https://onlinecourses.nptel.ac.in/noc20_mg70/preview

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME57 – THERMAL ENGINEERING LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Understand the construction and working of internal combustion engines, compressors, and thermal systems through models and experiments.
- Learn to evaluate engine performance metrics using real-time testing methods.
- Analyze valve and port timing diagrams of IC engines.
- Conduct performance tests on refrigeration, air-conditioning, and heat pump systems.
- Gain hands-on experience in assembly/disassembly of engines and understand their component functions.

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

CO1: Identify the components and working of diesel and petrol engines using cut models.

CO2: Interpret and draw valve and port timing diagrams for 4-stroke and 2-stroke engines.

CO3: Evaluate engine performance characteristics such as brake power, efficiency, and fuel consumption.

CO4: Analyze the functioning and performance of air compressors, refrigeration, and air-conditioning systems.

CO5: Demonstrate skills in assembly and disassembly of IC engines and explain the function of key parts.

1. Demonstration of diesel and petrol engines by cut models.
2. Valve timing diagram of 4-stroke diesel engine.
3. Port timing diagram of 2-stroke petrol engine.
4. Performance of 2-stroke single cylinder petrol engine.
5. Morse test on multi cylinder petrol engine.
6. Performance of 4-stroke single cylinder diesel engine.
7. Performance of two stage reciprocating air compressor.
8. Performance of Refrigeration system.
9. Performance of Air conditioning system.
10. Assembly and disassembly of diesel and petrol engines.
11. Performance of heat pump.
12. Performance of variable compression ratio of petrol engine.
13. Demonstration of heat pipe.

Reference Books:

1. V. Ganesan, Internal Combustion Engines, 4/e, Tata McGraw Hill, 2012.
2. Domkundwar & Domkundwar, A Course in Refrigeration and Air Conditioning, 3/e, Dhanpat Rai & Sons, 2013.
3. P. Holman, Heat Transfer, 10/e, McGraw Hill, 2010.

Online Learning Resources:

- https://youtu.be/g0R2c4Ddf7k
- https://youtu.be/TonAWJ6p-Cg
- https://www.vlab.co.in
- https://youtu.be/6Pqcl_OyBlQ
- https://youtu.be/TapQSBZbIEk

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B.Tech III Year I Semester

23AME58– MACHINE TOOLS AND METROLOGY LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- To understand the construction and working of general-purpose machine tools.
- To develop skills in performing operations like turning, drilling, milling, slotting, shaping, and gear cutting.
- To provide hands-on experience on industrial machines and their practical applications.
- To understand the principles and applications of precision measurement tools.
- To perform calibration and alignment tests on various machine tools.

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

CO1: Identify and describe the working of machine tools such as lathe, milling, drilling, shaping, slotting, and grinding machines.

CO2: Perform basic and advanced operations on lathe, drilling, and milling machines.

CO3: Demonstrate indexing and gear manufacturing using milling machine.

CO4: Calibrate and use measuring tools like vernier calipers, micrometers, and height gauges.

CO5: Measure internal bores, gear tooth thickness, and thread dimensions accurately.

(A) MACHINE TOOLS LAB

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, Slotting machine, Cylindrical grinder, Surface grinder and Tool and cutter grinder.
2. Operations on Lathe machines- Step turning, Knurling, Taper turning, Thread cutting and Drilling
3. Operations on Drilling machine - Drilling, reaming, tapping, Rectangular drilling, circumferential drilling
4. Operations on Shaping machine - (i) Round to square (ii) Round to Hexagonal
5. Operations on Slotter - (i) Keyway (T –slot) (ii) Keyway cutting
6. Operations on milling machines - (i) Indexing (ii) Gear manufacturing

(B) METROLOGY LAB

1. Calibration of vernier calipers, micrometers, vernier height gauge and dial gauges.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micrometer for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.
7. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

Reference Books:

1. P.C. Sharma and D.K. Aggarwal, A Textbook of Production Technology (Manufacturing Processes), 5/e, S. Chand & Company, 2010.
2. Hajra Choudhury & Nirjhar Roy, Workshop Technology: Vol. II – Machine Tools, 17/e, Media Promoters & Publishers, 2012.
3. Serope Kalpakjian and Steven R. Schmid, Manufacturing Engineering and Technology, 7/e, Pearson Education, 2013.
4. I.C. Jain, Engineering Metrology, 23/e, Khanna Publishers, 2019.
5. Brassard, Barrentine, & Martin, Fundamentals of Dimensional Metrology, 6/e, Delmar Cengage Learning, 2010.
Online Learning Resources:
• https://youtu.be/RX4DqYbOXyQ
• https://youtu.be/9zqHoND_Pvw
• https://youtu.be/pvVn2BaDbis
• https://youtu.be/bQhVNVqApF8
• https://youtu.be/E4XWWfIdloM

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Course Code	SOFT SKILLS	L	T	P	C
		0	1	2	2

Pre-requisite **SemesterIV/V**

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

Course Outcomes (CO):

COs	Statements	Blooms le
CO1	List out various elements of soft skills	L1, L2,
CO2	Describe methods for building professional image	L1, L2
CO3	Apply critical thinking skills in problem solving	L3
CO4	Analyse the needs of an individual and team for well-being	L4
CO5	Assess the situation and take necessary decisions	L5
CO6	Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being	L6

SYLLABUS

UNIT – I **Soft Skills & Communication Skills** **Lecture Hrs**

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

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II **Critical Thinking** **Lecture Hrs**

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

Activities:

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

UNIT – III **Problem Solving & Decision Making** **Lecture Hrs**

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

Activities:

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

Case Study & Group Discussion

UNIT – IV **Emotional Intelligence & Stress Management** **Lecture Hrs**

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

Activities:

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

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

UNIT – V **Lecture Hrs**

Corporate Etiquette

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

Activities

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

NOTE-:

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

Prescribed Books:

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

Reference Books

1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications 2018.

2. Alex K,*Soft Skills*S.Chand& Co, 2012 (Revised edition)

3. Gajendra Singh Chauhan& Sangeetha Sharma,*Soft Skills: An Integrated Approach to Maximise Personality*Published by Wiley, 2013

4. Pillai, Sabina & Fernandez Agna, *Soft Skills and Employability Skills,* Cambridge University Press, 2018

5. Dr. Rajiv Kumar Jain, Dr. Usha Jain,*Life Skills*(Paperback English)Publisher : Vayu Education of India, 2014

Online Learning Resources:

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year I Semester

23AME59 – TINKERING LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

- To identify the importance of Tinkercad in enhancing thinking capability.
- To apply design concepts to the real time applications.
- To analyse basics of Arduino Programming.
- To create 3D objects with 2d images.
- To design circuits for defined application using tinker cad.

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

CO1: Use Tinkercad to enhance creative thinking and Innovation

CO2: Design a model and convert to STL file format

CO3: Apply design of a circuit concepts for defined applications

CO4: Develop code in the form of programming and in the form blocks for the defined application

CO5: Use and apply simlab tool for the simple applications

Section - A

1.Introduction to 3D design module in Tinkercad, use of workplane, ruler and shapes library to create a 3D model

2.Tinkering of structural and kinematic components

a) Exercise - 1: Design of Jaw and Ring Spanner
b) Exercise - 2: Customise 2 gears of different sizes mesh each other
c) Exercise - 3: Balloon Powered Car
d) Exercise - 4: Turbine Blade / Propeller
e) Exercise - 5: Screw Conveyor

3.Convert 2d images to 3d objects

4.Simple experiments on rollers using Simlab tool

Section - B

1. Introduction to circuit's module in Tinkercad, use of general components, input and output components, controllers and bread boards to develop basic circuits.
2. Basic Introduction to Arduino board, Architecture, programming and its interfacing.
3. Design of circuits for the following exercises using Arduino board in Tinkercad
   a) Exercise - 1: LPG leakage detection
   b) Exercise - 2: Sun motion tracking
   c) Exercise - 3: Four way smart traffic light control
   d) Exercise - 4: Plant Monitoring system
   e) Exercise - 5: Home security system
4. Develop the programming for the above exercises using "BLOCKS" in Tinkercad.

Reference Books:

1. 3D Modeling and Printing with Tinkercad: Create and Print by James Floyd Kelly, Pearson Education, 2014.

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2. Tinkercad – Step by Step: Learn how to Easily Create 3D Objects (CAD), Design Electronic Circuits and Program with Tinkercad by Johannes Wild, Johannes Wild c/o RA Matutis publisher, 2022.
3. T for Tinkercad, C for Codeblock: Learn the Basics of Tinkercad Codeblock by Chak Tin, Hobbypress Tomorrowskills, 2021.
Online Learning Resources:
• https://www.tinkercad.com/things/8xxRj5BT2zl-spanner
• https://www.tinkercad.com/projects/Create-a-Balloon-Powered-Car
• https://www.tinkercad.com/things/hJqVhXuDlPN-turbine-blades
• https://www.tinkercad.com/things/4iBlLnyHXBV-lego-marble-run-screw-conveyor
• https://www.tinkercad.com/things/8qwgKJDCcWE-turning-a-2d-image-into-a-3d-object
• https://www.tinkercad.com/things/fgPXSCboPCV-lpg-gas-leakage-detector
• https://www.tinkercad.com/projects/How-to-Make-Sun-Tracking-Sunflower-Robot-Using-Ard
• https://www.tinkercad.com/things/5wYjZlGDlLB-4-way-traffic-lights
• https://www.tinkercad.com/things/dssa3MIgAfB-smart-plant-monitoring-system
• https://www.tinkercad.com/things/lqlbOXHFOHy-smart-home-security-system-with-sensors

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME61 - HEAT TRANSFER

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart the basic laws of conduction, convection and radiation heat transfer and their applications.
- To familiarize the convective heat transfer concepts.
- To explain basics of radiation heat transfer.
- To make conversant with the heat transfer analysis related to thermal systems like heat exchangers, evaporator, and condenser.

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

CO1: Apply the concepts of different modes of heat transfer.

CO2: Apply knowledge of conduction heat transfer in the design of insulation of furnaces and pipes.

CO3: Analyze free and forced convection phenomena in external and internal flows.

CO4: Design of thermal shields using the concepts of black body and non-black body radiation.

CO5: Apply the basics of mass transfer for applications in diffusion of gases.

UNIT – I: **8 Hrs**

Conduction: Basic modes of heat transfer – rate equations – generalized heat conduction equation – steady state heat transfer – conduction – solution for plain and composite slabs – cylinders – critical thickness of insulation – heat conduction through fins of uniform cross section – fin effectiveness and efficiency.

Unsteady State Heat Transfer – Conduction – Transient heat conduction – lumped system analysis and use of Heisler charts.

UNIT – II: **10Hrs**

Convection: Basic concepts of convection – heat transfer coefficients – types of convection – forced convection and free convection.

Free Convection: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation.

Forced Convection: Forced convection in external flow – concepts of hydrodynamic and thermal boundary layer – use of empirical correlations for flow over plates and cylinders. Fluid friction – heat transfer analogy, approximate solution to laminar boundary layer equation for external flow. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow.

UNIT – III: **8 Hrs**

Radiation: Radiation heat transfer – thermal radiation – laws of radiation – Black and Gray bodies – shape factor – radiation exchange between surfaces – Radiation shields – Greenhouse effect.

UNIT – IV: **8Hrs**

Heat Exchangers: Types of heat exchangers – parallel flow – counter flow – cross flow heat exchangers – overall heat transfer coefficient – LMTD and NTU methods – fouling in heat exchangers.

UNIT – V: **8Hrs**

Boiling and Condensation: Different regimes of boiling – nucleate, transition and film boiling – condensation – filmwise and dropwise condensation.

Mass Transfer: Conservation laws and constitutive equations – Fick's law of diffusion, isothermal equi - mass – Equimolal diffusion – diffusion of gases and liquids – mass transfer coefficient.

Text Books:

1. P.K. Nag, Heat Transfer, 3/e, Tata McGraw – Hill, 2011.

2. J.P.Holman, Heat Transfer, 9/e, Tata McGraw – Hill, 2008.
3. S. C. Arora & S. Domkundwar, A Course in Heat and Mass Transfer, Dhanpat Rai & CO.(P) LTD – Delhi, 2007.

Reference Books:

1. F. P. Incropera and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, 6/e, John Wiley, 2007.
2. Cengel. A.Yunus, Heat Transfer – A Practical Approach, 4/e, Tata McGraw – Hill, 2007.
3. S.P. Sukhatme, A Textbook of Heat Transfer, Universities Press, 2005
4. Lienhard and Lienhard, A Heat and Mass Transfer, Cambridge Press, 2011.
5. C.P. Kothandaraman and S. Subramanyan, Heat and Mass Transfer data book, New Age Publications, 2014.

Online Learning Resources:

- https://ocw.mit.edu/courses/mechanical-engineering/2-051-introduction-to-heat-transfer-fall-2015/
- https://www.udemy.com/topic/heat-transfer/
- https://www.youtube.com/watch?v=TWTQx3W-2k8
- https://onlinecourses.nptel.ac.in/noc20_ch21/preview
- https://ekeeda.com/degree-courses/mechanical-engineering/heat-transfer
- https://www.coursera.org/lecture/thermodynamics-intro/02-04-heat-transfer-gyDfJ
- https://www.youtube.com/watch?v=cjJ2LV5lkB8

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B.Tech III Year II Semester

23AME62 - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart the basic concepts of artificial intelligence and the principles of knowledge representation and reasoning.
- To introduce the machine learning concepts and supervised learning methods
- To enable the students gain knowledge in unsupervised learning method and Bayesian algorithms.
- To make the students learn about neural networks and genetic algorithms.
- To understand the machine learning analytics and deep learning techniques.

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

CO1: Explain the basic concepts of Artificial Intelligence.

CO2: Learn about the principles of supervised learning methods.

CO3: Gain knowledge in unsupervised learning method and Bayesian algorithms.

CO4: Get knowledge about Neural Networks and Genetic Algorithms.

CO5: Understand the machine learning analytics and apply deep learning techniques.

UNIT – I:

Introduction: Definition of Artificial Intelligence, Evolution, Need, and applications in real world. Intelligent Agents, Agents and Environments; Good Behaviour – concept of rationality, the nature of environments, structure of agents.

Knowledge – Representation and Reasoning: Logical Agents: Knowledge – based agents, the Wumpus world, logic. Patterns in Propositional Logic, Inference in First – Order Logic – Propositional vs first order inference, unification.

UNIT – II:

Introduction to Machine Learning (ML): Definition, Evolution, Need, applications of ML in industry and real – world, regression and classification problems, performance metrics, differences between supervised and unsupervised learning paradigms, bias, variance, overfitting and under fitting.

Supervised Learning: Linear regression, logistic regression, Distance-based methods, Nearest – Neighbours, Decision Trees, Support Vector Machines, Nonlinearity and Kernel Methods.

UNIT – III:

Unsupervised Learning: Clustering, K – means, Dimensionality Reduction, PCA and Kernel.

Bayesian and Computational Learning: Bayes theorem, concept learning, maximum likelihood of normal, binomial, exponential, and Poisson distributions, minimum description length principle, Naïve Bayes Classifier, Instance – based Learning – K – Nearest neighbour learning.

UNIT – IV:

Neural Networks and Genetic Algorithms: Neural network representation, problems, perceptron, multilayer networks and back-propagation, steepest descent method, Convolutional neural networks and their applications Recurrent Neural Networks and their applications, Local vs Global optima, Genetic Algorithms (GA) – binary coded GA, operators, convergence criteria.

UNIT – V:

Deep Learning: Deep generative models, Deep Boltzmann Machines, Deep auto-encoders, Applications of Deep Networks.

Machine Learning Algorithm Analytics: Evaluating Machine Learning algorithms, Ensemble Methods - Boosting, Bagging, and Random Forests.

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Text Books:
1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson Education, 2010.
2. Tom M. Mitchell, Machine Learning, McGraw Hill, 2013.
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, 2004.
Reference Books:
1. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.
3. T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning, 1/e, Springer, 2001.
4. Bishop, C. M., Pattern Recognition and Machine Learning, Springer, 2006.
5. M. Narasimha Murty, Introduction to Pattern Recognition and Machine Learning, World Scientific Publishing Company, 2015.
Online Learning Resources:
• https://www.javatpoint.com/artificial-intelligence-ai
• https://www.geeksforgeeks.org/
• https://onlinecourses.nptel.ac.in/noc22_cs56/preview
• https://nptel.ac.in/courses/106105470
• https://nptel.ac.in/courses/113104517

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME63 - CONTROL SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function.
- Transient and steady state response, time domain specifications and the concept of Root loci.
- Frequency domain specifications, Bode diagrams and Nyquist plots.
- State space modelling of Control system.

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

CO1: Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis

CO2: Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.

CO3: Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.

CO4: Design different controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

CO5: Develop different compensators. Implement them in solving various engineering applications.

UNIT – I:

CONTROL SYSTEMS CONCEPTS: Open loop and closed loop control systems and their differences – Examples of control systems – Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs – Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

UNIT – II:

TIME RESPONSE ANALYSIS: Step Response – Impulse Response – Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications – Steady state response – Steady state errors and error constants, P, PI, PID Controllers.

UNIT – III:

STABILITY ANALYSIS IN TIME DOMAIN: The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The Root locus concept – construction of root loci – effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV:

FREQUENCY RESPONSE ANALYSIS: Introduction, Frequency domain specifications – Bode diagrams – Determination of Frequency domain specifications and transfer function from the Bode Diagram – Stability Analysis from Bode Plots. Polar Plots – Nyquist Plots – Phase margin and Gain margin – Stability Analysis. Compensation techniques – Lag, Lead, Lag – Lead Compensator design in frequency Domain.

UNIT – V:

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STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS: Concepts of state, state variables and state model, state models – differential equations & Transfer function models – Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations – State Transition Matrix and its Properties. System response through State Space models. The concepts and difference of controllability and observability.
Text Books:
1. Katsuhiko Ogata, Modern Control Engineering, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. I. J. Nagrath and M. Gopal, Control Systems Engineering, New Age International (P) Limited Publishers, 5th edition, 2007.
Reference Books:
1. M.Gopal, Control Systems Principles & Design, 4/e, Mc Graw Hill Education, 2012.
2. B. C. Kuo and Farid Golnaraghi, Automatic Control Systems, John wiley and sons, 8/e, 2003.
3. Joseph J Distefano, Allen R Stubberud & Ivan J Williams, Schaum's outlines Feedback and Control Systems, 3/e, Mc Graw Hill Education, 2013.
4. Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Control System Design, Pearson, 2000.
5. Gene F. Franklin, J.D. Powell and Abbas Emami – Naeini, Feedback Control of Dynamic Systems, 6/e, Pearson, 2010.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc22_ee31/preview
• https://onlinecourses.nptel.ac.in/noc19_dc04/preview
• https://www.classcentral.com/course/swayam-control-systems-13963
• https://www.youtube.com/watch?v=HcLYoCmWOjI

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME64A - AUTOMOBILE ENGINEERING
(PROFESSIONAL ELECTIVE – II (A))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Impart the knowledge of vehicle structure and its components.
- Demonstrate various components of petrol engines and diesel engines.
- Trains about the various electrical system, circuits, and testing of automobiles.
- Explain the concepts of steering, suspension and braking system in automobile.

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

CO1: Identify different parts of automobile.

CO2: Explain the working of various parts like engine and brakes.

CO3: Describe the working of steering and the suspension systems.

CO4: Summarize the wheels and tires.

CO5: Outline the future developments in the automobile industry.

UNIT – I:

Introduction to vehicle structure and engine components: Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters.

UNIT – II:

Ignition and fuel supply: Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI.

UNIT – III:

Steering and suspension system: Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers.

UNIT – IV:

Wheels, Tires and Braking System: Wheels and Tires - Construction - Type and specification - Tire wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS)

UNIT – V:

Automobile electrical systems and advances in automobile engineering: Battery-General electrical circuits-Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP) Traction Control System (TCS) - Global Positioning System (GPS) - Hybrid vehicle.

Text Books:

1. Kirpal Singh, Automobile Engineering, Vol. 1 & 2, 14/e, Standard Publications, 2017.
2. William H. Crouse, Automotive Mechanics, 10/e, McGraw-Hill, 2006.
3. David A. Crolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann, 2009.
4. Richard Stone and Jeffrey K. Ball, Automotive Engineering Fundamentals, SAE International, 2004.

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Reference Books:
1. Bosch, Automotive Handbook, 6/e, SAE Publications, 2007.
2. K. Newton and W. Steeds, The Motor Vehicle, 13/e, Butterworth-Heinemann, 2001
3. Joseph Heitner, Automotive Mechanics Principles and Practices, 2/e, CBS Publishers, 2004.
Online Learning Resources:
• https://nptel.ac.in/courses/107106088
• https://nptel.ac.in/courses/107106080
• https://hindustanuniv.ac.in/assets/pdf/ug/CBCS/cbcs-automobile-2018.pdf
• https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160.htm
• https://dbatu.ac.in/wp-content/uploads/2020/07/B-Tech-Automobile_Final-Yr_22.06.2020-1.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME64B - MECHANICAL VIBRATIONS

(PROFESSIONAL ELECTIVE – II (B))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Demonstrate basic concepts and definitions of mechanical vibrations. To write equation of motion for discrete spring-mass systems with different configuration using classical and energy methods.
- To train the students about basic concepts of forced vibrations, vibration transmissibility and isolation and seismic instruments. Further to understand about various vibration control methods.
- To familiarize the students about two degree freedom system and various types of vibration absorbers.
- To analyze the two degree and multi degree of freedom systems.

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

CO1: Find natural frequency of un-damped single degree freedom systems.

CO2: Analyse the two degree freedom systems with and without damping.

CO3: Calculate transmissibility and isolation.

CO4: Solve problems on vibration absorber.

CO5: Use mechanical exciters and electro dynamic shaker.

UNIT – I:

Single Degree Freedom Systems: Un-damped free vibration: Classical method, Energy method, equivalent systems, torsional systems. Damped free vibration- Viscous damping, under damping, critical damping, over damping. Coulomb damping, equivalent damping coefficient. Simple problems.
Whirling of shafts: Transverse vibrations: Dunkerley's lower bound approximation, Critical speed of shafts.

UNIT – II:

Forced vibrations of Single Degree Freedom Systems: Steady state forced vibration, sources of excitation, impressed harmonic force, resonance impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping.

UNIT – III:

Two Degree Freedom Systems: Formulation of Equation of motion, Natural frequencies and modes of vibration by classical method, coupled pendulum, forced vibration, dynamic vibration absorber.

UNIT – IV:

Multi Degree Freedom Systems: Lagrangian method for formulation of equation of motion Influence co-efficient method, Lumped mass and distributed mass systems, Stodola method, Holzer's method, model analysis of free and forced vibrations.

UNIT – V:

Vibration measurement and Applications: Transducers: variable resistance transducers, Piezoelectric transducers, electro dynamic transducers and linear variable differential transformer transducer; Vibration pickups: vibrometer, accelerometer, velometer and phase distortion; Frequency-measuring instruments; Vibration exciters- Mechanical exciters and electro dynamic shaker.

Text Books:

1. Singrasu S. Rao, Mechanical Vibrations, 6/e, Pearson Education, 2018.
2. G.K.Groover, Mechanical Vibrations, 8/e, 2009.

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Reference Books:
1. L. Meirovich, Elements of Vibrations Analysis, Tata McGraw Hill, 1986
2. S. Graham Kelly, Mechanical Vibrations, Tata McGraw Hill, 1996
3. William Thomson, Theory of Vibrations with Applications, 5/e, Pearson, 2008
4. William Weaver, Timeoshenko, and Young, Vibration Problems in Engineering, 5/e, John Wiley, 2013.
5. C. Nataraj, Vibration of Mechanical Systems, 1/e, Cenage Learning, 2012.
Online Learning Resources:
• https://nptel.ac.in/courses/112107212
• https://nptel.ac.in/courses/112103111
• https://nptel.ac.in/courses/112103112
• https://nptel.ac.in/courses/101105081
• https://www.iare.ac.in/sites/default/files/PPT/MVSD%20PPT.pdf
• https://www.iare.ac.in/sites/default/files/lecture_notes/MV_LECTURE_NOTES.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME64C – NON DESTRUCTIVE EVALUATION

(PROFESSIONAL ELECTIVE – II (C))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce basic concepts of non destructive testing.
- Familiarize with characteristics of ultrasonic test, transducers, rejection and effectiveness.
- Describe concept of liquid Penetrant, eddy current and magnetic particle tests, its applications and limitations.
- Explain the principles of infrared and thermal testing, applications and honey comb and sandwich structures case studies.
- Impart NDE and its applications in pressure vessels, casting and welded constructions.

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

CO1: Explain various methods of non-destructive testing.

CO2: Apply relevant non-destructive testing method different applications.

CO3: Explain the applications of Railways, Nuclear and chemical industries.

CO4: Outline the limitations and disadvantages of NDE.

CO5: Explain the applications of NDA of pressure vessels, casting and welding constructions.

UNIT – I:

Introduction: Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

UNIT – II:

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect , Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT – III:

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current-Testing Effectiveness of Eddy Current Testing.

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

UNIT – IV:

Infrared And Thermal Testing: Introduction and fundamentals to infrared and thermal testing–Heat transfer – Active and passive techniques –Lock in and pulse thermography–Contact and non contact thermal inspection methods–Heat sensitive paints –Heat sensitive papers —thermally quenched phosphors liquid crystals – techniques for applying liquid crystals –other temperature sensitive coatings –Inspection methods –Infrared radiation and infrared detectors–thermo mechanical behavior of materials–IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

UNIT – V:

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Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions
Text Books:
1. J Prasad, GCK Nair , Non destructive test and evaluation of Materials, Tata mcgraw-Hill Education Publications, 2008.
2. Josef Krautkrämer, Herbert Krautkrämer, Ultrasonic testing of materials, 3/e, Springer-Verlag 1983.
3. X. P. V. Maldague, Non destructive evaluation of materials by infrared thermography, 1/e, Springer-Verlag, 1993.
Reference Books:
1. Gary L. Workman, Patrick O. Moore, Doron Kishoni, Non-destructive, Hand Book, Ultrasonic Testing, 3/e, Amer Society for Nondestructive, 2007.
2. ASTM Standards, Vol 3.01, Metals and alloys.
Online Learning Resources:
• http://www.twivirtualacademy.com/online-courses/ndt/
• https://www.classcentral.com/course/swayam-theory-and-practice-of-non-destructive-testing-9872
• https://onlinecourses.nptel.ac.in/noc20_mm07/preview
• https://www.youtube.com/watch?v=dyMR58TZMbo
• https://www.youtube.com/watch?v=Wam-Ewcn3aQ

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B.Tech III Year II Semester

23AME64D – STATISTICAL QUALITY CONTROL

(PROFESSIONAL ELECTIVE – II (D))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To understand the approaches and techniques of quality value and engineering
- To interpret statistical process control with $\overline{X}$, R, p, c charts and other types of control charts.
- To understand tolerance design and quality function deployment
- To understand techniques of modern reliability engineering tools.
- To interpret the concepts of complex system and reliability techniques.

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

CO1: Understand the approaches and techniques of quality value and engineering

CO2: Identify significance of statistical process control with $\overline{X}$, R, p, c charts and other types of control charts

CO3: Understand tolerance design and quality function deployment

CO4: Illustrate techniques of modern reliability engineering tools.

CO5: Interpret the concepts of complex system and reliability techniques

UNIT – I:

Quality value and engineering – quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design, quality costs – quality improvement.

UNIT – II:

Statistical process control $\overline{X}$, R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index. (SQC tables can be used in the examination)

Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plans.

UNIT – III:

Loss function, tolerance design – N type, L type, S type; determination of tolerance for these types.online quality control – variable characteristics, attribute characteristics, parameter design.

Quality function deployment – house of quality, QFD matrix, total quality management concepts.quality information systems, quality circles, introduction to ISO 9000 standards

UNIT – IV:

Reliability – Evaluation of design by tests - Hazard Models, Linear, Releigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement

UNIT – V:

Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness.

Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

Text Books:

1. Genichi Taguchi, Quality Engineering in Production Systems, 3/e, McGraw-Hill, 1988.
2. E. Balagurusamy, Reliability Engineering, 1/e, Tata McGraw-Hill, 2010.
3. Douglas C. Montgomery, Statistical Quality Control: A Modern Introduction, 7/e, Wiley, 2012.

Reference Books:

1. Frank M. Gryna Jr., Juran's Quality Planning & Analysis, 5/e, McGraw-Hill, 2005.
2. Philip J. Ross, Taguchi Techniques for Quality Engineering, 2/e, McGraw-Hill, 1988.
3. L. S. Srinath, Reliability Engineering, 3/e, Affiliated East-West Press Pvt. Ltd., 1991.
4. Eugene L. Grant & Richard S. Leavenworth, Statistical Process Control, 7/e, McGraw-Hill, 1996.
5. W. A. Taylor, Optimization & Variation Reduction in Quality, 2/e, Taylor Enterprises (or McGraw-Hill Education), latest known 2022 republication
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc24_mg50/preview
• https://www.youtube.com/watch?v=qpQjM2SXz0Q
• https://www.mooc-list.com/subject/statistical-process-control
• https://www.youtube.com/watch?v=_e-iZ2BAXPw
• https://www.youtube.com/watch?v=uutg8jKrL9w

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B.Tech III Year II Semester

23AME64E – COMPOSITE MATERIALS
(PROFESSIONAL ELECTIVE –(E))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

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

CO1: Identify the practical applications of composites.

CO2: Identify the polymer matrix composites.

CO3: Classify of bio- degradable composites.

CO4: Outline the various types of ceramic matrix materials.

CO5: List the advances & Applications of composites

UNIT – I:

Introduction to composites: Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT – II:

Polymer matrix composites : Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT – III:

Metal matrix compositerial: Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

UNIT – IV:

Ceramic matrix composites: Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis – SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT – V:

Advances & Applications of composites: Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications. Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Text Books:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:
1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.
Online Learning Resources:
• https://nptel.ac.in/courses/112104229
• https://nptel.ac.in/courses/112104168
• https://nptel.ac.in/courses/101104010
• https://nptel.ac.in/courses/105108124
• https://nptel.ac.in/courses/112104221

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B.Tech III Year II Semester

23AME66A - REFRIGERATION & AIR-CONDITIONING

(PROFESSIONAL ELECTIVE – III(A))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Provides insights in how thermodynamic principles are applied within the refrigeration and air conditioning industry.
- Introduce the students how real systems used in commercial, industrial refrigeration and air conditioning industries are built-up.
- Expose the students on various refrigeration methods like VCR, VAR and latest developments.
- Know the various air conditioning methods like summer, winter and year round air conditioning and to make the student to understand the practical applications of refrigeration and air conditioning systems

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

CO1: Appraise the importance of humidifiers and dehumidifiers.

CO2: Select the requirements of temperature and humidity for human comfort.

CO3: Demonstrate the heat pump working and its components.

CO4: List the various air conditioning equipments.

CO5: Use of Psychrometric charts for identification of properties of substances.

UNIT – I:

Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods.

Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems - Numerical Problems - Refrigeration Needs of Air Crafts.

UNIT – II:

Vapour Compression Refrigeration (VCR) System - Basic Cycle - Working Principle and Essential Components of the Plant - COP - Representation of Cycle On T-S and P-h Charts - Expander Vs. Throttling, Effect of Sub Cooling and Super Heating - Cycle Analysis - Actual Cycle- Influence of Various Parameters on System Performance - Construction and Use of P-h Charts - Numerical Problems. Refrigerants - Desirable Properties - Classification of Refrigerants Used - Nomenclature- Secondary Refrigerants- Lubricants - Ozone Depletion - Global Warming- Newer Refrigerants.

UNIT – III:

Vapor Absorption Refrigeration (VAR) System- Description and Working of NH3 - Water System and Li Br -Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components-Estimation of Motive Steam Required Principle and Operation of: (I) Thermo-Electric Refrigerator (ii) Vortex Tube or Hilsch Tube.

UNIT – IV:

Psychrometric Properties & Processes - Characterization of Sensible and Latent Heat Loads - Need For Ventilation, Consideration of Infiltrated Air - Heat Load Concepts. Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

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UNIT – V:
Air Conditioning Equipment - Humidifiers - Dehumidifiers - Air Filters, Fans and Blowers. Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump - Heat Sources - Different Heat Pump Circuits.
Text Books:
1. Refrigeration and Air Conditioning, C P Arora, TMH, 15/e, 2013.
2. S. C Arora & Domkundwar, A Course in Refrigeration and Air conditioning, Dhanpat rai & Co, 2018.
Reference Books:
1. Refrigeration and Air Conditioning / Manohar Prasad / New Age, 2/e, 2013.
2. Principles of Refrigeration - Dossat / Pearson Education, 4/e, 2007.
3. Refrigeration and Air Conditioning-P.L.Ballaney, 2/e, 2012.
4. Basic Refrigeration and Air-Conditioning - P.N.Ananthanarayanan / TMH, 4/e, 2013.
NOTE: Tables/Codes: Thermal Engineering Data Book containing refrigerant and Psychrometric property Tables and charts are permitted in Exam.
Online Learning Resources:
• https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_RAC_Lecture_Notes.pdf
• https://www.studocu.com/en-us/document/saint-louis-university/fluid-dynamics-laboratory/refrigeration-lecture-notes-1/3020577
• http://home.iitk.ac.in/~samkhan/ME340A.htm
• https://nptel.ac.in/courses/112105129
• http://dte.karnataka.gov.in/Institutes/gptkampli/GenericDocHandler/68-fc177b7d-f5d1-4580-b577-b1118df994f4.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME66B - MECHATRONICS

(PROFESSIONAL ELECTIVE – III (B))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To make the students to learn about the Basic electronics, electrical and mechanical components used to control the machines and industries.
- Various types of sensors, signal conditioning systems and various pneumatic and hydraulic components used in control systems. Micro controllers, PLCS and PLC program and programmable motion control systems.

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

CO1: Describe the basic components and functioning of mechatronic system.

CO2: Select the sensors for the desired application

CO3: Revise the concepts of solid state electronic devices

CO4: Explain the fundamental principles and working of various types of actuators.

CO5: Interface microcontrollers and microprocessors with sensors, actuators and other peripherals.

UNIT – I:

Introduction: Definition - Trends - Control Methods: Stand alone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

UNIT – II:

Signal Conditioning: Introduction - Hardware - Digital I/O , Analog input - ADC , resolution , speed channels Filtering Noise using passive components - Resistors, capacitors - Amplifying signals using OP amps -Software - Digital Signal Processing

UNIT – III:

Precision Mechanical Systems: Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Bearings- Motor / Drive Selection.

UNIT – IV:

Electronic Interface Subsystems: Motors Isolation schemes- opto coupling, buffer IC's - Protection schemes - circuit breakers, over current sensing, resettable fuses, Power Supply - Bipolar transistors/ mosfets.

Electromechanical Drives: Relays and Solenoids - Stepper Motors - DC brushed motors - DC brushless motors - DC servo motors - PWM's - Pulse Width Modulation - Variable Frequency Drives.

UNIT – V:

Microcontrollers Overview: 8051 Microcontroller , micro processor structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications, Programming - Assembly.

Programmable Logic Controllers: Basic Structure - Programming: Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection, interface - R232 etc.,-Applications.

Text Books:

1. W. Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd ed., Pearson Education, 2005.
2. Ganesh S. Hegde, Mechatronics, 1st ed., Jones & Bartlett Publishers, 2009.

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Reference Books:
1. Newton C. Braga, Mechatronics Sourcebook, 1st ed., Delmar/Thomson & Cengage Learning, 2002.
2. N. Shanmugam, Mechatronics, 1st ed., Anuradha Agencies Publishers, 2010.
3. Devdas Shetty and Richard A. Kolk, Mechatronics System Design, 1st ed., Course Technology (Thomson), 1997.
4. M. D. Singh and J. G. Joshi, Mechatronics, 1st ed., PHI Learning, 2006.
Online Learning Resources:
• https://www.srecwarangal.ac.in/ece-downloads/Mechatronics%20material.pdf
• https://kp.kiit.ac.in/pdf_files/06/SM_5th-SEM_Mech_Mechatronics.pdf
• https://www.cet.edu.in/noticefiles/259_Lecturer%20Note%20on%20Mechatronics-ilovepdf-compressed.pdf
• https://archive.nptel.ac.in/courses/112/107/112107298/
• https://nptel.ac.in/courses/112103174

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME66C – INDUSTRIAL ROBOTICS
(PROFESSIONAL ELECTIVE – III (C))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Discuss various applications and components of industrial robot systems
- Learn about the types of actuators used in robotics
- Calculate the forward kinematics and inverse kinematics.
- Learn about programming principles and languages for a robot control system
- Discuss the applications of image processing and machine vision in robotics.

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

CO1: Discuss various applications and components of industrial robot systems.

CO2: Learn about the types of actuators used in robotics.

CO3: Calculate the forward kinematics and inverse kinematics.

CO4: Learn about programming principles and languages for a robot control system.

CO5: Discuss the applications of image processing and machine vision in robotics.

UNIT – I:

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An overview of Robotics – present and future applications – classification by coordinate system and control system.

COMPONENTS OF THE INDUSTRIAL ROBOTICS:

Robot anatomy, work volume, components, number of degrees of freedom - robot drive systems, function line diagram representation of robot arms, common types of arms – requirements, challenges and design of end effectors.

UNIT – II:

ROBOT ACTUATORS AND FEEDBACK COMPONENTS:

Actuators: Pneumatic, Hydraulic actuators, Electric & stepper motors. Comparison of Electric, Hydraulic and Pneumatic types of actuation devices.

Feedback components: Position sensors – potentiometers, resolvers, encoders – velocity sensors.

UNIT – III:

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D–H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT – IV:

GENERAL CONSIDERATIONS IN PATH DESCRIPTION AND GENERATION: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages – description of paths with a robot programming language.

UNIT – V:

IMAGE PROCESSING AND MACHINE VISION: Introduction to Machine Vision, Sensing and Digitizing function in Machine Vision, Training and Vision System, Robotic Applications.

Text Books:

1. M. P. Groover, Industrial Robotics: Technology, Programming and Applications, 2/e, McGraw Hill Education, 2017.
2. Mittal R.K. and Nagrath I.J., Robotics and Control, Tata McGraw-Hill, 2003.

Reference Books:
1. Fu K. S., Gonzalez R. C., and Lee C. S. G., Robotics: Control, Sensing, Vision, and Intelligence, McGraw-Hill, 1987.
2. Richard D. Klafter, Thomas A. Chmielewski, and Michael Negin, Robotic Engineering: An Integrated Approach, Prentice Hall, 1989.
3. H. Asada and J. J. E. Slotine, Robot Analysis and Control, Wiley, Reprint Edition by BSP Books Pvt. Ltd., 2012.
4. John J. Craig, Introduction to Robotics: Mechanics and Control, 3/e, Pearson Education, 2005.
5. Saha S. K., Introduction to Robotics, Tata McGraw-Hill Education, 2008.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc23_me143/preview
• https://onlinecourses.nptel.ac.in/noc21_me76/preview
• https://onlinecourses.nptel.ac.in/noc21_me32/preview
• https://www.coursera.org/courses?query=robotics
• https://www.udemy.com/topic/industrial-robotics/?srsltid=AfmBOoo5ILvtEieF64GFjStmDELMdecI2iYbEu0TYew-CuQ47-KVZK3S

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME66D – SMART MANUFACTURING

(PROFESSIONAL ELECTIVE – III (D))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To apply knowledge of smart manufacturing systems' components in the context of Industry 4.0.
- To understand the concepts of smart machines and smart sensors.
- To understand and apply the concepts of IoT connectivity to Industry 4.0.
- To understand the concepts of Digital Twin and apply Machine Learning and Artificial Intelligence concepts in Manufacturing.
- To understand the concepts of Metaverse platform.

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

CO1: Learn about smart manufacturing systems' components and can handle it more effectively in context of Industry 4.0.

CO2: Learn about the smart machines and smart sensors.

CO3: Apply IoT to Industry 4.0 and they are able to make a system tailor-made as per requirement of the industry.

CO4: Learn about concepts of Digital Twin and able to apply Machine Learning and Artificial Intelligence concepts in Manufacturing.

CO5: Learn the concepts of AR/VR and Metaverse platform.

UNIT – I:

Concepts of Smart Manufacturing: Definition and key characteristics of smart manufacturing, Corporate adaptation processes, manufacturing challenges, challenges vs technologies, Stages in smart manufacturing. Minimizing Six big losses in manufacturing with Industry 4.0, and their benefits.

UNIT – II:

Smart Machines and Smart Sensors: Concept and Functions of a Smart, Machine Salient features and Critical Subsystems of a Smart Machine, Smart sensors; smart sensors ecosystem, need, benefits and applications of sensors in industry, Introduction to IoT, IIoT, and Cyber physical systems, Sensing for Manufacturing Process in IIoT, Block Diagram of an IoT Sensing Device, Sensors in IIoT Applications, Smart Machine Interfaces,

UNIT – III:

IoT connectivity for Industry 4.0: Industrial communication requirement and its infrastructure, an overview of different types of networks, mesh network in industrial IoT, IoT protocols and the internet, TCP/IP (transmission control protocol/internet protocol) model, IoT connectivity standards: common protocols, application layer protocols, internet/network layer protocols, physical layer IoT protocols, choosing the right IoT connectivity protocol.

UNIT – IV:

Digital Twin: Introduction, applications of digital twins, impact zones of digital twins in manufacturing (factories/plants and OEMs), advantages of digital twins, basic steps of digital twin technology

Machine Learning (ML) and Artificial Intelligence (AI) in Manufacturing: Introduction, benefits and applications of ML in industries, common approaches of ML; supervised and unsupervised, semi-supervised and reinforced ML.

UNIT – V:

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Metaverse – Basic concepts, AR/VR, Social Metaverse, Industrial Metaverse, How Web 3.0 is changing the Internet, Asset Classes Inside the Metaverse, Land, Coins, Characters/ Avatars, Skins, Utility, Industries Disrupted by the Metaverse, Smart wearables,
Text Books:
1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson Education, 2010.
2. Tom M. Mitchell, Machine Learning, McGraw Hill, 2013.
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, 2004.
4. AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017.
5. Artificial Intelligence and Machine Learning, Principles and applications by Vinod Chandra S.S., Anand Hareendran S., PHI.
Reference Books:
1. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.
3. MACHINE LEARNING: A PRACTITIONER'S APPROACH, by Vinod Chandra S.S., Anand Hareendran S., PHI.
4. M.C. Trivedi, A Classical Approach to Artifical Intelligence, Khanna Publishing House,New Delhi, 2018.
5. S. Kaushik, Artificial Intelligence, Cengage Learning India, 2011.
Online Learning Resources:
• https://en.wikipedia.org/wiki/Smart_manufacturing
• https://www.mdpi.com/2076-3417/10/24/9154
• https://www.mdpi.com/2076-3417/10/24/9154
• https://www.coursera.org/learn/digital-twins
• https://www.fast.ai/

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B.Tech III Year II Semester

23AME66E – MECHANICAL MEASUREMENTS

(PROFESSIONAL ELECTIVE – III (E))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart fundamental knowledge of measurement systems and their components.
- To explain various methods for measuring displacement, temperature, pressure, level, flow, speed, vibration, strain, humidity, force, torque, and power.
- To introduce transducers, sensors, and the role of control systems in measurement.
- To develop skills in error analysis and calibration of instruments.
- To enable students to select suitable measurement methods for industrial applications.

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

- Understand basic concepts and functional elements of measurement systems.
- Identify sources of error and methods for their elimination.
- Analyze and select appropriate transducers for displacement, temperature, pressure, level, and flow measurement.
- Apply methods for measuring speed, acceleration, vibration, strain, humidity, force, torque, and power.
- Understand the principles and components of control systems in engineering applications.

UNIT – I:

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photoelectric transducers, Calibration procedures.

UNIT – II:

Measurement of Temperature: Classification – Ranges –Various Principles of measurement – Expansion, Electrical Resistance –Thermistor – Thermocouple – Pyrometers –Temperature Indicators.

Measurement of Pressure: Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement –Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

Measurement of Level: Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

UNIT – III:

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flowmeter, Hot wire anemometer, Laser Doppler Anemometer(LDA).

Measurement of Speed: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non contact type of tachometer.

Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments– Vibrometer and accelerometer using this principle.

UNIT – IV:

Stress Strain Measurements: Various types of stress and strain measurements– electrical strain gauge – gauge factor– method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes. **Measurement of Humidity** – Moisture content of gases, sling psychrometer, Absorption psychrometer, Dewpoint meter.
UNIT – V:
Measurement of Force, Torque and Power – Elastic forcemeters, loadcells, Torsionmeters, Dynamometers. **Elements of Control Systems:** Introduction, Importance – Classification – Open and closed systems Servomechanisms – Examples with block diagrams– Temperature, speed & position control systems.
Text Books:
1. Beckwith, T.G., Marangoni, R.D., and Lienhard, J.H., Mechanical Measurements, 6/e, PHI Learning Pvt. Ltd., 2007.
2. D.S. Kumar, Measurement Systems: Applications and Design, 1/e, McGraw-Hill Education, 2010.
Reference Books:
1. R.K. Jain, Mechanical and Industrial Measurements, 10/e, Khanna Publishers, 2013.
2. Holman, J.P., Experimental Methods for Engineers, 8/e, McGraw-Hill Education, 2011.
3. A.K. Tayal, Instrumentation and Mechanical Measurements, 1/e, Galgotia Publications, 2004.
4. A.K. Sawhney, Mechanical Measurements and Instrumentation, 1/e, McGraw-Hill Education, 2005.
Online Learning Resources:
• https://nptel.ac.in/courses/112105047
• https://vlab.co.in/broad-area-mechanical-engineering
• https://ocw.mit.edu/courses/mechanical-engineering/
• https://library.automationdirect.com/what-is-a-transducer/
• https://instrumentationtools.com/measurement-instruments/

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME67 - THEORY OF MACHINES LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- To understand and analyze the kinematics of various mechanisms including links, pairs, and chains.
- To study and evaluate the working of commonly used mechanisms such as quick return mechanisms, reciprocating and oscillating engine mechanisms.
- To experimentally determine dynamic characteristics of governors, gyroscopes, cam mechanisms, and balancing apparatus.
- To compare theoretical and experimental values in machine dynamics experiments and interpret the results.

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

CO1: Identify and classify different types of kinematic links, pairs, chains, and mechanisms.

CO2: Demonstrate and explain the working of quick return, reciprocating, and oscillating engine mechanisms.

CO3: Apply the concept of inversions of four-bar linkages in real mechanisms.

CO4: Analyze various gear types (helical, worm, bevel, etc.) and determine conditions for interference.

CO5: Solve velocity problems using relative velocity and instantaneous center methods.

1. To study various types of kinematics links, pairs, chains & Mechanisms.
2. To study Whitworth Quick Return Motion Mechanism, Reciprocating Engine Mechanism and Oscillating Engine Mechanism.
3. To Study of inversions of four bar linkage.
4. To study various types of gears and condition for interference – Helical, cross helical, worm, bevel gear and gear profile (involute and cycloidal).
5. To determine the gyroscopic couple on Motorized Gyroscope.
6. To perform experiment on dead weight type governor to prepare performance characteristic curves and to find stability and sensitivity.
7. To perform experiment on spring–controlled governor to prepare performance characteristic curves and to find stability and sensitivity.
8. To perform the experiment on static / dynamic balancing.
9. To perform experiment on CAM Analysis Apparatus.
10. To determine whirling speed of shaft theoretically and experimentally.
11. Solution of minimum two problems each on determination of velocity using relative velocity and instantaneous center method.
12. Solution of minimum two problems each on relative acceleration method, involving Coriolis acceleration and one each on short cut methods (Klien Construction, Ritterhaus Construction. Modified Klien Construction

Online Learning Resources:

- https://archive.nptel.ac.in/courses/112/106/112106270/
- https://archive.nptel.ac.in/courses/112/104/112104121/
- https://archive.nptel.ac.in/courses/112/105/112105268/
- https://mm-nitk.vlabs.ac.in/

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B.Tech III Year II Semester

23AME68 - CONTROL SYSTEMS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- Determination of transfer functions of various systems and control of it by different methodologies.
- To provide knowledge in the analysis and design of controllers and compensators.
- The characteristics of servo mechanisms which are helpful in automatic control systems.
- To know the stability analysis using MATLAB.

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

CO1: Get the knowledge of feedback control and transfer function of DC servo motor.

CO2: Model the systems and able to design the controllers and compensators.

CO3: Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and can implement them to practical systems and MATLAB.

CO4: Determine the performance and time domain specifications of first and second order systems.

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple
4. Boolean expressions and application of speed control of motor.
5. Effect of feedback on DC servo motor
6. Transfer function of DC Machine
7. Effect of P, PD, PI, PID Controller on a second order system
8. Lag and lead compensation – Magnitude and phase plot
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Simulation of Op-Amp based Integrator and Differentiator circuits.
13. Linear system analysis (Time domain analysis, Error analysis) using Soft Tools.
14. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using Soft Tools
15. State space model for classical transfer function using Soft Tools – Verification.
16. P, PI and PID Controller design for Temperature Control using Soft Tools.

Reference Books:

1. M. H. Rashid, SPICE for Circuits and Electronics Using PSPICE, 2nd Edition, Prentice Hall, January 15, 1995.
2. MicroSim Corporation, PSPICE A/D User's Manual, Version 8.0, June 1997.
3. MicroSim Corporation, PSPICE A/D Reference Guide, Version 7.1, October 1996.
4. MathWorks Inc., MATLAB Version 4 User's Guide, Student Edition, Prentice Hall PTR, 1995.

Online Learning Resources:

- http://iitb.vlab.co.in/?sub=8&brch=117
- https://ce-dei.vlabs.ac.in/Objective.html
- http://vlabs.iitkgp.ac.in/ctrl/index.html

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech III Year II Semester

23AME69 - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING ALGORITHMS

(Skill oriented course – IV)

L	T	P	C
0	1	2	2

Course Objectives: The objectives of the course are to make the students learn about

- To enable the students write coding for various artificial intelligence and machine learning algorithms.
- To understanding of the core concepts and principles of AI and ML, including different learning paradigms (supervised, unsupervised, reinforcement learning), and common algorithms.
- To grasp the principles of deep learning and implement various neural network architectures, including Artificial Neural Networks (ANN), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), and Autoencoders, using a framework like TensorFlow.
- To apply learned concepts and programming skills to solve real-world data science problems through practical examples and project implementations.

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

CO1: Learn various Python libraries.

CO2: Do programming for regression methods.

CO3: Write coding for different types of neural networks.

CO4: Apply supervised machine learning algorithms like Decision Tree, SVM, and Naïve Bayes for classification problems.

CO5: Design and build autoencoders for unsupervised learning tasks.

List of Experiments:

1. Learning of Python libraries – Numpy, Pandas, Matplotlib, Seaborn
2. Numerical examples on Python libraries
3. Data Preprocessing and data cleaning using Python
4. Learning of TensorFlow
5. Write a program for Linear regression
6. Write a program for Logistic regression
7. Write a program for ANN
8. Write a program for CNN
9. Write a program for RNN
10. Write a program to build a Decision tree
11. Write a program to build a Naïve Bayes classifier
12. Write a program for SVM
13. Write a program for Auto-encoder

Reference Books:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2/e, O'Reilly Media, 2019.
2. François Chollet, Deep Learning with Python, 2/e, Manning Publications, 2021.
3. Mark Lutz, Learning Python, 5/e, O'Reilly Media, 2013.
4. Wes McKinney, Python for Data Analysis, 2/e, O'Reilly Media, 2017.

Online Learning Resources:

- https://numpy.org/doc/
- https://pandas.pydata.org/docs/

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Dept. of Humanities & Social Sciences

MANDATORY NON-CREDIT COURSE

TECHNICAL PAPER WRITING AND INTELLECTUAL PROPERTY RIGHTS

Course Code: **Semester V** **L T P C :2 0 0 0**

Course Objectives:

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Course Outcomes: On successful completion of this course, the students will be able to:

COURSE OUTCOMES: At the end of the course, students will be able to		**Blooms Level**
CO1	Identify key secondary literature related to their proposed technical paper writing	L1, L2
CO2	Explain various principles and styles in technical writing	L1, L2
CO3	Use the acquired knowledge in writing a research/technical paper	L3
CO4	Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.	L4
CO5	Evaluate different forms of IPR available at national & international level	L5
CO6	Develop skill of making search of various forms of IPR by using modern tools and techniques.	L3, L6

SYLLABUS

UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing - avoiding ambiguity- repetition, and vague language - highlighting findings - discussing limitations -

UNIT – II:

Technical Research Paper Writing: Use of English language in Technical writing - hedging and criticizing -plagiarism and paraphrasing - Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

UNUNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars-conferences- proof reading – seminar & conference paper writing;
Methodology-discussion-results- Documentation Styles (IPA, IEEE etc)

UNUNIT - IV

IntrIntroduction to Intellectual property: Introduction, types of intellectual property, International organizations agencies and treaties, importance of intellectual property rights

TraTrade Marks: Purpose and function, acquisition rights, protectable matter, selecting and evaluating trade mark trad Trade mark registration processes.

UNIT – V:

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership and registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

Textbooks:

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013
2. Adrian Wallwork. *English for Writing Research Papers.* Second Edition. Springer Cham Heidelberg New York, 2016

Reference Books:

1. R.Myneni, *Law of Intellectual Property*, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, *Intellectual Property Rights* Tata Mcgraw Hill, 2001
3. P.Narayan, *Intellectual Property Law*, 3rd Ed, Eastern Law House, 2007.
4. Dan Jones, Sam Dragga, *Technical Writing Style,* Pearson Education Limited, 1997

Online Resources

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/
5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
6. https://lawbhoomi.com/intellectual-property-rights-notes/
7. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA				
B.Tech IV Year I Semester				
23AME71–CAD/CAM				
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

Course Objectives: The objectives of the course are to make the students learn about

- Understand the basics of CAD/CAM, geometric representation, transformations.
- Explain geometric modeling methods in CAD.
- Familiarize numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC) machines.
- Impart knowledge on manual part programming and computer aided part programming & CIM
- Explain the principles robotics, Automation, Automatic Identification and Data Capture AI & ML

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

CO1: Apply the basics of geometric representation and transformations in CAD/CAM.

CO2: Choose geometric modeling methods for building CAD models.

CO3: Compare NC, CNC and DNC.

CO4: Develop manual and computer aided part programming for turning and milling operations.

CO5: Summarize the principles of robotics, automatic identification & data capture AI, ML

UNIT – I: Introduction to CAD/CAM:

CAD/CAM: Introduction- I/O devices, Product life cycle, CAD/CAM systems and applications-components of Computer aided design (CAD)/Computer aided manufacturing (CAM)/Computer aided engineering (CAE) systems, benefits– IGES, STEP.

2D and 3D geometric transformations: Translation, scaling, rotation, mirroring, homogenous transformations, concatenation of transformations.

UNIT – II: Geometric Modelling

Parametric representation: Representation of curves, Algebraic and geometric forms of cubic spline, Bezier curve Bernstein basis equations, properties, derivatives and B-spline curves- B-Spline basis equations, knot vectors, properties, NURBS for two dimensions.

Geometric modelling of surfaces: Surface patch, Coon's surface- Bezier and B-spline surfaces, sweep surfaces, surface of revolution, blending of surfaces.

Geometric Modelling of Solids: Wireframe, surface modelling, solid entities, Boolean operations, CSG approach and B-rep of solid modelling.

UNIT – III: Computer Aided Manufacturing (CAM):

Computer Aided Manufacturing (CAM): Structure of numerical control (NC) machine tools, designation of axes, drives and actuation systems, feedback devices, Elements of CNC system -Difference between computer numerical control (CNC) and direct numerical control (DNC), adaptive control system, CNC tooling, automatic tool changers and work holding devices, functions of CNC and DNC systems-Applications.

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UNIT – IV: Computer Integrated Manufacturing & Part Programming
Computer Integrated Manufacturing (CIM): Introduction to CIM, Data flow in CIM, CIM wheel, Process involved in CIM, Need for CIM, Advantages & disadvantages of CIM. Production system: automation in production systems, Manual labour in production systems, Automation principles and strategies. Part Programming: Manual Part Programming - Computer Aided Part Programming-Interactive Graphic System in Computer Aided Part Programming- block of information, preparatory and miscellaneous functions (G-codes, M-codes). Tool codes and tool length offset, interpolation, canned cycles, typical examples in turning, milling and drilling operation. APT Programming: APT language structure, APT geometry, APT Motion Commands: set-up commands, point to point motion commands; continuous path motion commands part programming preparation for typical examples (turning, milling and drilling operation).
UNIT – V: Automation & Automatic Identification and Data Capture
Automation: Anatomy and configuration of robot, characteristics of robots, grippers, application of robots in manufacturing, robot programming languages. **Automatic Identification and Data Capture:** Introduction, Reasons for AIDC, bar code, RFID and other AIDC technologies, CAQC – Inspection metrology, CMM, Machine Vision, other optical inspection methods, non-optical non-contact inspection technologies, Material handling and identification – current scenario [Artificial Intelligence (AI), Machine Learning (ML), Digital manufacturing (DM), Internet of Things (IOT), Cloud based manufacturing].
Text Books:
1. P. N. Rao, CAD/CAM: Principles and applications, 3/e, Tata McGraw-Hill, Delhi, 2017.
2. Ibrahim Zeid, R. Siva Subramanian, CAD/CAM: Theory and Practice, 2/e, Tata McGraw-Hill, Delhi, 2009.
Reference Books:
1. Mikell P. Groover, Emory W. Zimmers, CAD/CAM, 5/e, Pearson Prentice Hall of India, Delhi, 2008.
2. Michael E. Mortenson, Geometric Modeling, 3/e, illustrated, Industrial Press, 2006
3. TienChien Chang, Computer Aided Manufacturing, 3/e, Pearson, 2008.
4. P. Radhakrishnan, S. Subramanyan& V. Raju, CAD/CAM/CIM, 3/e, New Age International Publishers, 2008.
Online Learning Resources:
• https://onlinecourses.nptel.ac.in/noc20_me44/preview
• https://www.youtube.com/watch?v=EgKc9L7cbKc
• https://www.youtube.com/watch?v=KXFpTb9cBpY
• https://www.youtube.com/watch?v=vO1lc75jtiM&list=PLLvBXFAV-DeLYJkmexmAEo-qb2miY97C_
• https://web.iitd.ac.in/~hegde/cad/lecture/L01_Introduction.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech IV Year I Semester

23AHS71D – OPERATIONS RESEARCH

(Management Course –II)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- To impart the basic concepts of modelling, models and statements of the operations research.
- Formulate and solve linear programming problem/situations.
- Model strategic behaviour in different economic situations.
- To solve transportation problems to minimize cost.
- Apply Queuing theory to solve problems of traffic congestion, counters in banks, railway bookings etc.

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

CO1: Develop mathematical models for practical problems.

CO2: Apply linear programming to transportation problems.

CO3: Solve games using various techniques.

CO4: Solve production scheduling and develop inventory policies.

CO5: Apply dynamic programming methods

UNIT – I:

Introduction to Operations Research (OR): OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models.

Linear Programming(LP): Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Two–Phase Simplex Method, Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions; Concept of dual theorem.

UNIT – II:

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution - North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem, Degenerate Problem. Assignment Problem – Formulation, Hungarian Method for Solving Assignment Problems, Traveling Salesman problem.

UNIT – III:

Game theory: Optimal solution of two person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.

Job Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Job Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

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UNIT – IV:

Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with infinite and finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with infinite queue length.

Inventory Control: Introduction, Deterministic models – EOQ model with and without shortages, Production model, Buffer stock and discount inventory models with single price breaks. Selective inventory control.

UNIT – V:

Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision. Types of Replacement Problems, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

Dynamic Programming (DP): Introduction –Bellman's Principle of Optimality – Applications of Dynamic Programming – Shortest Path Problem – Capital Budgeting Problem – Solution of Linear Programming Problem by DP.

Text Books:

1. Sharma S.D., Operations Research: Theory, Methods and Applications, 15/e, KedarNath Ram Nath, 2010.
2. Taha H.A., Operations Research, 9/e, Prentice Hall of India, New Delhi, 2010.

Reference Books:

1. Hiller F.S., and Liberman G.J., Introduction to Operations Research, 7/e, Tata McGraw Hill, 2010.
2. Sharma J.K., Operations Research: Theory and Applications, 4/e, Laxmi Publications, 2009.
3. Premkumar Gupta and Hira, Operations Research, 3/e, S Chand Company Ltd., New Delhi, 2003.
4. Pannerselvam R., Operations Research, 2/e, Pentice Hall of India, New Delhi, 2006.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc25_ag15/preview
- https://www.edx.org/learn/operations/the-hong-kong-polytechnic-university-operations-research-an-active-learning-approach
- https://www.udemy.com/topic/operations-research/?p=1&srsltid=AfmBOoqy3D4-qkgGN-OzJNqhYfVoe1X09j5XI9fDX8lF2mUNAkJ2ryvm

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech IV Year I Semester

23AME72A - HYDROGEN AND FUEL CELL TECHNOLOGY

(PROFESSIONAL ELECTIVE – IV(A))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To understand different hydrogen production pathways for a sustainable development.
- To discuss the fundamentals of various types of fuel cell system, its components, and characterization techniques.
- To explain the thermodynamics and electrochemistry of different fuel cell systems.
- To inculcate the technical know-how of different analytical techniques for performance evaluation of fuel cell systems.

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

CO1: Understand fuel cell fundamentals

CO2: Demonstrate the operation of different fuel cells

CO3: Analyse the performance of PEM fuel cell system

CO4: Understand the Production, Storage and Transportation systems of Hydrogen

CO5: Understand the applications of Hydrogen in Stationary and Automotive applications.

UNIT – I:

Introduction to Fuel Cells – Fuel cell concept - key components - physical and chemical phenomena in fuel cells - advantages and disadvantages of fuel cells – different types of fuel cells and their characteristics – fuel cells for stationary applications – fuel cell vehicles.

UNIT – II:

Thermodynamic analysis – systematic enthalpy change of a reacting system – systematic Gibbs free energy – change of a reacting system – ideal efficiency of the energy conversion – energy balance in fuel cells.

UNIT – III:

Electrochemistry – Nernst equation, relation of the fuel consumption versus output – stoichiometric coefficients and utilization percentages of fuels and oxygen – mass flow rate calculation for fuel and oxygen in single cell and fuel cell stack – total voltage and current for fuel cells in parallel and serial connection – over-potential and polarizations,

UNIT – IV:

DMFC operation scheme – general issues-water flooding and water management - polarization in PEMFC - optimization design of PEMFC – case studies. Hydrogen economy – Introduction to hydrogen economy - production, storage and transportation systems – hydrogen from fossil fuels – electrolysis of water – thermochemical cycles – baseline and alternative thermochemical cycles.

UNIT – V:

Hydrogen utilization – Hydrogen for stationary and automotive applications – transmission and infrastructure requirements – safety and environmental impacts - economics of transition to hydrogen systems – case studies.

Text Books:

1. Vishwanathan B. and AuliceScibioh, "Fuel cells: Principles and Applications", University Press, 2006.
2. Ram B. Gupta, "Hydrogen Fuel: Production, Transport and Storage", CRC Press.

Reference Books:

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2. Peter Hoffman, "Tomorrow's Energy – Hydrogen Fuel cells and the Prospects for Cleaner Planet", MIT, 2002.
3. Prashukumar G.P., "Hydrogen – A Fuel for Automatic Engines"" ISTE, 1999.
4. Hart A.B. and Womack G.J., "Fuel Cells – Theory and Applications", Chapman and Hall, 1967.
5. Young G.J., "Fuel Cells", Rein hold publishing Corp., 1960.
6. Veziroglu T., "Hydrogen Energy", Springer publishing, 1975.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc22_ch66/preview
- https://archive.nptel.ac.in/courses/103/101/103101215/
- https://archive.nptel.ac.in/courses/103/102/103102015/
- https://onlinecourses.nptel.ac.in/noc24_me68/preview

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA				
B.Tech IV Year I Semester **23AME72B - CONDITION MONITORING** **(PROFESSIONAL ELECTIVE – IV (B))**				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
Course Objectives: The objectives of the course are to make the students learn about				
• Teach the basics of the theory and practice of condition monitoring				
• Introduce experimental techniques in condition monitoring				
• Teach the primary signal processing techniques				
• To teach techniques of data collection for the analysis of vibration monitoring				
• To introduce advanced methods (tool wear monitoring, lubricant analysis and radiographic techniques) in conditioning monitoring.				
Course Outcomes: At the end of the course, the students will be able to				
CO1: Familiar with theoretical and practical aspects of condition monitoring				
CO2: Develop the ability to plan for experimental testing of condition monitoring				
CO3: Understanding of signal processing techniques				
CO4: Understand of the data collection techniques for the analysis of vibration monitoring				
CO5: Appreciate role of tool wear monitoring in condition monitoring and radiographic techniques.				
UNIT – I:				
Introduction to condition monitoring: Basic concept, techniques - visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, crack monitoring, thickness monitoring, noise and sound monitoring.				
UNIT – II:				
Basic signal processing techniques: Probability distribution and density, Fourier analysis, Hilbert Transform, Cepstrum analysis, Digital filtering, Deterministic/random signal separation, Time-frequency analysis Wavelet transform: Introduction to Wavelets, Continuous Wavelet Transform (CWT), Discrete wavelet transform (DWT), Wavelet Packet Transform (WPT),types of wavelets – Haarwavelets,Shannon wavelets, Meyer wavelets, Daubechies wavelets, Coifmann wavelets and applications of wavelets.				
UNIT – III:				
Vibration monitoring, mention bearing and gear faults: Introduction, vibration data collection, techniques, instruments, transducers, selection, measurement location, time domain analysis, frequency domain analysis, time-frequency domain analysis and commonly witnessed machinery faults diagnosed by vibration analysis. Vibration signals from rotating and reciprocating machines – signal classification, signals generated by rotating machines, signals generated by reciprocating machines. Introduction, construction, types of faults, rolling element, rolling element bearing diagnostics and gear diagnostics.				
UNIT – IV:				
Other methods in condition monitoring: Wear monitoring and lubricant analysis - sources of contamination, techniques, Spectrometric Oil Analysis Procedure (SOAP) and ferrography, Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.				
UNIT – V:				
Machine tool wear monitoring techniques and case studies.				

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Text Books:

1. Robert Bond Randall, Vibration-Based Condition Monitoring: Industrial, Aerospace and Automotive applications, John Wiley & Sons Ltd., 2011
2. R.A.Collacot, Mechanical Fault Diagnosis, Chapman and Hall Ltd., 1977.

Reference Books:

1. John S.Mitchell, Introduction to Machinery Analysis and Monitoring, PennWell Books,1993
2. R.C.Mishra, K.Pathak, Maintenance Engineering and Management, Prentice Hall of India Pvt. Ltd., 2002.
3. AmiyaRanjanMohanty, Machinery Condition Monitoring: Principles and Practices, CRC press, 2014

Online Learning Resources:

- https://www.fluke.com/en/products/condition-monitoring
- https://onlinecourses.nptel.ac.in/noc22_me60/preview
- https://nptel.ac.in/courses/112105232
- https://onlinecourses.swayam2.ac.in/nou21_me10/preview
- https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-me12/

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.TechIV Year I Semester

23AME72C - INDUSTRIAL HYDRAULICS AND PNEUMATICS

(PROFESSIONAL ELECTIVE – IV (C))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize on Fluid Power Engineering and Power Transmission System.
- Introduce the students, the basic concepts of hydraulic and pneumatic systems.
- Expose the students with various hydraulic and pneumatic actuators.
- Familiarize on fluid power systems and its applications to real time.
- Know the problem, which occur in fluid power systems and take necessary troubleshooting/ maintenance activities.
- Get practiced in designing hydraulic and pneumatic systems.

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

CO1: Compare the differences between hydraulic and pneumatic systems.

CO2: Identify the practical applications in automation.

CO3: Build the circuits for a given applications.

CO4: Develop hydraulic and pneumatic power packs.

CO5: Discuss the importance of PLC and microprocessor in hydraulic and pneumatic systems.

UNIT – I: Introduction

Introduction to fluid power - Types, advantages and application of fluid power systems. Properties of hydraulic fluids – General types of fluids – Fluid power symbols as per ISO/ANSI. Basic Components of Hydraulic and Pneumatic Systems. Comparison of Mechanical, Electrical, Hydraulic & Pneumatic systems for force and motion analysis in automation.

UNIT – II: Hydraulic Pumps, Actuators and Controlling elements

Types of hydraulic pumps - construction and working principle - design considerations, selection, specifications and characteristics of pumps. Types of actuators-construction and working principle - design considerations, selection, specifications and characteristics of actuators.

Control and Regulation Elements: Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Selection of valves for hydraulic circuits.

UNIT – III: Design of Hydraulic Circuits:

Speed control circuits - Regenerative circuits- Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier–Intensifier circuit. - Reservoir design - Selection of components. Hydraulic circuits - Reciprocating - Quick return - Sequencing synchronizing - Safety circuits - Industrial applications circuits - Hydraulic Press - Milling Machine - Planner - Fork Lift.

UNIT – IV: Pneumatic Systems:

Pneumatic fundamentals - Properties of air – Compressors – Filter, Regulator, and Lubricator unit – Air control valves, Quick exhaust valves, and pneumatic actuators. Control Elements - Logic Circuits -Position - Pressure Sensing - Switching – Electro Pneumatic. Robotic arms.

UNIT – V: Design of Pneumatic Circuits

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Classic-Cascade-Step counter - Combination -Methods - PLC-Microprocessors -Uses - Selection criteria for Pneumatic components. Installation and Maintenance of Hydraulic and Pneumatic power packs - Fault finding - Principles of Low Cost Automation - Case studies.
Text Books:
1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2000.
2. Majumdar S.R, "Oil Hydraulics", Tata McGraw Hill, 2000.
3. Majumdar S.R, "Pneumatic Systems -- Principles and Maintenance", Tata McGraw Hill, 2001.
4. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.
Reference Books:
1. Andrew Parr, Hydraulic & Pneumatics, 2/e, Jaico Publishing House Elsevier, 1999.
2. Harry L. Stevart D.B, "Practical Guide to Fluid Power", Taraoeala Sons and Port Ltd. Broadey, 1976.
Online Learning Resources:
• Chrome-extension://efaidnbmnnibpcaglefindmkaj/viewer.htms?pdfhrl https%3A%2%2Fwww.iare.ac.in%2Fsites%2Fdefault%2Ffiles%2FDHPS%2520LECTURER%2520 NOTES%2520FINAL.pdf&chunk=true.
• chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww. iare.ac.in%2Fsites%2Fdefault%2Ffiles%2FDHPS%2520PPT%2520%2520FINAL.pdf&chunk=true.
• https://nptel.ac.in/courses/112/105/112105047/

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.TechIV Year I Semester

23AME72D – SMART MATERIALS

(PROFESSIONAL ELECTIVE – IV (D))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the smart materials and its role in developing intelligent systems.
- Introduce the students with HBLS and LBHS smart materials.
- Expose the students in smart systems development and uses.
- Understand the working principle of smart actuators and smart sensors.

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

CO1: Describe the role of smart materials in development of intelligent systems and adaptive structures.

CO2: Compare polycrystalline and single crystal piezeoelectric materials.

CO3: Identify the influence of stress on characteristic temperatures in SMA and EAP.

CO4: Explain techniques of self-sensing MEMS sensors.

CO5: Design for sensors based on HBLS Smart Material

UNIT – I:

Introduction to Smart Materials: What is Intelligence? Artificial intelligence Vs. embedded Intelligence, Definition of smart material, need for smart materials, classifications of smart systems, components of a smart systems, smart system applications, the role of Smart Materials in developing Intelligent Systems and Adaptive Structures.

UNIT – II:

High bandwidth - Low strain generating (HBLS) Smart Materials: Piezoelectric Materials – constitutive relationship, electromechanical coupling coefficients, piezoelectric constants, piezoceramic materials, variation of coupling coefficients in hard and soft piezoceramics, polycrystalline vs single crystal piezoelectric materials, polyvinyldene fluoride, piezoelectric composites.

Magnetostrictive Materials – constitutive relationship, magneto-mechanical coupling coefficients, Joule Effect, Villari Effect, Matteuci Effect, Wiedemann effect, Giant magnetostriction in Terfenol-D, Terfenol-D particulate composites, Galfenol and Metglas materials.

UNIT – III:

Low bandwidth - High strain generating (LBHS) materials: Shape Memory Alloys (SMA) – Introduction, Phenomenology, Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators. Electro-active Polymers (EAP)- Introduction, Phenomenology, Influence of stress on characteristic temperatures.

UNIT – IV:

Smart actuators: Based on HBLS smart materials: Piezoelectric Actuators – Induced Strain actuation model, Unimorph and Bimorph Actuators, Actuators embedded in composite laminate, Impedance matching in actuator design, Feedback Control, Pulse Drive, Resonance Drive. Magnetostrictive Actuators – Magnetostrictive Mini Actuators, Thermal instabilities, Discretely distributed actuation, Manetostrictive Composites.

Based on LBHS Smart Materials - Shape Memory Alloy based actuators for Shape Control, Electro-active Polymers for Work-Volume Generation.

UNIT – V:
Smart Sensors: Sensors based on HBLS Smart Materials - Piezoelectric Sensors Magnetostrictive Sensors Techniques of Self Sensing MEMS Sensors. Sensors based on LBHS Smart Materials - EAP based sensors, SMA based encoders, Optical Fibre based Sensing.
Text Books:
1. M.V. Gandhi, B.D. Thompson, Smart Materials and Structures, 1/e, Springer Science & Business Media, 1992.
Reference Books:
1. Brian Culshaw, Smart Structures and Materials, 1/e, Artech House, 2000.
2. Paolo Gaudenzi, Smart Structures: Physical Behaviour, Mathematical Modelling and Applications, 1/e, Wiley, 2009.
3. W.G. Cady, Piezoelectricity: An Introduction to the Theory and Applications of Electromechanical Phenomena in Crystals, Dover Publications, 1964. (Reprint edition).
Online Learning Resources:
• https://nptel.ac.in/courses/112104251
• http://wwwcourses.sens.buffalo.edu/mae538/LecNotes.html
• http://ssdl.iitd.ac.in/vssdl/smart.pdf
• https://www.stem.org.uk/resources/elibrary/resource/33044/smart-materials-1

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA				
B.TechIV Year I Semester **23AME72E – SUPPLY CHAIN MANAGEMENT** **(PROFESSIONAL ELECTIVE – IV (E))**				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
Course Objectives: The objectives of the course are to make the students learn about				
• Explain the basics of supply chain management.				
• Familiarize inventory management techniques and models to ensure EOQ batch size under risk management.				
• Demonstrate various distribution strategies for shipment of products.				
• Focus on evaluating of strategic alliance partners and understanding of RDBMS				
Course Outcomes: At the end of the course, the students will be able to				
CO1: Apply the concepts of supply chain management for demand forecasting.				
CO2: Make use of SCM and inventory management for procurement				
CO3: Analyse the shipment activities and related issues				
CO4: Build third party alliances.				
CO5: Adapt the RDBMS data for communications and analyzing future challenges and understand e-commerce strategies				
UNIT – I:				
Understanding the supply chain: What is SCM? Why SCM? The Complexity, Key issues in SCM Logistics network - Introduction, Data Collection, Transportation, Ware house Management, Strategic location of ware houses, Demand forecasting, Role of aggregate planning, MRP, ERP, Managing variability, Key features of Network configuration.				
UNIT – II:				
Inventory management: Inventory management: Concepts of Materials Management, Economic lot size model, Effect of Demand uncertainly, Fixed order costs, Variable lead frames, Inventory under certainly & uncertainty, Risk Management.				
UNIT – III:				
Distribution strategies: Distribution strategies: Introduction, Centralized vs Decentralized control, Direct shipment, Cross Docking, Push based vs Pull based supply chain.				
UNIT – IV:				
Strategic alliances: Third party Logistics (3PL), Retailer – supplier relationship issues, requirements, success & failures, Distributor integration Types & issues.				
UNIT – V:				
MIS & SCM: Relational Data Base Management (RDBMS), System Architecture, Communications, and Implementation of ERP, Decision support systems for SCM: Analytical tools, Presentation tools, Smooth production flow Current issues & directing challenges for future, e-Commerce strategies and world class supply chain management.				
Text Books:				
1. Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, 4/e, Pearson, 2010.				
2. David N. Burt, Donald W. Dobler , World Class Supply Management: The Key to Supply Chain Management, 2/e, McGraw-Hill/Irwin, 2003.				
Reference Books:				

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1. John Joseph Coyle, Edward J. Bardi, C. John Langley, The Management of Business Logistics: A Supply Chain Perspective, South-Western/Thomson Learning, 2003.
2. UpendraKachru ,Logistics and Supply Chain Management, Excel Books, 2009.
Online Learning Resources:
• https://www.coursera.org/specializations/supply-chain-management.
• https://nptel.ac.in/courses/110105067.
• https://ocw.mit.edu/courses/engineering-systems-division/esd-260j-logistics-systems-fall-2006/
• https://open.sap.com/courses/scm1.
• https://www.edx.org/professional-certificate/mitx-supply-chain-analytics.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA				
B.TechIV Year I Semester **23AME73A- CRYOGENICS** **(PROFESSIONAL ELECTIVE – V (A))**				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
Course Objectives: The objectives of the course are to make the students learn about				
• Impart the knowledge of cryogenics and its properties.				
• Demonstrate various Liquefaction cycles.				
• Trains about the separation of cryogenics gases.				
• Explain about cryogenic refrigerants.				
Course Outcomes: At the end of the course, the students will be able to				
CO1: Understand the scope and history of cryogenics. To understand the properties of materials at low temperature applying fundamental knowledge.				
CO2: Apply the knowledge of low temperature production methods to understand and analyse different liquefaction systems. To gain knowledge about the critical components involved in liquefaction.				
CO3: Apply the knowledge of ideal refrigeration techniques, to understand and analyse common cryogenic refrigeration systems. To understand some of the novel cryogenic refrigeration methods.				
CO4: To gain knowledge and to understand various cryogenic fluid storage and transport systems and to evaluate their performance applying fundamental concepts				
CO5: Gain knowledge about different cryogenic instrumentation and to understand cryo pumping.				
UNIT – I:				
Introduction: Insight on Cryogenics, Properties of Cryogenic fluids, Material properties at Cryogenic Temperatures. Applications of Cryogenics in Space Programs, Superconductivity, Cryo Metallurgy, Medical applications.				
UNIT – II:				
Liquefaction Cycles: Carnot Liquefaction Cycle, F.O.M. and Yield of Liquefaction Cycles. Inversion Curve - Joule Thomson Effect. LindeHampson Cycle, Precooled LindeHampson Cycle, Claudes Cycle Dual Cycle, Ortho-Para hydrogen conversion, Eollins cycle, Simpson cycle, Critical Components in Liquefaction Systems.				
UNIT – III:				
Separation of Cryogenic Gases: Binary Mixtures, T-C and H-C Diagrams, Principle of Rectification, Rectification Column Analysis - McCabe Thiele Method. Adsorption Systems for purification.				
UNIT – IV:				
Cryogenic Refrigerators: J.T. Cryocoolers, Stirling Cycle Refrigerators, G.M. Cryocoolers, Pulse Tube Refrigerators Regenerators used in Cryogenic Refrigerators, Dilution refrigerators, Magnetic Refrigerators.				
UNIT – V:				
Handling of Cryogens: Cryogenic Dewar, Cryogenic Transfer Lines. Insulations used in Cryogenic Systems, Instrumentation to measure Flow, Level and Temperature. Applications of Cryogenic Systems: Cryogenic application for food preservation – Instant Quick – Freezing Techniques, Super Conductive devices, Cryogenic applications for space technology. Application of cryogenic systems, super conducting devices, space technology, nuclear technology, cryogenics in biology and medicine.				
Text Books:				

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1. Klaus D. Timmerhaus and Thomas M. Flynn, Cryogenic Process Engineering, Plenum Press, New York, 1989.
2. Randall F. Barron, Cryogenic Systems, McGraw-Hill, 1985.
Reference Books:
2. Scott R.B., Cryogenic Engineering, Van Nostrand and Co., 1962.
3. Herald Weinstock, Cryogenic Technology, Boston Technical Publishers, inc., 1969.
4. Robert W. Vance, Cryogenic Technology, John wiley& Sons, Inc., New York, London.
5. G.Venkatarathnam, Cryogenic Mixed Refrigerant Processes, Springer Publication, 2010.
6. J.G.Weisend, Hand Book of Cryogenic Engineering —II, Taylor and Francis, 1998.
Online Learning Resources:
• https://archive.nptel.ac.in/courses/112/101/112101004/
• https://onlinecourses.nptel.ac.in/noc24_me68/preview
• https://www.me.iitb.ac.in/~matrey/nptel.html
• https://www.youtube.com/playlist?list=PLbMVogVj5nJTvV6PaBMpvjBwfT4FzqcN8
• https://archive.org/details/NPTEL-MechEngr-Cryogenic_Engineering

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B.TechIV Year I Semester

23AME73B - GAS TURBINES AND JET PROPULSION

(PROFESSIONAL ELECTIVE – V (B))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the gas turbine operating cycles.
- Explore the working of gas turbines.
- Understand the propulsion systems in aircraft that are essential to graduate engineers who are intended to work in aircraft system/component manufacturing/maintenance environments.
- Describe and appreciate the key aeronautical engineering features of the context in which the relevant industry operates.

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

CO1: Carry out a cyclic analysis of a gas turbine engine, including turbofan engines.

CO2: Understand the working of various components of gas turbines

CO3: Determine the applicability of a given propeller system for a given aircraft.

CO4: Explain the turboprop and turbojet

CO5: Design constraints and environmental impact of rocket-engine

UNIT – I:

Gas Turbine Operating Cycles: Simple open cycle gas turbine or air standard Brayton cycle, Actual Brayton cycle, the cycle air flow rate, the cycle work ratio, optimum pressure ratio or maximum cycle thermal efficiency, means of improving the efficiency and the specific output of simple cycle.

UNIT – II:

Gas Turbines; gas turbine applications, gas turbine advantages & disadvantages, energy flow & back work, deviation from ideal cycle, gas turbine with regeneration, thermal efficiency of gas turbine with & without regenerator, gas turbine engines, intercooling & reheating, turbojet engine, turbofan engine, turboprop engine.

UNIT – III:

Historical sketch- reaction principle- essential features of propulsion devices- Thermal jet engines, classification of – energy flow, thrust, thrust power and propulsion efficiency- need for thermal jet engines and applications.

UNIT – IV:

Turboprop and turbojet – thermodynamic cycles, plant layout, essential components, and principles of operation – performance evaluation – thrust augmentation and Thrust reversal – contrasting with piston engine propeller plant.

Ram jet- Thermo dynamic cycle, plant lay out, essential components – principle of operation – performance evaluation – comparison among atmospheric thermal jet engines - serqujet and pulse jet, elementary treatment.

UNIT – V:

Need for, applications- basic principle of operation and parameters of performance – classification, solid and liquid propellant rocket engines, advantages, domains of application – propellants – comparison of propulsion systems. Rocket Technology: Flight mechanics, application thrust profiles, acceleration staging of rockets, need for – feed systems, injectors and expansion nozzles – rocket transfer and ablative cooling.
Text Books:
1. V. Ganesan, Gas Turbines, Tata McGraw-Hill Education, 3/e, 2010.
2. S. L. Somasundaram, Gas Dynamics and Jet Propulsion, Scitech Publications (India) Pvt. Ltd., 2/e, 2013.
Reference Books:
1. H. Cohen, G. F. C. Rogers, and H. I. H. Saravanamuttoo, Gas Turbine Theory, Addison Wesley Longman, 5th Edition, 2001.
2. Philip G. Hill and Carl R. Peterson, Mechanics and Thermodynamics of Propulsion, Addison-Wesley, 2nd Edition, 1992.
3. George P. Sutton and Oscar Biblarz, Rocket Propulsion Elements, Wiley, 8th Edition, 2010.
4. Jack D. Mattingly, Elements of Gas Turbine Propulsion, McGraw-Hill, 1996.
5. R. M. Ramaswamy, Gas Dynamics and Space Propulsion, Jaico Publishing House, 1st Edition, 2009.
Online Learning Resources:
• https://www3.nd.edu/~powers/ame.40431/notes.pdf
• https://soaneemrana.org/onewebmedia/GAS%20TURBINE%20AND%20JET%20&%20ROCKET%20PROPULSION1.pdf
• https://archive.nptel.ac.in/courses/112/103/112103262/
• https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SAE1302.pdf
• https://www.slideshare.net/slideshow/gas-turbines-lecture-by-university-notes/267223883

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B.TechIV Year I Semester

23AME73C - ELECTRIC AND HYBRID VEHICLES

(PROFESSIONAL ELECTIVE – V (C))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- To familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

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

CO1: Explain the working of hybrid and electric vehicles.

CO2: Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources.

CO3: Develop the electric propulsion UNIT and its control for application of electric vehicles.

CO4: Choose proper energy storage systems for vehicle applications.

CO5: Design and develop basic schemes of electric vehicles and hybrid electric vehicles.

UNIT – I:

Introduction to Hybrid and Electric Vehicles: History of hybrid and electric vehicles, Need for hybrid and electric vehicles and their limitations. Social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Specifications of hybrid and electric vehicles.

UNIT – II:

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT – III:

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT – IV:

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT – V:

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications,

Design Considerations For Electric Vehicles: Various Resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Power steering- Tire choice- Wing Mirror, Aerials and Luggage racks.

Text Books:

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1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, AvestaGoodarzi, Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014.
3. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
Reference Books:
1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. John G. Hayes, G. AbasGoodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018.
Online Learning Resources:
• https://archive.nptel.ac.in/courses/108/103/108103009/
• https://www.youtube.com/watch?v=wypbLRe9xUg
• https://www.youtube.com/watch?v=q6BYr5-fq5U
• https://www.youtube.com/watch?v=3E1SXG7VkQk
• https://www.iare.ac.in/sites/default/files/IARE_HEV_LN_0.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.TechIV Year I Semester

23AME73D – AUTOMATION IN MANUFACTURING

(PROFESSIONAL ELECTIVE – V (D))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Understand the basics and evolution of automation in manufacturing systems
- Learn the role of automated material handling, storage systems, and identification technologies.
- Gain insight into manufacturing systems, assembly lines, and their optimization.
- Understand the fundamentals of automated assembly systems, group technology, and flexible manufacturing.
- Explore the application of machine learning in the context of automation and smart manufacturing.

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

CO1: Understand the core concepts of automation in manufacturing.

CO2: Analyze and apply material handling and identification technologies like RFID and barcode systems.

CO3: Evaluate manufacturing systems and automated production line designs.

CO4: Design and assess automated assembly systems, group technology, and flexible manufacturing.

CO5: Understand and apply basic machine learning techniques in manufacturing automation.

UNIT – I:

Over View of Manufacturing and Automation: Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.

UNIT – II:

Material Handling and Identification Technologies: Material handling, equipment, Analysis. Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Automatic identification methods, Barcode technology, RFID.

UNIT – III:

Manufacturing Systems and Automated Production Lines: Manufacturing systems: components of a manufacturing system, Single station manufacturing cells; Manual Assembly lines, line balancing Algorithms, Mixed model Assembly lines, Alternative Assembly systems. Automated production lines, Applications, Analysis of transfer lines-With and without buffer.

UNIT – IV:

Automated Assembly Systems: Fundamentals, Analysis of Assembly systems. Cellular manufacturing, part families, cooling, production flow analysis. Group Technology and flexible Manufacturing systems, Quantitative Analysis.

UNIT – V:

Machine learning: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

Text Books:

1. Automation, production systems and computer integrated manufacturing/ Mikell. P Groover/PHI/3rd edition/2012.
2. CAD/CAM/CIM/ P. Radha Krishnan & S. Subrahamanyarn and Raju/New Age International Publishers/2003.

Reference Books:

1.	System Approach to Computer Integrated Design and Manufacturing/ Singh/John Wiley /1996.
2.	Computer Aided Manufacturing/Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang/ Pearson/ 2009.
3.	Manufacturing and Automation Technology / R Thomas Wright and Michael Berkeihiser / Good Heart/Willcox Publishers.
Online Learning Resources:	
•	https://nptel.ac.in/courses/112106138
•	https://www.youtube.com/watch?v=g2C9XQw8Fgo
•	https://nptel.ac.in/courses/112102106
•	https://nptel.ac.in/courses/106106139
•	https://www.youtube.com/watch?v=KglUJli-FsA

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.TechIV Year I Semester

23AME73E – INTRODUCTION TO TOOL DESIGN

(PROFESSIONAL ELECTIVE – V (E))

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Describe the basic concepts of Tool Design.
- Classify Fits and Tolerances used in Tool Design.
- Define the fundamental concepts of Designing of Jigs and Fixtures.
- Apply basic mathematics to design the press tool dies.
- Understand the nomenclature of the milling cutters.

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

CO1: Compare the Ferrous and non-ferrous tool materials.

CO2: Classify the types of chip formation during orthogonal cutting.

CO3: Design Drill Jigs and Fixtures.

CO4: Design a simple gripper for robot.

CO5: Understand the concept of design of die and piercing operations.

UNIT – I:

INTRODUCTION TO TOOL DESIGN: Introduction –Tool Engineering – Tool Classifications– Tool Design Objectives – Tool Design in manufacturing- Challenges and requirements- Standards in tool design- Tool drawings -Surface finish – Fits and Tolerances - Tooling Materials- Ferrous and Non ferrous Tooling Materials- Carbides, Ceramics and Diamond -Non metallic tool materials-Designing with relation to heat treatment.

UNIT – II:

DESIGN OF CUTTING TOOLS: Mechanics of Metal cutting –Oblique and orthogonal cutting- Chip formation and shear angle - Single-point cutting tools – Milling cutters – Hole making cutting tools- Broaching Tools - Design of Form relieved and profile relieved cutters-Design of gear and thread milling cutters.

UNIT – III:

DESIGN OF JIGS AND FIXTURES: Introduction – Fixed Gages – Gage Tolerances –selection of material for Gauges – Indicating Gages – Automatic gages – Principles of location – Locating methods and devices – Principles of clamping – Drill jigs – General considerations in the design of drill jigs – Drill bushings – Methods of construction –Types of Fixtures – Vice Fixtures – Milling Fixtures – Boring Fixtures – Broaching Fixtures.

UNIT – IV:

DESIGN OF PRESS TOOL DIES: Types of Dies –Method of Die operation–Clearance and cutting force calculations- Blanking and Piercing die design – Pilots – Strippers and pressure pads- Presswork materials – Centre of pressure -Strip layout – Short-run tooling for Piercing – Bending dies – Drawing dies-Design and drafting.

UNIT – V:

TOOL DESIGN FOR CNC MACHINE TOOL

Introduction –Tooling requirements for Numerical control systems – Fixture design for CNC machine tools- Sub plate and tombstone fixtures-Universal fixtures– Cutting tools– Tool holding methods– Automatic tool changers and tool positioners – Tool presetting– General explanation of the Brown and Sharp machine.

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Text Books:
1. Cyrll Donaldson, George H.LeCain, V.C. Goold, "Tool Design", Tata McGraw Hill Publishing Company Ltd., 2000.
2. E.G.Hoffman," Jig and Fixture Design", Thomson Asia Pvt Ltd, Singapore, 2004.
Reference Books:
1. P.C.Sharma, A Text book of Production Engineering, S.Chand Publications, 1999.
2. PrakashHiralal Joshi, "Tooling data", Wheeler Publishing, 2000
3. Venkataraman K., "Design of Jigs, Fixtures and Presstools", TMH, 2005.
4. Haslehurst M., "Manufacturing Technology", The ELBS, 1978.
Online Learning Resources:
• https://www.iare.ac.in/sites/default/files/lecture_notes/TOOL%20DESIGN_Lecture_Notes.pdf
• https://www.cet.edu.in/noticefiles/261_MMP%20Lecture%20Notes-ilovepdf-compressed.pdf
• https://www.vssut.ac.in/lecture-notes.php?url=production-engineering
• https://nptel.ac.in/courses/112/105/112105233/
• https://www.youtube.com/watch?v=7MkX-sW97rI

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B.TechIV Year I Semester

23AME76–CAD/CAM LAB

(Skill Oriented Course –V)

L	T	P	C
0	1	2	2

Course Objectives: The objectives of the course are to make the students learn about

- To experiment with trusses and beams to determine stress, deflection.
- To demonstrate part programmes using FANUC controller.
- To generate G-code for automated tool path using CAM software.

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

CO1: Apply finite element analysis to determine stresses, deflections, and natural frequencies in structural members.

CO2: Analyze steady-state heat transfer problems in 2D and axisymmetric components using numerical methods.

CO3: Develop CNC part programs for turning and milling operations using standard formats and FANUC controller syntax.

CO4: Generate APT programs for 2D geometries and interpret the tool movement commands.

CO5: Create automated CNC tool paths and G-code using commercial CAM software for manufacturing applications.

1. Determination of deflection and stresses in 2D and 3D trusses and beams.
2. Determination of principal and Von-mises stresses in plane stress, plane strain and axisymmetric components.
3. Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.
4. Steady state heat transfer analysis of plane and axisymmetric components.
5. CNC part programming for turned components
    a) Plain turning and facing
    b) Step Turning Operation
    c) Taper turning
6. CNC programming for milled components
    a) Circular interpolation
    b) End milling
    c) Pocket milling
7. Generation of APT programming for 2D objects
8. Automated CNC Tool path and G-Code generation usingCAM packages.

Reference Books:

1. Groover, M. P., Automation, Production Systems, and Computer-Integrated Manufacturing, Pearson Education, 4th Edition, 2015.
2. Ibrahim Zeid, Mastering CAD/CAM, McGraw Hill, 2005.
3. Y. Koren, Computer Control of Manufacturing Systems, McGraw Hill, 1983.
4. Peter Smid, CNC Programming Handbook, Industrial Press Inc., 3rd Edition, 2007.
5. David F. Rogers, An Introduction to NURBS: With Historical Perspective, Morgan Kaufmann, 2001.

Online Learning Resources:

- http://vlabs.iitkgp.ernet.in/mr/
- https://ocw.mit.edu

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech IV Year I Semester

23AME77 – HEAT TRANSFER LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

- Understand different modes of heat transfer
- Gain knowledge about natural and force convection phenomenon
- Estimate experimental uncertainty in measurements

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

CO1: Explain different modes of heat transfer.

CO2: Identify parameters for measurement for calculating heat transfer.

CO3: Determine effectiveness of heat exchanger.

CO4: Design new equipment related to heat transfer.

CO5: Apply principles of heat transfer in wide application in industries.

List of Experiments

1. Determine the overall heat transfer coefficient across the width of composite wall.
2. Determine the thermal conductivity of a metal rod.
3. Determine the thermal conductivity of insulating powder material through concentric sphere apparatus.
4. Determine the thermal conductivity of insulating material through lagged pipe apparatus.
5. Determine the efficiency of a pin fin in natural and forced convection.
6. Determine the heat transfer coefficient for a vertical cylinder in natural convection.
7. Determine the heat transfer coefficient in forced convection of air in a horizontal tube.
8. Determine the heat transfer coefficients on film and drop wise condensation apparatus.
9. Determine the effectiveness of a parallel and counter flow heat exchanger.
10. Study the pool boiling phenomenon and different regimes of pool boiling.
11. Experiment on pool boiling.
12. Determine the emissivity of the test plate surface.
13. Experiment on Stefan-Boltzmann apparatus.
14. Determine the heat transfer rate coefficient in fluidized bed apparatus.

Reference Books:

1. Abdul Matheen, Heat Transfer Laboratory Manual, Laxmi Publications; 2/e, 2007.

Online Learning Resources:

- https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab
- https://www.iare.ac.in/sites/default/files/lab1/IARE_HT_LAB_MANUAL.pdf
- https://mrcet.com/downloads/digital_notes/ME/III%20year/(R18A0388)Heat%20Transfer%20Lab.pdf
- https://mrcet.com/downloads/ME/Mech%20III-II.pdf

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(Common to All Branches of Engineering)

R-23

Course Code	Gender Sensitization		L	T	P	C
			0	0	2	0
Pre-requisite		Semester				

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes (CO):

COs	Statements	Blooms level
CO1	Understand the basic concepts of gender and its related terminology	L1, L2,
CO2	Identify the biological, sociological, psychological and legal aspects of gender.	L1, L2
CO3	Use the knowledge in understanding how gender discrimination works in our society and how to counter it.	L3
CO4	Analyzethe gendered division of labour and its relation to politics and economics.	L4
CO5	Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups	L5
CO6	Develop students' sensibility with regard to issues of gender in contemporary India	L3

SYLLABUS

Unit-1UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making

Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-2GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

Unit-3GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn't Work.‖ —Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction- Unrecognized

and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-4GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Just Relationships

Prescribed Books

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990

Reference Books

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India,*London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment,* London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, *A Life in Trans Activism*(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender

chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. Gender Roles and Relations

https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

3. Gender and Labour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed

https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. **GENDER-BASED VIOLENCE**
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls

https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDER AND CULTURE**
https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/

https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/

https://archive.nptel.ac.in/courses/109/106/109106136/

Abdulali Sohaila. —I Fought For My Life…and Won.‖Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/