



**Prof. Ram Meghe Institute of Technology And Research
Badnera –Amravati**

**An Autonomous Institute Affiliated to Sant Gadge Baba Amravati University,
Amravati, Maharashtra (India)**

**PROGRAMME SCHEME & SYLLABI
2025-26
B.Tech (Mechanical Engineering)**



**Prof. Ram Meghe Institute Of Technology And Research,
Badnera - Amravati.**

Published By

Principal

Prof. Ram Meghe Institute Of Technology And Research, Badnera - Amravati.

VIDARBHA YOUTH WELFARE SOCIETY'S
PROF. RAM MEGHE INSTITUTE OF TECHNOLOGY AND RESEARCH
(AN AUTONOMOUS INSTITUTE, AFFILIATED TO SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI)
FOUR YEAR DEGREE COURSE IN BACHELOR OF TECHNOLOGY
BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: FIRST (Group B)																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/ IA			Int.	Ext.		
1	2SF01	Applied Mathematics - II	3			BSC		3	3	60	30	10	100	40				
2	2SF02	Applied Chemistry	3			BSC		3	3	60	30	10	100	40				
3	2SF03	Basics of Electrical Engineering	2			ESC		2	3	60	30	10	100	40				
4	2SF04	Biology for Engineers	2			BSC		2	3	60	30	10	100	40				
5	2SF05	Universal Human Values*	2			VEC		2				50	50	25				
6	2SCM01	Engineering Mechanics	3			PCC		3	3	60	30	10	100	40				
7	2SF06	Indian Knowledge Systems *	2			IKS		2				50	50	25				
Practical																		
8	2SF07	Applied Chemistry Lab			2	BSC		1							25	25	50	25
9	2SF08	Basic of Electrical Engineering Lab			2	ESC		1							25	25	50	25
10	2SCM02	Engineering Mechanics Lab			2	PCC		1							25	25	50	25
11	2SF09	Workshop/Digital Fabrication Lab			2	ESC		1					600		25	25	50	25
		Total	17		8			21									200	
														Total	800			

* Assessment will be based on Unit Tests and Assignments

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FOUR YEAR DEGREE COURSE IN BACHELOR OF TECHNOLOGY
BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: SECOND (Group B)

SEMESTER: SECOND (Group B)																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/ IA			Int.	Ext.		
1	1SF01	Applied Mathematics - I	3			BSC		3	3	60	30	10	100	40				
2	1SF02	Applied Physics	3			BSC		3	3	60	30	10	100	40				
3	1SF03	Engineering Graphics	2			ESC		2	3	60	30	10	100	40				
4	1SF04	Programming for Problem Solving	2			ESC		2	3	60	30	10	100	40				
5	1SF05	Professional Communication Skills*	1	1		AEC		2				50	50	25				
6	1SM01	Fundamentals of Mechanical Engineering	3			PCC		3	3	60	30	10	100	40				
7	1SF06	Design Thinking *	1			VEC		1				50	50	25				
Practical																		
8	1SF07	Applied Physics Lab			2	BSC		1							25	25	50	25
9	1SF08	Engineering Graphics Lab			2	ESC		1							25	25	50	25
10	1SF09	Programming for Problem Solving Lab			2	ESC		1							25	25	50	25
11	1SM02	Fundamentals of Mechanical Engineering Lab			2	PCC		1							25	25	50	25
12	1SF10	NSS/Sports/Yoga/Cultural/Community Service **			2	LLC		1							50		50	25
		Total	15	1	10			21					600				250	
										Total Marks = 850								

* Assessment will be based on Unit Tests, Assignments and Case Studies
 ** Assessment will be based on participation in associated activities of not less than 30 hours

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Second semesters) to qualify for UG Certificate

Title		Credit
Two relevant MOOC/NPTEL courses as decided by BOS		4
And		
Internship (Min 60 hrs)		4
Total		8

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FOUR YEAR DEGREE COURSE IN BACHELOR OF TECHNOLOGY
BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: THIRD																			
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme										
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL				
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks	
											Max. Marks MSE/ MSIE	Max. Marks TA/ IA			Int.	Ext.			
Theory																			
1	3SM01	Fluid Mechanics	2			PCC		2	3	60	30	10	100	40					
2	3SM02	Engineering Thermodynamics	3			PCC		3	3	60	30	10	100	40					
3	3SM03	Production Processes	2			PCC		2	3	60	30	10	100	40					
4	3SM04	Mechanics of Materials	3			PCC		3	3	60	30	10	100	40					
5	3SMOE1	OE-I	3			OE		3	3	60	30	10	100	40					
6	3SM05	Entrepreneur Essential and Early Stage Start-up *	2			EEMC		2				50	50	25					
7	3SM06	Environmental Studies*	2			VEC-01		2				50	50	25					
Practical																			
8	3SM07	Fluid Mechanics - Lab			2	PCC		1							25	25	50		
9	3SM08	Machine Drawing - Lab			2	PCC		1							25	25	50		
10	3SM09	Production Processes Lab			2	PCC		1							25	25	50		
11	3SM10	CEP/FP			4	ELC		2							25	25	50		
		Total	17		10			22					600				200		
										Total Marks = 800									

Open Elective-I (OE-I): - B) 3SMOE1B-Marketing Management, C) 3SMOE1C- Industrial Safety, D) 3SMOE1D- Disaster Management

* Assessment will be based on Unit Tests and Assignments

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FOUR YEAR DEGREE COURSE IN BACHELOR OF TECHNOLOGY
BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: FOURTH																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/ IA			Int.	Ext.		
Theory																		
1	4SM01	Hydraulic Machine	3			PCC		3	3	60	30	10	100	40				
2	4SM02	Material Science	3			PCC		3	3	60	30	10	100	40				
3	4SM03	Manufacturing Technology	3			PCC		3	3	60	30	10	100	40				
4	MDM-1	MDM-1	3			MDM		3	3	60	30	10	100	40				
5	4SMOE2	OE-2	3			OE		3	3	60	30	10	100	40				
6	4SM04	Industrial Management*	2			EEMC		2				50	50	25				
7	4SM05	Technical Report Writing*	2			AEC		2				50	50	25				
Practical																		
8	4SM06	Hydraulic Machine - Lab			2	PCC		1							25	25	50	25
9	4SM07	Material Science - Lab			2	PCC		1							25	25	50	25
10	4SM08	Manufacturing Technology - Lab			2	PCC		1							25	25	50	25
11	4SM09	Python Programming lab			2	VSEC-01		1							25	25	50	25
		Total	19		8			23					600				200	
Total Marks = 800																		
Open Elective II (OE-2) :- 4SMOE2B- Financial Planning, 4SMOE2C-Introduction to Cyber Law, 4SMOE2D- Biodiversity																		
Second Year Exit Criteria (UG Diploma)																		

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for Diploma

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	4
Internship (Min 60 hrs)	4
Total	8

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BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)**

SEMESTER: FIFTH																		
Sr No	Course Code	Course Name	Teaching Scheme					Examination Scheme										
			Hours / Week			Group	Total Hours /Week	Credits	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		

Theory

1	5SM01	Heat Transfer	3			PCC		3	3	60	30	10	100	40				
2	5SM02	Metrology and Quality Control	3			PCC		3	3	60	30	10	100	40				
3	5SM03	Industrial Automation	3			PCC		3	3	60	30	10	100	40				
4	5SM04	PEC-01	2			PEC		2	3	60	30	10	100	40				
5	5SM05	PEC-02	2			PEC		2	3	60	30	10	100	40				
6	MDM-2	MDM-2	3			MDM		3	3	60	30	10	100	40				
7	5SMOE3	OE-3	3			OE		3	3	60	30	10	100	40				

Practicals

8	5SM06	Heat Transfer-Lab			2	PCC		1							25	25	50	25
9	5SM07	Metrology & Measurement Systems -Lab			2	PCC		1							25	25	50	25
10	5SM08	Industrial Automation.-Lab			2	PCC		1							25	25	50	25
11	5SM09	CAD & Simulation Lab			2	PCC		1							25	25	50	25
		Total	19		8			23					700				200	

Total Marks = 900

Program Elective Course 01 (PEC-01) :- 5SM04PE1A- Thermal Engineering, 5SM04PE1B- Mechanical Measurement & Control systems, 5SM04PE1C- Plastic Engineering & Composites

Program Elective Course 02 (PEC-02) :- 5SM05PE2A- Industrial Product Design, 5SM05PE2B Automobile Engineering, 5SM05PE2C- Additive Manufacturing.

Open Elective-3 (OE-3) :-	A) 5SMOE3A- Waste to Energy,	C) 5SMOE3C- Project Management ,	D) 5SMOE3D- Aptitude for Engineers
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BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: SIXTH																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/ IA			Int.	Ext.		

Theory

1	6SM01	Theory of Machines	3			PCC		3	3	60	30	10	100	40				
2	6SM02	I C Engines	3			PCC		3	3	60	30	10	100	40				
3	6SM03	Refrigeration & Air Conditioning	2			PCC		2	3	60	30	10	100	40				
4	6SM04	PEC-03	3			PEC		3	3	60	30	10	100	40				
5	6SM05	PEC-04	3			PEC		3	3	60	30	10	100	40				
6	MDM-03	MDM-03	3			MDM		3	3	60	30	10	100	40				
7	6SM06	SAP Material Management*	2			VSEC		2				50	50	25				

Practical

9	6SM07	Theory of Machines- Lab			2	PCC		1							25	25	50	25
10	6SM08	I C Engines - Lab			2	PCC		1							25	25	50	25
11	6SM09	Refrigeration & Air Conditioning-Lab			2	PCC		1							25	25	50	25
			Total		19		6					650					150	
Total Marks = 800																		

Program Elective Course 03 (PEC-03) :- A) 6SM04PE3A- Basic Electrical Drives & Control, B) 6SM04PE3B- Energy Conversion , C) 6SM04PE3C- Finite Element Analysis

Program Elective Course 04 (PEC-04) :- A)6SM05PE4A- PPC, B) 6SM05PE4B- Computational Fluid Dynamics, C) 6SM05PE4C- Robotics & Industrial Application

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Sixth semesters) to qualify for B.Voc.

Two relevant MOOC/NPTEL courses as decided by BOS		4
85And		
Internship (Min 60 hrs)		4
Total		8

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FOUR YEAR DEGREE COURSE IN BACHELOR OF TECHNOLOGY
BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)
SCHEME (BASED ON NEP 2020)**

SEMESTER: SEVENTH																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		

Theory

1	7SM01	New & Renewable Energy Sources	3			PCC		3	3	60	30	10	100	40				
2	7SM02	Design of Machine Elements	3			PCC		3	3	60	30	10	100	40				
3	7SM03	PEC-05	2			PEC		2	3	60	30	10	100	40				
4	7SM04	PEC-06	2			PEC		2	3	60	30	10	100	40				
5	MDM-4	MDM-04	3			MDM		3	3	60	30	10	100	40				

Practical

6	7SM05	RM			8	ELC		4						25	25	50	25
7	7SM06	Major Project (Phase I)			8	ELC		4							50	50	25
		Total	13		16			21					500			100	
										Total Marks = 600							

Program Elective Course 05 (PEC-05) :- A) 7SM03PE5A- Industrial Engineering, B) 7SM03PE5B- Gas Turbine & Jet Propulsion, C) 7SM03PE5C -Hybrid & Electric Vehicle

Program Elective Course 06 (PEC-06) :- A) 7SM04PE6A- Smart Manufacturing, B) 7SM04PE6B- Ergonomics, C) 7SM04PE6C- Heat Exchanger Design

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BRANCH: MECHANICAL ENGINEERING - SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)
SCHEME (BASED ON NEP 2020)

SEMESTER: EIGHTH																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours /Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
1	8SM01	Mechatronics #	3			PCC		3	3	60	30	10	100	40				
2	8SM02	Operation Research Techniques #	3			PCC		3	3	60	30	10	100	40				
3	8SM03	PEC-07 #	2			PEC		2	3	60	30	10	100	40				
Practicals																		
5	8SM04	Internship/OJT/ Major Project Phase II			24	ELC		12							100	100	200	100
		Total	8		24			20					300				200	
										Total Marks = 500								
Program Elective Course 07 (PEC-07) :- A) 8SM03PE7A- Tool Design, B) 8SM03PE7B- Solar Energy, C) 8SM03PE7C- Mechanical Estimation and Costing																		

Mode of teaching will be online/ or offline.

SEM		I	II	III	IV	V	VI	VII	VIII	Total
CREDIT		21	21	22	23	23	22	21	20	173

***MDM BASKETS OF COURSES FOR ALL Departments**

MDM Basket/ Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Artificial Intelligence	1	4SAMDM1	Artificial Intelligence and Expert Systems	IV	CE, CSE, EXTC, IT, CSE(IoT), ME	Artificial Intelligence and Data Science
	2	5SAMDM2	Applied Artificial Intelligence	V		
	3	6SAMDM3	Generative Artificial Intelligence	VI		
	4	7SAMDM4	Safe and Responsible Artificial Intelligence Systems	VII		
Data Science	1	4SAMDM5	Programming for Data Science	IV	CE, CSE, EXTC, IT, CSE(IoT), ME	
	2	5SAMDM6	Business Intelligence and Analytics	V		
	3	6SAMDM7	Data Engineering	VI		
	4	7SAMDM8	Ethics in Data Science	VII		
Civil Engineering	1	4SCMDM1	Introduction to Environmental Engineering	IV	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	Civil Engineering
	2	5SCMDM2	Introduction to Water Resource Engineering	V		
	3	6SCMDM3	Introduction to Transportation Engineering	VI		
	4	7SCMDM4	Basics of Structural Analysis	VII		
Construction Technology	1	4SCMDM5	Building Planning	IV	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	
	2	5SCMDM6	Construction Materials	V		
	3	6SCMDM7	Basics of Surveying	VI		
	4	7SCMDM8	Basics of Geotechnical Engineering	VII		

MDM Basket/ Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Computer Science and Engineering	1	4SKMDM1	Fundamentals of Data Structures	IV	CE, EXTC, CSE(IoT), ME	Computer Science and Engineering
	2	5SKMDM2	Introduction to Algorithms	V		
	3	6SKMDM3	Database Management System	VI		
	4	7SKMDM4	Basics of Enterprise Resource Planning	VII		
Software Engineering	1	4SKMDM5	Software Requirements Engineering	IV	AI&DS, CE, EXTC, IT, CSE(IoT), ME	
	2	5SKMDM6	Software Architecture	V		
	3	6SKMDM7	Software Project Management	VI		
	4	7SKMDM8	Software Testing and Quality Assurance	VII		
Electronics and Communication Engineering	1	4SEMDM1	Electronic Instrumentation	IV	AI&DS, CE, CSE, IT, CSE(IoT), ME	
	2	5SEMDM2	Electronic Devices and Circuits	V		
	3	6SEMDM3	Analog and Digital Communication	VI		
	4	7SEMDM4	Electronic Circuit Design	VII		
Telecommunication Engineering	1	4SEMDM5	Basic Electronic Communication Systems	IV	AI&DS, CE, CSE, IT, ME	Electronics and Telecommunication Engineering
	2	5SEMDM6	Introduction to Wireless Communication	V		
	3	6SEMDM7	Introduction to Mobile Computing	VI		
	4	7SEMDM8	Satellite and Optic Fiber Communication	VII		
Information Technology	1	4SNMDM1	Data Transmission and Information Technology	IV	AI&DS, CE, CSE, EXTC, CSE(IoT), ME	Information Technology
	2	5SNMDM2	Data Communication Networks	V		
	3	6SNMDM3	E-Commerce	VI		
	4	7SNMDM4	Management Information Systems	VII		

Cyber Security	1	4SNMDM5	Introduction to Cyber Security	IV	CE, EXTC, CSE(IoT), ME	
	2	5SNMDM6	Fundamentals of Cryptography	V		
	3	6SNMDM7	Basics of Ethical Hacking	VI		
	4	7SNMDM8	Blockchain Technology	VII		
Mechanical Engineering	1	4SMMDM1	Energy Engineering	IV	AI&DS, CE, CSE, EXTC, IT, CSE(IoT)	Mechanical Engineering
	2	5SMMDM2	Automobile Engineering and Electric Vehicles	V		
	3	6SMMDM3	Industrial Engineering	VI		
	4	7SMMDM4	Industrial Automation	VII		
Robotics and Automation Engineering	1	4SMMDM5	Mechatronics	IV	AI&DS, CE, CSE, EXTC, IT, CSE(IoT)	Computer Science & Engineering (IoT)
	2	5SMMDM6	Rapid Prototyping	V		
	3	6SMMDM7	Automation Engineering	VI		
	4	7SMMDM8	Robotics and industrial Application	VII		
Internet of Things	1	4SXMDM1	Fundamentals of IoT	IV	AI&DS, CE, CSE, EXTC, IT, ME	
	2	5SMMDM6	Rapid Prototyping	V		
	3	6SMMDM7	Automation Engineering	VI		
	4	7SMMDM8	Robotics and industrial Application	VII		

* indicates that the Track for MDM will be decided by respective Board of Studies (BoS)

DOUBLE MINOR (SPECIALIZATION) BASKETS OF COURSES FOR ALL DEPARTMENTS

Double Minor / Specialization Minor Basket Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Advanced Programming	1	3SASM	Programming Language for Data Science	III	CSE, CE, EXTC, IT, CSE(IoT), ME	Artificial Intelligence and Data Science
	2	4SASM	Advanced Java Programming	IV		
	3	5SASM	Mobile Application Development	V		
	4	6SASM	Introduction to Gaming	VI		
	5	7SASM	Introduction to Software Development Platform (GitHub)	VII		
	6	8SASM	Databases and SQL for Data Science	VIII		
Construction Management and Environmental Engineering	1	3SCSM	Environmental Pollution and Control	III	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	Civil Engineering
	2	4SCSM	Water Treatment Engineering	IV		
	3	5SCSM	Waste Water Treatment Engineering	V		
	4	6SCSM	Project Management and Planning	VI		
	5	7SCSM	Construction Material Management	VII		
	6	8SCSM	Construction Quality Management	VIII		
Web Technology	1	3SKSM	Introduction of HTML	III	AI&DS, CE, EXTC, IT, CSE(IoT), ME	Computer Science and Engineering
	2	4SKSM	Javascript	IV		
	3	5SKSM	Web Engineering	V		
	4	6SKSM	Cloud Technology	VI		
	5	7SKSM	Distributed Database	VII		
	6	8SKSM	User Experience Design	VIII		
Embedded System	1	3SESM	Fundamentals of Digital Electronics	III	AI&DS, CE, CSE, IT, ME	Electronics and Telecommunication Engineering
	2	4SESM	Digital System Design	IV		
	3	5SESM	Introduction to Microprocessors	V		
	4	6SESM	Microcontroller and Applications	VI		
	5	7SESM	Advanced Microcontrollers	VII		
	6	8SESM	Embedded System and RTOS	VIII		

Double Minor / Specialization Minor Basket Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Information Processing	1	3SNSM	Fundamentals of Information Technology	III	CE, CSE, EXTC, CSE(IoT), ME	Information Technology
	2	4SNSM	Database Processing	IV		
	3	5SNSM	Network Processing	V		
	4	6SNSM	Data Mining and Warehousing	VI		
	5	7SNSM	Data Visualaization	VII		
	6	8SNSM	Big Data Processing	VIII		
Manufacturing Techniques	1	3SMSM	Manufacturing Processes-I	III	AI&DS, CE, CSE, EXTC, IT, CSE(IoT),	Mechanical Engineering
	2	4SMSM	Manufacturing Processes -II	IV		
	3	5SMSM	Modern Manufacturing Techniques	V		
	4	6SMSM	Production Management	VI		
	5	7SMSM	Productivity Techniques	VII		
	6	8SMSM	Computer Integrated Manufacturing	VIII		
Industrial IoT	1	3SXSM	Introduction to Internet of Things	III	AI&DS, CE, CSE, EXTC, IT, ME	Computer Science & Engineering(IoT)
	2	4SXSM	Industrial Sensors and Actuators	IV		
	3	5SXSM	Edge and Fog Computing	V		
	4	6SXSM	Embedded System for Internet of Things	VI		
	5	7SXSM	Application of IoT in Healthcare and Agriculture	VII		
	6	8SXSM	Internet of Things Security	VIII		

Honors Baskets of Courses for all Departments

Name of Department	Sr. No.	Course Code	Course Name	Semester
Artificial Intelligence and Data Science	1	4SAH	Advanced Programming for Data Science	IV
	2	5SAH	Advanced Data Science and Analytics	V
	3	6SAH	Business and Web Analytics	VI
	4	7SAH	Data Engineering	VII
	5	8SAH1	Deep Learning and its Applications	VIII
	6	8SAH2	Minor Project	VIII
Civil Engineering	1	4SCH	Air Pollution and Control	IV
	2	5SCH	Structural Dynamics	V
	3	6SCH	Geographic Information Systems	VI
	4	7SCH	Advanced Foundation Engineering	VII
	5	8SCH1	Finite Element Method	VIII
	6	8SCH2	Minor Project	VIII
Computer Science and Engineering	1	4SKH	Data Science and Analytics	IV
	2	5SKH	Natural Language Processing and Text Analytics	V
	3	6SKH	Artificial Neural Network	VI
	4	7SKH	Optimization Techniques for Data Analytics	VII
	5	8SKH1	Computer Vision	VIII
	6	8SKH2	Minor Project	VIII
Electronics and Telecommunication Engineering	1	4SEH	PLC & SCADA	IV
	2	5SEH	Electronics Circuit Design	V
	3	6SEH	Cognitive Radio	VI
	4	7SEH	Biomedical Signal Processing	VII
	5	8SEH1	VLSI Design Verification and Testing	VIII
	6	8SEH2	Minor Project	VIII

Honors Baskets of Courses for all Departments

Name of Department	Sr. No.	Course Code	Course Name	Semester
Information Technology	1	4SNH	Advanced Data Science	IV
	2	5SNH	Artificial Neural Network	V
	3	6SNH	Advanced Artificial Intelligence	VI
	4	7SNH	Advanced Machine Learning	VII
	5	8SNH1	Advanced Speech and Natural Language Processing	VIII
	6	8SNH2	Minor Project	VIII
Mechanical Engineering	1	4SMH	Energy Audit	IV
	2	5SMH	Computer Aided Design	V
	3	6SMH	Advance Heat Transfer	VI
	4	7SMH	3D Printing and Application	VII
	5	8SMH1	AI for Mechanical Engineering	VIII
	6	8SMH2	Minor Project	VIII
Computer Science & Engineering(IoT)	1	4SXH	IoT Architectures and Protocols	IV
	2	5SXH	Internet of Things Security	V
	3	6SXH	Embedded Systems and IoT	VI
	4	7SXH	Machine Learning For IoT	VII
	5	8SXH1	Data Science in IoT	VIII
	6	8SXH2	Minor Project	VIII

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati
(An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology
Choice Based Credit System (Semester Pattern)
Branch: Mechanical Engineering

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme									
									THEORY						PRACTICAL			
			Hours / Week			Honours Course Applicable to	Total Hours /Week	Credits										
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max.		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
IV	4SMH	Energy Audit	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
V	5SMH	Computer Aided Design	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
VI	6SMH	Advance Heat Transfer	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
VII	7SMH	3D Printing and Application	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
VIII	8SMH 1	AI for Mechanical Engineering	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
VIII	8SMH 2	Minor Project	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF01	Applied Mathematics II	03	00	00	03

Course Requisite:

- 1) Basic Knowledge of Matrix and Complex number.
- 2) Elementary Integral Calculus.

Course Learning Objectives:

- 1) To deal with system of equations and solutions of Eigen value problem.
- 2) To express real valued periodic function in terms of sines and cosines
- 3) To Use Complex number theory in engineering application such as signal processing.
- 4) To familiarize with techniques in double and triple integrals and its applications.

Course Outcomes:

Students will be able to:

1. Make use of system of equations in matrix forms.
2. Find the periodic functions as an infinite series.
3. Apply De Moivre's theorem in various concepts of complex number.
4. Use new technique DUIS and to evaluate Beta and Gamma function.
5. Evaluate double integrals over bounded regions.
6. Evaluate triple integral and its applications.

	Subject: Applied Mathematics II	L
Unit I	Matrices: Rank of a matrix, Consistency of linear system of equations by matrix method, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof).	7
Unit II	Fourier series: Fourier expansion of function in $(C, C+2L)$, half range Fourier series.	6
Unit III	Complex Numbers: Roots of complex number by deMoivre's theorem, Hyperbolic and inverse hyperbolic functions, Separation of real and imaginary parts, Logarithm of complex numbers.	7
Unit IV	Integral Calculus I: Differentiation under integral sign, Beta Function and Gamma Function.	7
Unit V	Integral Calculus II: Double integration, change of order of integration, transformation to polar coordinates, Evaluation of area by double integration.	6
Unit VI	Integral Calculus III: Triple integration, Transformation to spherical polar coordinates, Volume of solid by triple integration.	7
Total		40

Text Books:

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.

Reference Books:

1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF02	Applied Chemistry (AC)	03	00	00	03

Course Prerequisites:

1. Fundamentals of redox reactions and electrochemistry.
2. Knowledge of chemical reaction.
3. Basic knowledge of qualitative and quantitative analysis.

Course Learning Objectives:

1. To enable students to manufacture functional materials on the basis of chemical forces.
2. To provide the knowledge of characteristics and application of cement, fuels and lubricants.
3. To impart knowledge of characteristics of water and methods for the removal of impurities from water.
4. To summarize students with operating principles, working processes and applications of energy conversion, storage devices and also with corrosion and corrosion control methods.

Course Outcomes:

Students will be able to

1. Apply the knowledge of chemical forces to design functional materials.
2. Apply the knowledge of useful engineering materials such as cement and lubricant.
3. Describe properties of hard water, its disadvantages and various processes for removal of water impurities.
4. Describe properties of chemical fuels, analysis methods and its applications.
5. Identify various types of corrosion, mechanism and control methods to protect metals.
6. Describe operating principles working processes and applications of energy conversion and storage devices.

	Subject: Applied Chemistry (AC)	L
UNIT I	Engineering Materials and Their Properties: Introduction, Classification of Engineering materials, Chemical Forces in materials- Primary forces and Secondary forces, Properties of materials, Role of chemical forces in alteration of magnitude of the properties such as Density, Melting Point, Solubility, Strength, Stiffness, Elasticity and Plasticity. Real life examples where these interactions played major role to enhanced their properties: - vulcanized rubber and plasticized PVC.	6
UNIT II	Cement Engineering: Introduction, Types of cement, Raw materials used for the manufacturing of Portland cement, Manufacturing of Portland cement by wet process. Functions of chemical constituents of cement: Tri-calcium aluminate, Tri-calcium silicate, Di-calcium silicate, Tetra-calcium alumino ferrite, magnesia, sulphur trioxide, iron oxide, alkalis, free lime, alumina. Physical Properties of Portland cement: Heat of hydration, Fitness, Soundness, Strength, Setting and hardening.	6
UNIT III	Water Characteristics & Their Effects on Boiler: Introduction. Characteristics of water: - Hardness, pH, alkalinity, DO, TDS and Chloride ion concentration. Disadvantages of characteristics of water in Boiler: - Scale & sludge, Priming & Foaming, Caustic embrittlement and Boiler corrosion. Methods of analysis: - EDTA	8

	method, Iodometric method and conductometric titration. Methods for removal of impurities: Sedimentation, Neutralization, Zeolite process, De-Ionization process and Reverse osmosis. Calculation of hardness by data obtained from EDTA and zeolite processes.	
UNIT IV	Fuel and Lubricant: Introduction, Types of Fuels, Properties of Fuels: Ignition Temperature, Calorific value. Types of calorific value. Solid Fuel: Coal, classification of coal, analysis of coal: ultimate analysis. Liquid Fuel: Crude oil, Fractional distillation of crude oil, Properties of liquid fuel: Octane number and Cetane number. Gaseous Fuel: Hydrogen gas, economy of hydrogen gas as fuel. Lubricants: Introduction, classification of lubricants, properties of lubricants, uses of lubricants.	7
UNIT V	Energy Sources & Storage Devices: Introduction, Principle of batteries, Types of Batteries: Primary Batteries-Dry Cell, Mercury cell, Secondary Batteries- NICAD (Ni-Cd) battery, Lithium-ion battery. Green energy sources: Photo voltaic cell (Solar Cell), Fuel Cell.	6
UNIT VI	Corrosion & Its Control: Introduction, Types of corrosion: Dry and Wet corrosion, Mechanism of dry and wet corrosion, Factor affecting corrosion: Nature of metal and nature of environment, Types of wet corrosion- Pitting corrosion, waterline corrosion, stress and galvanic corrosion, Methods of corrosion control- Cathodic protection: Sacrificial anode and impressed current method, Protective coating: Galvanizing and Tinning process.	7
	Total	40

Text Books:

1. Textbook of Engineering Chemistry by Dara S S and Umare S S.
2. Engineering Chemistry by Jain & Jain (Dhanpat Rai & Sons)
3. Engineering chemistry by S. S. Dara, S. Chand Publication
4. Engineering & Technology by Shashi Chawala, Dhanpat Rai & Sons.
5. Engineering Chemistry by K. Sesha Maheswaramma, Mridula Chugh, Pearson.

Reference Books:

- 1) Engineering Chemistry: Fundamentals and Applications by Shikha Agarwal.
- 2) Chemistry for Engineers by B K Ambasta
- 3) Engineering Chemistry by N Krishnamurthy and P Vallinayagam.
- 4) Engineering & Technology Vol-I & II-by Rajaram& Kuriocose.
- 5) Engineering Chemistry by Prasanta Rath (Cengage learning).

B.Tech. First Year Engineering (Mechanical Engg)

Pre-requisites:

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

Course Learning Objectives:

1. To introduce students with different terminologies in electrical engineering and network simplification methods of resistances.
2. To understand DC and AC Circuit analysis.
3. To understand magnetic circuits and Electromagnetic induction.
4. To understand single phase Transformer and Safety in electrical installation.

Course Outcomes:

After completion of this course the student shall be able to :

1. Understand fundamentals of Electrical Engineering and be adequately trained to solve Network of resistances by using transformation techniques.
2. Demonstrate DC circuits by finding different parameters like voltage, currents, resistance using laws and theorems.
3. Explain different properties of electromagnets and phenomenon of electromagnetic induction in magnetic circuits.
4. Illustrate the different terms of AC and analyze single phase AC circuits.
5. Explain Three phase A.C circuits
6. Explain single phase Transformer and Safety in electrical installation.

Unit No.	Content: Basics of Electrical Engineering	No. of Lectures Required
1	Fundamentals of Electrical Engineering: Basic concepts of Current, Voltage, Power, energy and relationship between them. Resistance, Resistivity, Conductance, Conductivity, Network simplification of Resistances (Series, Parallel, Delta-Star and Star-Delta transformation)	05

2	DC Circuit Analysis: Types of Sources, Current and voltage division principle, Source Transformation, Ohm's Law, Kirchoff's Laws (KCL and KVL) , Superposition Theorem, Thevenin's Theorem.	05
3	Magnetic circuits and Electromagnetic Induction: Basic concepts of Flux, flux density, MMF, Reluctance, Permeance, Magnetic field intensity and their relationship. Series Magnetic circuits, B-H curve, Principle of electromagnetic induction, Types of Magnetically induced EMF, Concept of self and mutual Inductance.	05
4	A.C. Fundamentals: Generation of sinusoidal alternating voltages and currents, Different terminologies associated with AC circuit. Behavior of AC circuit containing Pure R, L, and C. Phasor representation in rectangular & polar form, Impedance and admittance concept. Series R-L, R-C and R-L-C circuit, Resonance in Series R-L-C circuit, Power in single phase circuit: - Concepts of active, reactive and apparent power, Power factor.	05
5	Polyphase Circuits : Generation of Three phase voltages, current and power, Star connected and delta connected balanced circuits, Relationship between line current, phase current and line voltage, phase voltage , analysis of balanced three phase circuits Power measurement in Three phase circuit .	05
6	Single phase Transformer: Single-phase transformer construction and working (Ideal and practical), Types of Transformer, EMF equation of Transformer, Efficiency & Regulation of transformer, condition for maximum efficiency. Electrical Safety : Safety precautions in electrical installation, Earthing, Types of Earthing (Plate and Pipe Earthing)	05
	Total	30

Recommended Text Books:

1. B. L. Thereja, Basic electrical engineering, S. Chand Publications.
2. D.P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", TMH Publishing Co. Ltd., New Delhi, 3rd edition
3. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", 2nd Edition, Oxford Press.
4. Kulshreshtha D.C., " Basic Electrical Engineering" , First Ed., TMH

Reference Books:

1. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", 2nd Edition, Oxford Press. R
2. A.E. Fitzgerald, D.E. Higginbotham, "Basic Electrical Engineering", McGraw Hill Book Co., New York, 2nd edition
3. Dr.S.L.Uppal, "Electrical Wiring, Estimating and Costing", Khanna Publishers.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF04	Biology for Engineers	02	00	00	02

Pre-requisites: Nil

Course Learning Objectives:

- 1:** To acquire the knowledge of basic concepts of biology and the need of the subject in Engineering.
- 2:** To study the human organs and their analogy with engineering applications.
- 3:** To be acquainted with the latest trends in bio-engineering.
- 4:** To become familiar with the concept of Bio-mimicry and understand how nature has inspired innovations in technology.

Course outcomes:

- 1 Understand basic biological concepts and define the terminologies.
- 2 Understand various organs in body, their function; it's analogy with engineering applications.
- 3 Acquire knowledge of medical tools and machineries used in the treatment.
- 4 Understand the concepts of 3D printing and its biomedical applications and trends in bio-engineering
- 5 Understand the concepts like biosensors, biofuels and biochips.
- 6 Understand the concept of Bio-mimicry and nature inspired technology

	Subject: Biology for Engineers	L
UNIT I	Introduction to Basic Biology: Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes, The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types	04
UNIT II	Human Organ Systems and Bio Designs – 1 Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics.). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).	04
UNIT III	Human Organ Systems and Bio Designs – 2 Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).	05

UNIT IV	Trends in Bioengineering-1 Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D Printed tooth, Dental implants, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis	05
UNIT V	Trends in Bioengineering-2 Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels. Tissue engineering And its application, transgenic plants and animals	06
UNIT VI	Nature-Bioinspired Materials and Mechanisms: Bio-mimicry, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).	06
	Total	30

Reference Books:

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
7. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
8. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF05	Universal Human Values (UHV)	02	00	00	02

Prerequisites: NIL

Course Learning Objectives:

- 1) To facilitate in students the understanding of Universal Human Values.
- 2) To imbibe professional Ethics in students.
- 3) To aware students about their role in all aspects of life, including their place in the family, society and nature.

Course Outcomes:

Students will be able to

- 1) Understand the need for value education and its significance in personal and societal development.
- 2) Understand the harmony between the 'I' and the body and its significance for overall well-being.
- 3) Identify and appreciate the values in human-human relationships, emphasizing trust (Vishwas) and respect (Samman).
- 4) Develop a holistic perception of harmony at all levels of existence.
- 5) Communicate effectively about the importance of harmony in nature, promoting awareness and inspiring others to adopt sustainable practices.
- 6) Recognize the relevance of a humanistic constitution and humanistic universal order.

	Subject: Universal Human Values	L
UNIT I	Process for Value Education: Understanding nature and scope for Value Education, Self-Exploration–concept and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being	4
UNIT II	Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ – Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body	5

UNIT III	Understanding Harmony in the Family and Society- Harmony Human - Human Relationship: Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas.	5
UNIT IV	Building the Universal Harmonious Order: Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to worldfamily!	5
UNIT V	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence	5
UNIT VI	Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	5
	Total	30

Text Books:

- 1) R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books:

- 1) Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
- 2) E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond

& Briggs, Britain.

- 3) Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
- 4) Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
- 5) A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
- 6) P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
- 7) A N Tripathy, 2003, Human Values, New Age International Publishers.
- 8) Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi STantra Shodh, Amravati.
- 9) E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
- 10) M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
- 11) B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
- 12) B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Term Work (50 marks):

- 1) Analyze case studies on universal human values, such as ethical dilemmas or social issues.
- 2) Participate in group discussions on universal human values, including debates and presentations.
- 3) Visit community centers or NGOs working to uplift communities to demonstrate the values of selfless service.
- 4) Reading an article or literature on the people who were involved in selfless activities and prepare the report to express a view on the article.

Marking Scheme:-

- 1) Case Study: 10 Marks
- 2) Group Discussion: 10 Marks
- 3) Visit to community Centre: 10 Marks
- 4) Report on Article Reading: 10 Marks
- 5) Attendance -10 Marks

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF06	Indian Knowledge System	02	00	00	02

Course Prerequisites: Nil

Course Learning Objectives:

In this course students will know and understand contribution of ancient Indian scientists through

- 1) Introduction to contribution of Indian scientist in various fields of Science and Technology and Astronomy
- 2) Introduce to contribution of Indian scientist in Chemistry, Metallurgy and Mathematics.
- 3) Introduction to contribution of Indian scientist in Medical Sciences and Life Sciences.

Course Outcomes:

Students will be able to –

1. Discuss contribution of Indian Scientists in various fields of scientists and technology.
2. Narrate contribution of Indian Scientists in the field of Astronomy.
3. Discuss contribution of Indian Scientists in the field of Chemistry and Metallurgy.
4. Discover contribution of Indian Scientists in the field of Mathematics.
5. Collect contribution of Indian Scientists in the field of Medical Science and Ayurveda.
6. Discuss contribution of Indian Scientists in the field of Plant and Animal Science.

	Subject: Indian Knowledge System	L
UNIT I	India's Contribution to Science and Technology: Pre-Independence contribution. Brief information about various fields of contributions.	4
UNIT II	Contribution in Astronomy: The Beginnings of Indian Astronomy, The Early Historical Period, The Siddhāntic Era, The Kerala School, Other Post-Siddhāntic Developments.	4
UNIT III	Contribution to Chemistry and Metallurgy: Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Classical Age, Laboratories and Apparatus Metallurgy before and during the Harappan Civilization, Iron Metallurgy and its applications, Zinc Metallurgy	4
UNIT IV	Contributions to Mathematics: First Steps, contributions from: early historical period, the classical period, the classical period: post Aryabhatta, contributions of Shri P C Mahalanobis, Shri Shrinivasa Ramajujan.	5
UNIT V	Contributions to Medical Science and Ayurveda as way of life, health and well being The tradition of surgery, Inoculation for smallpox, Microbiology and Paracitology, Communicable diseases and epidemics, An evolving pharmacopoeia, Cross-cultural interactions,	5

	What is Ayurveda? Integrative approach to healthcare, Integrative approach to healthcare, Principles of Ayurvedic healing, Five elements, three Doshas and Treating diseases to restore health.	
UNIT VI	Contributions to Plant and Animal Science Plant Science in Ancient India, Animal Science in Ancient India, Indian Traditional Knowledge on Environmental Conservation.	4
	Total	26

Text Books:

- 1) Indian Contributions to Science compiled by Vijnana Bharati

Reference Books:

- 1) History of Science and technology in India by Dr. Binod bihari satpathy
- 2) Hindu achievements In exact science by Benoy Kumar Sarkar
- 3) Science in Ancient India by Subhash C. Kak

Term Work: (50 Marks)

- 1) Interaction with traditional practitioners (Vaidyas, artists, craftsmen) and prepare a report after the interaction.
- 2) Drawing or designing based on traditional Indian art (Madhubani, Warli, etc).
- 3) Project on traditional agriculture, water harvesting system, mathematics in ancient India etc.
- 4) Research paper on specific topics in IKS, such as the significance of Ayurveda in modern healthcare, chemistry in ancient era etc.

Marking scheme:

- 1) Report on the interaction: 10 marks
- 2) Drawing or designing on traditional Indian art: 10 marks
- 3) Project on traditional activities: 10 marks
- 4) Research paper on specific topic of IKS: 10 marks
- 5) Attendance in theory classes: 10 marks

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF07	Applied Chemistry Lab	00	00	02	01

Course Prerequisites:

1. Basic knowledge of qualitative and quantitative analysis.
2. Basic knowledge of titrations-based experiments.
3. Knowledge of chemistry lab precautions, prohibitions and safety aids.

Course Learning Objectives:

1. To impart skills of quantitative and qualitative analysis.
2. To provide knowledge of synthesis of co-crystal
3. To familiar students with some fundamental of chemistry experiments.

Course Outcomes:

Students will be able to

1. Determine the properties of water, chemical fuel, lubricant and cement based on laboratory techniques.
2. Synthesis of co-crystals and determination of its melting point.
3. Handle some important analytical instruments.

	Subject: Applied Chemistry Lab
Expt. 1	Preparation of Paracetamol and oxalic acid co-crystal and determination of its melting point.
Expt. 2	Determination of hardness of water by EDTA method.
Expt.3	Determination Alkalinity (NaOH and Na ₂ CO ₃) in given water sample
Expt.4	Determination of chlorine in water sample. (Iodometry)
Expt.5	Determination of Dissolved Oxygen in Water Sample.
Expt.6	Determination of pH of unknown sample by pH meter
Expt.7	Determination of H ⁺ ion concentration by conductivity meter.
Expt.8	Determination of % CaO in given cement sample.
Expt.9	Determination of % of moisture in coal sample by proximate analysis.
Expt.10	Determination of viscosity of lubricating oil by Redwood viscometer No.1
Expt.11	Determination of viscosity of lubricating oil by Redwood viscometer No. 2
Expt.12	Determination of flash point of lubricating oil by Abel's apparatus
Expt.13	Determination of acid value of lubricating oil.
Expt.14	Determination of mass of Zn coating on galvanized article
	Total hours for the completion of minimum nine (09) experiments

Text Books:

1. Experiments and Calculations in Engineering Chemistry by S. S. Dara, S. Chand & Company LTD.
2. Engineering Chemistry Practical Book by Dipika Jaspal and Arti Malviya.
3. Laboratory Manual on Engineering Chemistry by S. K. Bhasin and Sudha Rani, Dhanpat Rai Publishing Company.

Reference Books:

- 1) Experiments In Engineering Chemistry by Payal B Joshi.
- 2) Principles of Analytical Chemistry by Miguel Valcarcel

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF08	Basic of Electrical Engineering Laboratory	00	00	02	01

Prerequisite: Nil

Course Learning Objectives:

1. To analyse DC Circuits.
2. To analyse single phase and three phase AC circuits.
3. To understand single phase transformers.

Course Outcomes:

After completion of this course the student shall be able to:

1. Estimate different electrical parameters like voltage, current in DC circuits using basic laws and theorems.
2. Determine various parameters of AC circuits and find relation between them in single phase AC circuits.
3. Analyze relation between electrical parameters of balanced three phase AC circuits and transformers.

List of Experiments:

Minimum 08 practical's are to be conducted out of the following:

1. To validate Kirchoff's Current Law for DC Circuits.
2. To validate Kirchoff's Voltage Law for DC Circuits
3. To verify Thevenin theorems for DC Circuits.
4. To verify the Superposition theorem for DC Circuits.
5. To analyze RLC Series circuit and to plot its phasor diagram.
6. To verify relationships between line and phase values for Star connected load.
7. To verify relationships between line and phase values for Delta connected load.
8. To conduct load test on single phase transformer and pre-determine its efficiency and regulation.
9. Open circuit and short circuit test on Single phase transformer.
10. Demonstration of Earthing.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SCM02	Engineering Mechanics Lab	00	00	02	01

Course Prerequisites: Nil

Course Objectives:

Students will be taught -

1. Performance of practical's based on concepts related to engineering mechanics.
2. Working of Lifting Machines
3. Graphical analysis to verify analytical concepts.

Course Outcomes:

Students will be able to -

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures. List of Experiments/

List of Experiments/ Practical's:

Minimum Eight (08) experiments/ *Practicals* are to be performed

1. To verify Law of Polygon of forces
2. To determine reactions at the supports of simple beam.
3. To determine forces in members of Jib crane.
4. To determine coefficient of friction on inclined plane.
5. To determine Coefficient of coil friction.
6. To verify law of machine for screw jack.
7. To verify law of machine for differential axle wheel.
8. To verify law of machine for single purchase crab.
9. To verify law of machine for double purchase crab.
10. Three compulsory graphical solutions.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
2SF09	Workshop/Digital Fabrication Lab	00	00	02	01

Course Prerequisites: Nil

Course Objectives:

1. To make familiar with different tools, equipment and to understand their basic purposes.
2. To develop skills and get hands on experience of marking, measuring, cutting, machining, shaping, forming processes and joining processes
3. To make the students well versed with basic electrical, electronics and computer components.
4. To learn the modern manufacturing techniques such as CNC, Robotic Operations and 3D printing

Course Outcomes:

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

1. understand manufacturing processes, tools & equipment's, which are commonly employed in industries.
2. Apply craftsmanship & fabricate the components using various manufacturing techniques.
3. Understand the modern electrical, electronics & computer components & their applications

Group A

- 1) **Fitting** : Introduction to different tools , equipment's and operations in Fitting Shop. Prepare one job in the Fitting shop, involving operations like marking, filing, hacksaw cutting, drilling and tapping etc.
- 2) **Sheet Metal** : Introduction to Sheet Metal tools and equipment's, their uses, different sheet metal joints and operations in Sheet Metal. Prepare one job in the Sheet Metal shop.
- 3) **Welding** : Introduction to Welding, welding tools and equipment's, their uses. Brief introduction to different welding processes, different welding joints. Prepare one job in the Welding shop.
- 4) **Smithy** : Introduction to different tools , equipments and Smithy operations like upsetting, drawing ,bending, forming etc. Prepare one job in the smithy shop.
- 5) **Carpentry** : Introduction to different wood working tools , equipment's and machines , types of joints and operations performed in Carpentry Shop. Prepare one job in the Carpentry shop.
- 6) **Machining** :- Introduction and practice of basic machining operations on Drilling , Lathe and shaper machine tools.

Group B

- 1) To identify the computer hardware parts, understand working of these parts, & Assemble demonstrate its working
- 2) Identification of various electrical & electronic components & tools used in domestic/industrial applications

- 3) Development of circuit schematic using EDA tools
- 4) 3D printing demonstration
- 5) Robotic operations demonstration
- 6) CNC operations demonstrations

Note- Students have to perform any 4 practical from group A & any 3 practical from group B

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF01	Applied Mathematics I	03	00	00	03

Course Requisite:

1. Basic idea of differential and integral calculus.
2. Fundamental knowledge of trigonometric functions.
3. Essential knowledge of Differential Equation.

Course Learning Objectives:

1. To familiarize with techniques in calculus.
2. To evaluate partial derivatives of explicit, implicit functions, maxima and minima values of the functions.
3. To solve differential equation of certain type of differential equations and its applications.
4. To determine infinite series and their convergence and divergence.

Course Outcomes:

Students will be able to:

1. Make use of derivatives for finding nth derivatives and to solve indeterminate forms.
2. Extend the basic ideas of the calculus of functions of single variables to functions of several variables and its concept.
3. Find maximum and minimum value of a function.
4. Solve certain types of differential equations by various methods.
5. Utilize it for engineering problems of electrical circuit.
6. Determine infinite series and their convergence and divergence.

	Subject: Applied Mathematics I	L
Unit I	Differential Calculus I: Successive differentiation, Leibnitz's theorem on the nth derivative of a product, Indeterminate forms.	7
Unit II	Differential Calculus II: Partial differentiation, Euler's theorem on homogeneous function.	6
Unit III	Differential Calculus II: Partial differentiation, Euler's theorem on homogeneous function.	7
Unit IV	Ordinary differential equations of first order and first degree: Non-homogeneous differential equation, Linear differential equation, reducible to Linear differential equation, Exact differential equation and reducible to Exact differential equation.	7
Unit V	Differential equations of first order and higher degree: Solvable for p, solvable for x and solvable for y, Application to Orthogonal Trajectories and Electrical circuits by Kirchoff's law.	6

Unit VI	Infinite Series: Tests for convergence by p-series test, Comparison test, Ratio test, Rabbe's test and Root test.	7
	Total	40

Text Books:

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.

Reference Books:

1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF02	Applied Physics	03	00	00	03

Course Prerequisites:

- 1) Elementary idea about electric charge, electricity & magnetism.
- 2) Basic knowledge of material science.
- 3) Fundamental knowledge of optics.

Course Learning Objectives:

- 1) To impart the essential knowledge and applications of ballistics of charged particles in electric and magnetic fields.
- 2) To impart the fundamentals of optics, fibre optics and laser physics and their various applications in engineering fields.
- 3) To impart the knowledge of crystallography, fluid dynamics and cathode ray oscilloscope and their applications.
- 4) To enhance the imagination and creativity in students by performing practical experiments on related topics.

Course Outcomes:

Students will be able to,

- 1) Apply the concepts of electric and magnetic fields in mass spectrograph and Cathode Ray Oscilloscope.
- 2) The students will gain the basic ideas about crystallography and will be able to identify different types of crystal structures in solids.
- 3) The students will be able to utilize the knowledge of interference and diffraction.
- 4) The Students will gain the knowledge of LASER, its types and applications.
- 5) The Students will acquire the knowledge of fibre optics, its types and applications.
- 6) The Students will gain the knowledge of fluid dynamics and its applications.

	Subject: Applied Physics	L
UNIT I	Electron Ballistics: Motion of charged particle in uniform transverse electric and transverse magnetic fields, velocity selector (energy filter), Bainbridge mass spectrograph, Hall effect, cathode ray oscilloscope : working and its block diagram.	8

UNIT II	Crystallography: Crystal structure, Unit cell, Cubic crystal structure: SC, BCC and FCC, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, coordination number, atomic packing fraction, Miller indices, Bravais lattice Inter-planar distance between adjacent planes.	6
UNIT III	Interference and Diffraction of Light: Fundamental condition of interference, thin film interference due to reflected light, Newton's rings experiment and its applications, Fresnel and Fraunhofer diffraction, plane transmission diffraction grating.	7
UNIT IV	Laser Physics: Absorption, spontaneous and stimulated emission of radiation, population inversion, pumping, metastable state, characteristics and applications of laser, Ruby laser, He-Ne Laser.	6
UNIT V	Fibre Optics: Snell's law, total Internal reflection, construction of optical fibre, acceptance angle and acceptance cone, numerical aperture, types of optical fibre, attenuation, fibre optic communication system.	7
UNIT VI	Fluid Dynamics: Viscosity, Stoke's law, streamline and turbulent flow of liquid, Poiseuille's equation, Continuity equation, Bernoulli's theorem.	6
	Total	40

Text Books:

- 1) R.K.Gaur & S.L.Gupta: Engineering Physics, Dhanpat Rai & Sons.
- 2) Hitendra K. Malik & A.K.Singh: Engineering Physics, Tata McGraw Hill
- 3) M.N. Avadhanulu & P.G. Kshirsagar: Engineering Physics, S.Chand Pub., 2008

Reference Books:

- 1) Orazio Svelto: Principle of Lasers, Springer
- 2) Frank L.Pedrotti, Leno M. Pedrotti, Leno S. Pedrotti: Introduction to optics.

B.Tech. First Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF03	Engineering Graphics	02	00	00	02

Course Pre-requisites:

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

Course Learning Objectives:

- 1: To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions.
- 2: To understand the representations of 3D objects and their projections.
- 3: To understand the representations of orthographic and isometric views of objects.
- 4: To introduce & apply different drafting commands of CAD software.

Course Outcomes:

At the end of course, Learner will be able to:

1. Use the drawing instruments effectively to dimension the given figures and describe the methods of projection.
2. Construct the various types of plane in different orientation.
3. Apply knowledge of projection to construct different view of regular solid objects
4. Identify the pictorial views of the object.
5. Recognize the pictorial views of the object and construct isometric scale, isometric projection & views
6. Develop the lateral surfaces of primitive solids by using CAD Software.

	Subject: Engineering Graphics	L
UNIT I	Basics of Engineering Drawing and Projection: Introduction to drawing instrument and their uses, concept of dimensioning and scales, geometric construction. Projection of Point, Projection of Line.	04
UNIT II	Projection of Plane: Projection of different types of planes such as triangular plane, square plane, rectangular plane, pentagonal plane, hexagonal plane, circular plane etc. by using change of position method and auxiliary plane method.	04
UNIT III	Projection of Solids: Projection of solids for Prism, Pyramid, Cone and Cylinder.	05
UNIT IV	Orthographic Projection: Construction of elevation, plan and side view of given object by using first and third angle projection methods.	05
UNIT V	Isometric Views and Projection: Construction of isometric scale, isometric views and projection.	06

UNIT VI	Fundamental of CAD Software: Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization.	06
	Total	30

Text Books:

1. Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand, Gujrat, 2007.
2. Shah P. J. – Engineering Drawing, S. Chand Publication, 2008.
3. Dhawan R. K. – Engineering Drawing, S. Chand Publication, (5th edition, 2008).
4. Ingole D.S. – Engineering Graphics, Nirali Publication, Pune (1st Edition 2020).
5. Tickoo Sham – AutoCAD, BPB Publications.

B.Tech. First Semester (Mechanical Engg)

Course code	Course Title	L	T	P	C
1SF04	Programming for Problem Solving	02	00	00	02

Course Prerequisites: Basic Computer Knowledge, Logical Thinking

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of the Programming for Problem Solving

1. Develop a solid understanding of the fundamental concepts of programming and problem-solving, including the input-process-output cycle, algorithms, and program design principles such as top-down and bottom-up approaches.
2. Acquire proficiency in the C programming language, including the ability to write and execute basic C programs, effectively use input-output functions, work with variables, data types, and operators, and understand the concept of program execution.
3. Demonstrate competence in using control constructs such as decision-making statements and looping statements to create efficient and structured programs.

Course Outcomes :

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

1. Understand the basic concepts of computer organization, program design and Algorithms.
2. Explain the basic structure and fundamentals of C programming.
3. Compare and contrast the decision-making constructs and looping statements in C programming.
4. Understand the concept of arrays and string functions in C language.
5. Demonstrate the ability to write and use the concept of functions.
6. Apply the concepts of pointer declaration, assignment and arithmetic operation

	Programming for Problem Solving	L
Unit-1	Introduction: Characteristics of Computer, Organization of Computer, Input – Process Output Cycle Various Types of Memory (Primary Memory & Secondary Memory), Introduction to C language, Basic structure.	05
Unit-2	C Fundamentals: Program Execution First C Program, Input Output using scanf() and printf(), Data type, Variables, Keywords, Operators and their precedence.	05
Unit-3	C Control construct: Decision making using if, if-else,if-else-if and switch.	05

	Looping using for, while, do while, Jumps Statements (break, continue, goto, return), Basic Programs.	
Unit-4	Array and Strings: Introduction to Array, 1-D array: Declaration & Initialization, 2-D array: Declaration & Initialization, Strings: Declaration & Initialization, String functions.	05
Unit-5	Functions: Function: Pre defined functions; User defined functions, Multi-function Program, Elements of user defined functions, Return value and their types, Function calls, Function Declaration.	05
Unit-6	Pointers: Definition and uses of pointers, pointer declaration, pointer assignment, pointer arithmetic, Pointers and Functions: Call by value and call by reference.	05
	Total	30

Text Book:

- 1) R. S. Salaria : Programming for Problem Solving , Khanna Publication .
- 2) E Balagurusamy: Computing Fundamentals and C Programming- Tata McGraw Hill, Second Edition

Reference Books:

1. Herbert Schildt- C Complete reference (Tata McGraw Hill)
2. Yashwant Kanetkar- Let us C- Seventh Edition

B.Tech. First Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF05	Professional Communication Skills (PCS)	01	01	00	02

Course Prerequisites:

- 1) Basic knowledge of vocabulary and grammar of English.
- 2) Basic knowledge of LSWR skills.

Course Learning Objectives:

- 1) Introduce communication skills and improve vocabulary.
- 2) Enhance the Employability skills and develop problem solving attitude.
- 3) Develop confidence and help them attend interviews successfully.
- 4) Develop the importance of team building and networking.

Course Outcomes:

Students will be able to

- 1) Use words correctly in a sentence.
- 2) Become a competent communicator.
- 3) Express and present their ideas relevant to the given topic.
- 4) Develop critical thinking skills, decision making ability and team spirit.
- 5) Develop skills needed for approaching different types of interviews.
- 6) Become ethical confident individual professionally and socially.

	Subject: Professional Communication Skills (PCS)	L
Unit I	Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers	5
Unit II	Unseen passage, vocabulary building (Synonyms & Antonyms, Prefix and Suffix, Error Analysis, one word substitute), developing story on given outline.	5
Unit III	Self-Introduction-organizing the material - introducing the topic – extempore speech – Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—Visual presentation	5
Unit IV	Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills	5
Unit V	Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview – FAQs	5

	related to job interviews	
Unit VI	Recognizing differences between groups and teams- networking professionally-respecting social protocols-understanding career management-developing a long- term career plan-making career changes.	5
	Total	30

Text Books:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students, OrientBlackSwan: Hyderabad, 2016.
3. M.Ashraf Rizvi, Effective technical communication. Tata McGraw-Hill Publishing Company Limited. New Delhi.

Reference Books:

1. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
2. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
3. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.
4. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.

Term Work (50 marks):

- 1) **Oral Communication:** Self introduction, Extempore, Group discussion, Presentation, Role plays and Mock interview (Students should complete any two oral activities).
- 2) **Non verbal communication:** Body language, facial expressions, tone of voice.
- 3) **Written communication:** Test (short answers, developing story, expanding an idea, comprehending unseen passage) and Assignments based on the syllabus.

Marking Scheme:-

- 1) Oral activity I: 10 marks
- 2) Oral activity II: 10 marks
- 3) Written test based on syllabus: 10 marks
- 4) Assignments based on syllabus: 10 marks
- 5) Personal Interview: 10 marks

B.Tech. First Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SM01	Fundamental of Mechanical Engineering	03	00	00	03

Course Pre-requisites: Nil

Course Learning Objectives:

1. To learn the basic concepts of Mechanical engineering and its application in day to day life
2. To learn the basic concepts of energy source and various energy conversion plant.
3. To learn and be familiarized with the manufacturing processes and various concepts of automobile engineering
4. To learn the basis for machine design along with various power transmission elements

Course Outcomes:

Students will be able to

1. Understand and identify the basics mechanical elements in day to day life
2. Understand the energy conversion and power generation systems using conventional and non conventional energies.
3. Identify various Manufacturing Processes
4. Understand the basics of machine design like types, criteria, steps in design
5. Identify & classify the automobile and along with its various parts
6. Identify the conventional & nonconventional machines and will also be able to understand recent trends in mechanical engineering

	Subject: Fundamental of Mechanical Engineering	L
UNIT I	Introduction of Mechanical engineering: Application of mechanical engineering (a) In day to day life (b) Interdisciplinary use Introduction of common machine element types and there use a) Screw fastener & rivets b) Bearing & Bushes c) Springs d) Levers e) Shaft keys & couplings f) O’rings and oil seals	06
UNIT II	Introduction to Energy sources: •Conventional, Non-Conventional & Sustainable energy sources • Thermal steam power plant •Hydroelectric power plant • Wind power plant • Nuclear power plant	06
UNIT III	Introduction to Manufacturing Processes: • Primary shaping processes • Machining processes • Surface finishing Processes • Joining processes • Processes effecting change in properties	07
UNIT IV	Introduction to Machine design • Definition • Classification of design • Steps in machine design • Design criteria of common machining elements • Introduction to various power transmission systems a) Belt drives b) Chain drive c) Gear and gear Train	07

UNIT V	Introduction to Automobile • Classification of automobile • Introduction of various system in automobile a) Power transmission system (layout of Automobile) b) Steering system c) Suspension system d) Breaking system • Introduction to automobile Engine a) S.I Engine b) C.I Engine c) Electric Vehicle d) Hybrid Vehicle.	07
UNIT VI	Introduction to recent trends in mechanical engineering: • Automation • Robotics • CNC Machining • Machine learning	06
	Total	39

Text Book

1. Thermal Engineering by R.K.Rajput, Laxmi Publicashions (P) Ltd ,9th Edition 2013
2. Elements of Workshop Technology: v.1, by Choudhary Hajra Sk, Media Publishers & Promoters,India

References Book

1. A text Book of Thermal Engineering – R.S.Khurmi & J.K.Gupta-S.Chand Publications-Revised Edition-2012
2. Non-Conventional Energy Sources by G D Rai, Khanna publication
3. Machine Design by R.S.Khurmi & J.K.Gupta-S.Chand Publications
4. Elements of Workshop Technology: v.1, by Choudhary Hajra Sk, Media Publishers & Promoters,India
5. Workshop Technology Vol II- By B.S Raghuwanshi.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF06	Design Thinking (DT)	01	00	00	01

Course Prerequisites: Nil

Course Learning Objectives:

- 1) To familiarize students with design thinking concepts and principles.
- 2) To ensure students can practice the methods, processes and tools of design thinking.
- 3) To ensure students can apply the design thinking approach and have ability to model real world situations.

Course Outcomes:

Students will be able to –

- 1) Understand design thinking principles and concepts.
- 2) Practice the methods, processes, and tools of design thinking.
- 3) Describe the role and purpose of the observation phase.
- 4) Explain the purpose and structure of the point-of-view phase.
- 5) Illustrate the purpose, flow, and importance of the ideate phase.
- 6) Clarify the role and purpose of the prototype phase.

	Subject: Design Thinking	L
Unit I	Fundamentals of Design Thinking: Principles of Design Thinking, the process of Design Thinking, how to plan a Design Thinking project	2
Unit II	Understanding the Design Problem: Search field determination, Problem clarification, Understanding of the problem, Problem analysis, Reformulation of the problem	3
Unit III	Observing the Problem: Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design	2
Unit IV	Defining the Problem: Point-of-View Phase, Characterization of the target group, Description of customer needs	3
Unit V	Finding and Selecting Ideas: Ideate Phase, The creative process and creative principles, Creativity techniques, Evaluation of ideas	2
Unit VI	Prototyping: Prototype Phase, Lean Startup Method for Prototype Development, Visualization and presentation techniques	2
	Total	14

Text Books:

- 1) Christian Mueller-Roterberg, Handbook of Design Thinking, Research Gate November 2018.
- 2) Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Amazon books.

Reference Books: Dr. D. Ravindran, Introduction to Design Thinking, Notion Press.

Term Work (50 marks)

Students should complete the following activities

- 1) Participate in a design challenge to solve the real-world problem using design thinking principles.
- 2) Analyze case studies on design thinking application in various industries.
- 3) Design a project that applies design thinking principles to a specific problem or opportunity.

Marking Scheme:-

- 1) Participation in a design challenge -10
- 2) Case Study-10
- 3) Designing of a project-10
- 4) Assignments-10
- 5) Attendance in theory classes- 10

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF07	Applied Physics Lab	00	00	02	01

Course Prerequisites:

- 1) Identify and handle various equipment likes vernier calliper, micrometer screw gauge, multimeter, spectrometer.
- 2) Basic knowledge of graphical representation of observed values.

Course Learning Objectives:

- 1) To gain practical knowledge by applying experimental methods to correlate with the theory.
- 2) Apply the analytical techniques and graphical analysis to the experimental data.
- 3) To develop basic understanding of various experimental principles involved.

Course Outcomes:

Students will be able to,

- 1) Develop experimental skills to impart practical knowledge in real time.
- 2) Understand principle, concept, working and applications of areas in physics and compare the results obtained with theoretical calculations.
- 3) Conduct experiment and record experimental data, Analyse the obtained data and Draw conclusions from the Labortary exercise based on the analysed data.

	Subject: Applied Physics Laboratory
Expt. 1	Study of CRO I: To measure A.C voltage, D.C voltage and frequency using CRO.
Expt. 2	Study of CRO II: To determine frequency of unknown signal by using Lissajous patterns.
Expt. 3	To determine wavelength of monochromatic light by using Newton's Ring experiment.
Expt. 4	To determine wavelength of monochromatic light by using Plane transmission diffraction grating.
Expt. 5	Determination of grating element of diffraction grating, using LASER beam.
Expt. 6	Study of various crystal structures.
Expt. 7	To determine Miller Indices of crystal planes.

Expt. 8	To plot the V-I characteristics of LED and to find it's striking potential.
Expt. 9	To measure the intensity and divergence of given LASER beam.
Expt. 10	To determine the coefficient of viscosity using Stoke's law.
Expt. 11	Study of Hall effect in semiconductor.
	Total (Minimum 8 particles are to be performed)

Text Books:

- 1) Dr. Ruby Das & C. S. Robinson: Engineering Physics Practical, Laxmi Publications.
- 2) Dr. B. Shriniwas Rao: Engineering Physics Practical, Laxmi Publication.

Reference Books:

- 1) William David Cooper: Electronic Instrumentation and Measurement Techniques, Eastern Economy Edition publications.

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF08	Engineering Graphics – Lab	00	00	02	01

Course Pre-requisites:

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

Course Learning Objectives:

1. To understand the concepts of drawing as a language of communication of Engineers
2. To improve the visualization skills for better understanding of solids using CAD software.
3. To acquire skills to interpret and convert multi-views drawing into single view and vice-versa.

Course Outcomes:

At the end of course, Learner will be able to –

1. Illustrate the projection of points, lines and surfaces
2. Understand the concept of orthographic and isometric projection
3. Construct different types of solids in different positions by using CAD software

List of Practical:

Every student will submit a set of at least FIVE drawing sheets (from 1 to 6 listed below) and perform at least TWO practical (from 7 to 9 listed below) using CAD software.

Examination will consist of viva-voce based on the syllabus.

1. Projection of straight line
2. Projection of plane
3. Projection of solids
4. Orthographic projection
5. Isometric projection/view
6. Free hand sketches of simple machine elements, like
 - (a) Screw threads ISI profile
 - (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
 - (c) Foundation bolts – Rag, eye, lewis types
7. Drafting of basic 2D geometrical shapes using CAD software
8. Drafting of basic 3D geometrical shapes using CAD software
9. Drafting of 2D and 3D objects using surface modelling commands

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF09	Programming for Problem Solving Lab	00	00	02	01

Course Learning Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving Lab by being able to do each of the following:

1. Set up and use a C programming development environment (IDE, compiler, etc.) to write, compile, and run programs.
2. Understand and apply fundamental programming constructs such as variables, control structures, functions, arrays, strings, and pointers in C.
3. Develop algorithmic thinking using flowcharts or pseudocode to solve problems through a structured, top-down approach.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Develop and execute basic C programs to solve simple problems using appropriate programming constructs.
2. Analyze and apply control flow mechanisms and data structures (arrays, strings, functions, and pointers) to implement efficient C programs.
3. Demonstrate problem-solving skills through the application of algorithmic logic and programming techniques

List of Experiment:

Minimum 8 to 10 practical's are to be conducted based on subject 1SF04 Programming for Problem Solving

List of Experiments/ Practical's:

Minimum 8 experiments are to be performed.

1. Set up a C programming environment (compiler, IDE, etc.).
2. Write a simple program to display "Hello, World!".
3. Solve a simple problem using a top-down approach and develop a program accordingly.
4. Use flowcharts or pseudo code to represent the algorithm for a specific problem.
5. Write program to illustrate precedence of operator

6. Write programs that demonstrate the use of if, if-else, and switch statements for decision making.
7. Create and manipulate 1-D, 2-D arrays (declaration, initialization, accessing elements).
8. Explore string manipulation functions (strcpy, strcat, strlen, etc.)
9. Write programs using user-defined functions to solve specific tasks
10. Understand and use return values and their types.
11. Explore the concept of call by value using pointers.
12. Explore the concept of call by reference using pointers

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SM02	Fundamental of Mechanical Engineering- Lab	00	00	02	01

Pre-requisites: Nil

Course learning objectives:

1. To study the basic concepts of production machines and various machine tools.
2. To acquire knowledge of mechanical systems like thermal system & non conventional energy systems.
3. To become more aware about the basics of automobile and hydraulic systems.

Course Outcomes:

Students will be able to

1. Understand & demonstrate the basics concepts of production machines and various machine tools.
2. Understand & demonstrate the basics concepts of mechanical systems like thermal system & non conventional energy systems.
3. Understand & demonstrate the basics of automobile and hydraulic systems.

List of Practical:

1. Study of production machine. (anyone)
2. Study of various machining tools.
3. Study of house hold refrigerator
4. Study of Non-conventional energy system (Anyone).
5. Study of any automobile layout and its specification.
6. Study of hydraulic system & Pneumatic system

B.Tech. First Year Engineering (Mechanical Engg)

Course Code	Course Title	L	T	P	C
1SF10	NSS/Sports/Yoga/Cultural/Community Service	00	00	02	01

Course Prerequisites:

1. Basic physical and mental fitness.
2. Willingness to volunteer time.

Course Learning Objectives:

1. To develop a sense of responsibility, discipline and social values through participation in community base activity.
2. To enhance physical, mental and emotional wellbeing while fostering teamwork.
3. To strengthen, problem solving, decision making and organizing skill by addressing real world issues in the community.

Course Outcomes:

Students will be able to –

1. Demonstrate and understand community service and social responsibility through the participation in NSS activities.
2. Demonstrate proficiency in basic yoga posture and breathing techniques.
3. Develop leadership, creativity, self-expression and time management skills through the participation in sports activities, music, dance, drama or fine art.

	Subject: NSS/Sports/Yoga/Cultural/Community Service
ACTIVITY- I	NSS- Cleanliness drive, Blood donation, Tree plantation, Health and hygiene awareness program, Plastic waste management.
ACTIVITY-II	SPORTS- Introduction to Sports, Importance of health and fitness, Brief information of any one outdoor game, Brief information of any one indoor game, Article writing on any recent match of your choice.
ACTIVITY-III	YOGA- Introduction to yoga, Importance of yoga, Suryanamaskar (12 yoga postures) with benefits, Importance of balanced diet, Meditation for mental health.
ACTIVITY-IV	CULTURAL- Skit, Mime & Street play, Light music (singing), Any one dance form, Poster/Rangoli (any theme).
ACTIVITY-V	COMMUNITY SERVICE- Visit to blind home, Visit to Old age home, Visit to Orphanage, Distribution of clothes, medicine to needy people.

Text Book:

- 1) “National Service Scheme: A Handbook for Volunteers” by Dr. A. R. Anuradha.
- 2) “Sports and Physical Education” by Dr. S. K. Sharma.

Reference Book:

- 1) “The Yoga Sutras of Patanjali” by Swami Sivananda.

Term Work (50 marks):

- 1) Field visits to 'Old age home', Orphanage or Ashram shala to run activities such as cleaning the premises, tree plantation, donating medicines, cloths etc., to develop the values of selfless service.
- 2) Participation in yoga sessions to promote physical and mental fitness and also to get aware about yoga.
- 3) Participation in outdoor and indoor games to promote physical
- 4) Participation in various cultural activities for the development of skills and to encourage creativity and talent.
- 5) Participation in community services such as making water bowls for birds, tree plantation, distribution of food to underprivileged families, etc.

Marking Scheme:

1. Field visit: 10
2. Participation in yoga: 10
3. Participation in outdoor and indoor games: 10
4. Participation in various cultural activities: 10
5. Participation in community services: 10

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM01	Fluid Mechanics	02	00	00	02

Pre-requisites:

- 1.Knowledge of Applied science
- 2.Knowledge of Engineering mathematics

Course Learning Objectives:

- 1: To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows
- 2: To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow
- 3: To inculcate the importance of boundary layer flow and its applications
- 4: To determine the losses in a flow system, flow through pipes, impact of jet

Course Outcomes:

At the end of course, Learner will be able to

- 1.Understand the basic properties of fluid
- 2.Understand various forces & conditions of equilibrium of floating & submerged bodies
- 3.Understand kinematics and dynamics of flow.
- 4.Apply Darcy weisbach equation in various fluid flow
- 5.Understand the concept of motion of viscous fluid
- 6.Understand and Evaluate the performance of various fluid machinery

	Subject: Fluid Mechanics	L
UNIT I	Basic properties of fluid: Density, Specific weight, Specific Volume, Specific gravity, Viscosity of fluid, Surface Tension, Capillarity, vapour pressure & cavitation. pressure & its measurement: Pascals law, Hydrostatic law of pressure & pressure variation in fluid, measurement of pressure by Manometer	5
UNIT II	Buoyancy & floatation: Concept of buoyancy, Centre of buoyancy. Stability of floating body, Metacenter & metacentric height. Condition of equilibrium of floating & sub-merged body. Hydrostatic pressure force on plane surfaces. Measurement of total pressure & Centre of pressure	5
UNIT III	Kinematics of fluid flow, Methods of describing fluid motion, Types of flow, rate of flow, streamline, potential line, flow net, velocity & acceleration, continuity equation in three dimensional flow. Dynamics of fluid flow : Eulers equation of motion, Bernoullis equation measurement of fluid flow with venturimeter.	5

UNIT IV	Flow through pipes: Losses in pipe, major losses, Darcy's Weisbach equation, minor losses due to sudden enlargement, contraction, entry, exit & pipe fitting. Flow through series & parallel pipes, concept of water hammer in pipes	5
UNIT V	Motion of viscous fluid: Introduction to Laminar & Turbulent flow, Concept of Boundary layer & its type, Boundary layer separation, Reynolds number & its significance. Drag & Lift force on object	5
UNIT VI	Principal of fluid machinery : Force exerted by fluid jet on plane, curved, stationary & moving vanes. Velocity diagrams, work done & efficiency.	5
	Total	30

Text Books :

1. Fluid Mechanics and Hydraulic Machines by R. K. Bansal
2. Engineering fluid Mechanics by R. K. Rajput.

Reference Books :

1. Hydraulic, Fluid Mechanics & Fluid Machines, S. Ramamrutham.
2. Fluid Mechanics & Machinery by Modi & Sheth.
3. Fluid mechanics & Machinery by CRSP. Ojha, R. Berndtsson.
4. Fluid Mechanics by Streeter; Mcgraw Hill Education

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM02	Engineering Thermodynamics	03	00	00	03

Course Pre-requisites:

1. An introductory background of Mathematics is needed.
2. An introductory background of physics is needed.
3. An introductory background of chemistry is needed.

Course Learning Objectives:

- 1: To learn the basic concepts of thermodynamics, thermodynamic systems, work and heat
- 2: To learn the laws of thermodynamics and their applications
- 3: To learn the air standard cycles

Course Outcomes:

At the end of course, Learner will be able to

1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. Understand the concepts of first law of thermodynamics.
3. Apply first law of thermodynamics during non-flow processes.
4. Apply first law of thermodynamics to flow processes.
5. Understand the concepts of second law of thermodynamics.
6. Understand the concept of air standard cycles.

	Subject: Engineering Thermodynamics	L
UNIT I	Introduction to basic concepts of thermodynamics: Macroscopic and microscopic approaches, properties of system, state and equilibrium, processes and cycle. Temperatures and Zeroth law of thermodynamics, Quasi-static process. Gas Laws and Ideal gas equation of states, difference between gases and vapours, equation of state, gas constant and universal gas constant	6
UNIT II	Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams	6

UNIT III	First Law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment. Energy a property of system, internal energy- a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Change in internal energy and Heat transfer during various non-flow processes	6
UNIT IV	First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine, compressor, pumps, heat exchangers, Throttle valve etc.	7
UNIT V	Second Law of thermodynamics: Limitations of Ist law, Thermal energy reservoir, heat engine, refrigerator and heat pump. Efficiency of heat engines, COP of heat pump and refrigeration. Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem and its corollaries. The thermodynamic temperature scale, Reverse carnot cycle and Inequality of Clausius	7
UNIT VI	Air Standard Cycles: Sterling, Otto, Diesel, Semidiesel, and Brayton cycle, their efficiencies, mean effective pressure and comparison. Introduction to Vapour Cycle:- Rankine Cycle	7
	Total	39

Text Books :

1. Engineering Thermodynamic - by P. K. Nag.
2. Fundamentals of Engineering Thermodynamics; R. Yadav;
3. Thermodynamics Basics and Applied: by V. Ganeshan

Reference Books :

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G. J. Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson.
6. Thermal Engineering: by Mahesh M. Rathore

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM03	Production Processes	02	00	00	02

Course Pre-requisites:

1. knowledge of properties of material.
2. knowledge of fundamentals of Mechanical engineering

Course Learning Objectives:

- 1: To impart the pattern making and sand casting processes.
- 2: To learn the mechanical working of metals and allied processes.
- 3: To learn the mechanical joining and welding processes.

Course Outcomes:

At the end of course, Learner will be able to

1. Understand the basic concept of foundry process and related activities
2. Understand the various sand casting processes.
3. Understand the working of melting furnaces and advance casting processes.
4. Understand the metal forming processes.
5. Understand & apply the techniques of various joining processes
6. Understand & apply the advance welding techniques

	Subject: Production Processes	L
UNIT I	Introduction to manufacturing processes & classification; Introduction to types pattern, pattern making, Pattern materials. Moulding processes, core making. Core making and types of cores	4
UNIT II	Sand casting Process : properties of moulding sands, Gating system, types of gates , runner and risers. Advance casting processes, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, cleaning of castings. Continuous casting, die casting equipment and processes	6
UNIT III	Introduction of melting, furnaces and types of furnaces, cupola furnace, pit furnace, open hearth furnace, gas fired furnace and their operation, Electric furnaces. Defects in castings and its types, Causes and remedies of casting defects	5
UNIT IV	Mechanical working of metals: Extrusion, piercing, pipe and tube production, manufacture of seamless pipe, spinning, rolling and types of rolling mills	5

UNIT V	Introduction of joining processes:- Mechanical joining processes, soldering, brazing Welding, Arc welding, Gas welding, Types and purpose of Electrodes, TIG & MIG processes	5
UNIT VI	Introduction of Welding: Submerged arc welding & resistance welding, butt welding. Friction welding, forge welding, plasma arc, thermit welding. Welding defects	5
	Total	30

Text Books :

1. Workshop Technology Vol. I by Bawa, Tata Mc-Graw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

Reference Books :

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A. Lindberg, PHI Pub 2001.
4. Manufacturing technology Vol. I, by P. N. Rao

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM04	Mechanics of Materials	03	00	00	03

Pre-requisites:

1. Knowledge of Engineering Mathematics
2. Knowledge of Engineering Mechanics
3. Knowledge of Fundamentals of Mechanical Engineering

Course Learning Objectives:

- 1: To learn different types of material behavior.
- 2: To acquire the knowledge of SF and BM diagrams to analyze resistance offered by the beam and able to solve practical problems.
- 3: To learn the stress & strain in the member subjected to axial, bending & torsional load.
- 4: To apply deflection criteria to check the stability of beam.

Course Outcomes:

At the end of course, Learner will be able to

1. Analyze mechanical behavior of engineering material.
2. Understand the shear force, bending moment, torsion.
3. Understand the concept of various stresses subjected to axial, bending load.
4. Understand various stresses related to torsion load.
5. Understand the concept of strain energy and impact loading.
6. Understand slope and deflection of various types of beams in different loading conditions.

	Subject: Mechanics of Materials	L
UNIT I	Mechanical Properties Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and Triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics	7
UNIT II	Shear Force & Bending Moment Diagrams Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.	7
UNIT III	Theory of Pure Bending Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section	7
UNIT IV	Torsion Theory of torsion & assumptions, derivation of torsion equation, polar	7

	modulus, stresses in solid & hollow circular shaft, power transmitted by shaft	
UNIT V	Strain energy Strain energy under Uni-Axial tension and compression impact loads and instantaneous stresses. Strain energy and resilience, proof resilience, shear resilience, strain energy due to self load	7
UNIT VI	Deflection of Beam Deflection in simply supported beam, Cantilever beam subjected to point loads, uniformly distributed loads, Moments by Macauley's method	7
	Total	42

Text Books :

1. Strength of Materials, S. Ramamruthm , Danpat Rai and Sons, New Delhi .
2. Strength of Material, R. S. Khurmi, S. Chand Publication, Delhi.

Reference Books :

1. Mechanics of Materials, E.P.Popov, Prentice Hall of India, New Delhi.
2. Elements of Strength of Materials, S. Timoshenko and O.H.Young, East West Press Private Ltd., New Delhi.
3. Introduction to Solid Mechanics, Shames, I. H., Prentice Hall of India, NewDelhi
4. Mechanics of Materials, Beer and Johnston, McGraw Hill.
5. Strength of Material : A Practical Approach, D. S. Prakash Rao, University Press, Hyderabad

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM05	Entrepreneur Essentials and Early Stage Start-up	02	00	00	02

Course Pre-requisites:

1. Visits to Business Places

Course Learning Objectives:

- 1 To Gain knowledge of a broad range of topics related to entrepreneurship and entrepreneurial strategies.
- 2 To Gain knowledge on entrepreneurial potential as an individual.
- 3 To Gain knowledge on discovering opportunities.
- 4 To Gain knowledge on business models.

Course Outcomes:

At the end of course, Learner will be able to:

1. Gain knowledge on basic entrepreneurial issues Develop critical thinking skills to solve real life Entrepreneurship and SME problems
2. Gain knowledge on opportunities / ideas screening
3. Understand the basics of project appraisal
4. Understand the basics of project cost estimation and project finance
5. Understand the basics of enterprise management
6. Understand the basics of social entrepreneurship

	Subject: Entrepreneur Essentials and Early Stage Start-up	L
U NI T I	Entrepreneurship: need, scope, Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (McClelland's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes.	5
U NI T II	Entrepreneurial Idea and Innovation: Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness	4

UNIT III	Project Management: Project management: meaning, scope & importance, role of project manager project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal,; Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.	5
UNIT IV	Project Financing: Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.	5
UNIT V	Management of Enterprises Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds, cost of capital; break- even analysis, balance sheet its analysis.	4
UNIT VI	Social Entrepreneurship: Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.	5
	Total	28

Text Books:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas

Reference Books:

1. Entrepreneurship: Roy Rajeev; OUP.
2. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
3. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn,H.PHI
4. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

Term Work: (50 Marks)

There will be internal evaluation of any one of the following reports submitted by the students and a viva.

- 1.Students should submit a real time "Project/Business Feasibility Report" containing Technical appraisal, Environmental appraisal, Market appraisal, Managerial appraisal etc.

OR

2.Students should visit any one existing business place and submit a "Project Management Report" containing type of management, human resource management, financing, marketing etc.

Marking Scheme: -

1. Assignments based on syllabus (Minimum 3) - 15 Marks
2. Seminar Report Writing – 05 Marks
3. Seminar Presentation – 05 Marks
4. Project/ Case Study Report Writing – 15 Marks
5. Project/ Case Study Report Writing – 05 Marks
6. Attendance in theory Classes- 05 Marks

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM06	Environmental Studies (EVS)	02	00	00	02

Course Pre-requisites: Nil

Course Objectives:

1. The importance of Environmental Studies.
2. The need of renewable and non-renewable energy resources.
3. The components, structures and types of ecosystem.
4. The Impact of different types of pollution.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the scope and importance of environmental studies.
2. Apply the knowledge of renewable and non-renewable energy resources.
3. Understand the concept of ecosystem.
4. Apply the knowledge of environmental pollution.
5. Understand the current environmental issues of India.
6. Understand the role of Information Technology in environment and human health.

	Subject: Environmental Studies (EVS)	L
Unit-1	The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness.	05
Unit-2	Renewable and non renewable resources: Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Energy Resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies, Role of individual in conservation of natural resources.	05

Unit-3	Eco Systems: Concept of an eco system, structure and function of an eco system, Producers, consumers, decomposers, Food chains, food webs. Introduction, types, characteristic features, structure and function of the following eco systems: Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)	05
Unit-4	Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Noise pollution, role of an individual in prevention of pollution, Pollution Case Studies.	05
Unit-5	Current Environmental Issues in India: Water conservation-development of watersheds, Rain water harvesting and ground water recharge, Eutrophication and restoration of lakes, Conservation of wetlands, Ramsar sites in India. Climate Changes – Global warming, Acid rain, Ozone layer Deflection, Waste Management - Swachha Bharat Abhiyan.	05
Unit-6	Human population and the environment: Population explosion- family welfare program, Environment and human health, Human rights, Women and child welfare, Role of information technology in Environment and human health. Visit to environment assets-river / forest / grassland / hill / mountain. Visit to a polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills slopes, etc (field work equal to 5 lecture works)	05
	Total	30

Text Book:

1. Textbook of Environmental studies by Erach Bharucha, UGC

References:

1. Fundamental concepts in Environmental Studies by D D Mishra, S Chand & Co Ltd
2. Environmental studies, Nidhi Dhawan, Kiran Bist by I.K. International House Pvt Ltd.

Term Work: 50 Marks

Marking Scheme:

1. Field Visit – 10 Marks
2. Attendance – 10 Marks
3. Class Test (Internal) – 10 Marks
4. Assignment (2 Nos.) – 20 Mark

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM07	Fluid Mechanics –LAB	00	00	02	01

Course Prerequisites - Nil

Course Learning Objectives (CLOs)

1. To introduce and explain the fundamentals of fluid mechanics
2. To learn demonstration of Bernoulli's equation.
3. To learn of Jet on Plane/Inclined/Curved surfaces

Course Outcome (COs)

At the end of course, students will be able to

1. Understand and analysis various fluid properties at rest and in motion
2. Understand and analysis various fluid properties in motion
3. Evaluate performance characteristics of frictional losses and impact of jet.

Practicals: At least 6 from the list.

1. Measurement of fluid pressure by manometer.
2. Determination of metacentric height.
3. Verification of Bernoulli's equation.
4. Determination of co-efficient discharge by Venturimeter.
5. Calculation of Reynolds number for Laminar & Turbulent flow.
6. Determination of co-efficient of friction (Major losses in Pipes) through pipe.
7. Determination of Minor losses in pipe.
8. Determination of Impact of Jet on Plane/Inclined/Curved surfaces.

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM08	Machine Drawing –Lab	00	00	02	01

Course Pre-Requisites:

1. Knowledge of Engineering Graphics and various machine parts..

Course Learning Objectives (CLOs)

- 1 To know the conventions for materials and parts
- 2 To learn the techniques of sectioning and visualizing/imagine the objects and develop the missing views.
- 3 To seek the knowledge of development of surfaces
- 4 To prepare the drawings for machine assembly & its detailing.

Course Outcome (COs) :-

At the end of course, students will be able

1. To Recall, Understand and apply the conventions for materials and parts used in industries
2. To demonstrate, Create and draw the techniques of sectioning and visualizing/imagine the objects and sketch the development of the missing views.
3. To develop the surfaces of objects and apply knowledge during their fabrications and to remember, understand and drawing of the machine assembly drawings & detail drawings.

List of Practical's:

(Minimum 5 drawing sheets are to be prepared by students based on given practicals)

1. Conventional representations of materials and machine components.
2. Sectional orthographic projection methods & missing view.
3. Development of surfaces of Cubes / Prisms / Cylinders / Pyramids / Cones & their cut sections.
4. Preparation of detail drawings of simple machine assembly.
5. Preparation of assembly drawing of simple machines.
6. Drawing of Riveted /screwed fastening.
7. Drafting of Oldham's coupling.
8. Drafting of screw jack.

Books recommended:

1. Engineering drawing by N.D. Bhatt; Charactor Publications.
2. Machine Drawing by A. M. Bisen; New Edge International publication.
3. Machine Drawing by R. K. Dhawan, S. Chand
4. Machine Drawing by Basant Agrawal, McGraw Hill.

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM09	PRODUCTION PROCESSES- Lab	00	00	02	01

Course Prerequisites- Nil

Course Learning Objectives (CLOs)

- 1: To study and perform the sand mould making.
- 2: To study and preparation of the pattern.
- 3: To study and perform the mechanical joining and welding process.

Course Outcome (COs)

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

1. Understand the various pattern making and moulding processes.
2. Understand the metal casting process and related activities.
3. Demonstrate the joining and welding processes.

Practical : At least 6 number from the list.

- 1 Study of safety precautions in workshop practices.
- 2 Pattern making -one job.
- 3 Foundary :- Sand preparation and practice in moulding of various types of patterns.
- 4 Preparation of bench moulding with own prepared pattern.
- 5 Joining Processes : job involving electric welding / resistance welding process.
- 6 Joining Processes : job involving gas welding process.
- 7 One job on Mechanical Working of Metals like piercing / drawing / bending/ embossing/ spinning/ upsetting, etc.

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SM10	Community Engagement Project/Field Project (CEP/FP)	00	00	04	02

Pre-requisites:

1. All courses/laboratories from I,II Semester

Course Learning Objectives:

Students shall UNDERTAKE and EXECUTE a Mini Project through a group of students to:-

- 1 Understand the “Project Development Cycle”, through Mini Project.
- 2 Inculcate mechanical/interdisciplinary knowledge implementation skills.
- 3 Develop students’ abilities to transmit technical information clearly through Technical Report on the Mini Project work carried out.

Course Outcomes:

At the end of course, Learner will be able to:

- 1 Practice acquired knowledge within the chosen area of technology for project development.
- 2 Identify, reproduce, improve and refine the technical aspects of the chosen project with a comprehensive and systematic approach.
- 3 Work as an individual or in a team in development of technical projects and communicate and report effectively project related activities and findings.

Minor Project Work:

Group Size:

Minimum 2 and maximum 5 students can form a group for the mini project.

Project Type:

The selected mini project should be based on any of the following
Design and development of a prototype mechanical system/product.

- Design and development of laboratory equipments/test rigs,
- Industry needs based basic survey or Testing or Analysis etc.
- Investigate performance of mechanical systems using experimental method
- Parametric analysis of components/systems/devices
- Investigation of optimum process/material for product development.
- Solution for society/industry problems

General guidelines:

Project domain may be from the following, but not limited to:

- Thermal Systems
- Robotics Mechanisms/design systems
- Production/advance manufacturing
- Materials: Composite/Nano
- Automation and Control Systems
- Mechatronics Systems
- Agriculture system.
- Smart systems using AI

Project Report:

A project report with following contents shall be prepared:

1. Title
2. Objectives
3. Relevance and significance
4. Methodology
5. Analysis-Simulation/experimentation/survey/testing etc.
6. Result and Discussion
7. Conclusion

Term Work: (25 Marks)

Marking Scheme: -

1. Model Making/ Mini project/ Field Study - 10 Marks
2. Report Writing – 05 Marks
3. Presentation – 05 Marks
4. Attendance - 05 Marks

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SMOE1B	OE-I-Marketing Management	03	00	00	03

Pre-requisites: Nil

Course Learning Objectives:

- 1:** To impart the knowledge of Marketing management and the basic concepts of consumer Behaviour
- 2:** To impart the knowledge of basic concepts of Marketing Research, pricing and product decisions, and channels of distribution
- 3:** To impart the basic knowledge of Advertising and Sales promotion strategies and Sales personnel Management
- 4:** To impart the basic knowledge of International marketing, Services marketing and Online Marketing

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the concepts of Marketing Management consumer behaviour
2. Demonstrate the knowledge of Marketing Research and Pricing decisions
3. Understand the concepts of Product development and channels of distribution
4. Demonstrate the knowledge Advertisement development & strategies
5. Understand the concepts of Sales promotion strategies and Sales personnel Management
6. Understand the concepts of International marketing, Services marketing and Online Marketing

	Subject: Marketing Management	L
UNIT I	Marketing Management -Definition, Scope, Objectives 4 P's of Marketing Mix for Products Factors affecting consumer buying Behavior, Consumer Buying Decision Process, Customer Relationship Management	7

UNIT II	Marketing Research: Objectives and scope, Marketing research Procedure, Major techniques of Marketing Research. Pricing Decisions: Meaning, significance and objectives of Pricing, Types and strategies of Pricing. Pricing under different competitive situations	6
UNIT III	Product: Meaning, classes of Products, classification of consumer products, Product Life cycle (PLC) process, New Product Development strategy, Functions of packaging as a marketing tool Channel of distribution: Role and importance, channel selection, types of intermediaries, objectives of physical distribution	7
UNIT IV	Advertising: Definition, objectives, Advertising organization, Advertising Budget, Media planning, classes of advertising, Advertising & Ethics, Steps in making layouts, Advertising Campaign, Push and Pull strategy in advertising	6
UNIT V	Sales Promotion: Meaning, objectives, types of sales promotion schemes, Promotion Mix, Objectives of Marketing organization, types of marketing organization Sales Personnel: Role of sales manager, sales personnel recruitment, selection and training, motivation, Appraisal of performance. Expenses control	6
UNIT VI	International marketing: Environment, Marketing mix strategy for International marketing, Documents for International marketing, Payment procedure in international trade Marketing of services: Meaning, characteristics, classification of services, elements of marketing mix in service marketing: 7 P's of marketing Online marketing: Meaning, objectives, Understanding internet/online consumers, Online Advertising, Advantages & Limitations of Online marketing	7
	Total	39

Text Books :

1. Principles of Marketing, Philip T.Kotler, Pearson.
2. Marketing Management, Biplab S. Bose, Himalaya Publishing house
3. Marketing Management – Verma & Duggal - Oxford University Press

Reference Books:

1. K.S Chandrasekar, Marketing Management text and cases, Tata McGraw-Hill publications.
2. Kumar, R.S Case studies in marketing management.
3. Fundamentals of Marketing, Stanton, Etzel & Walker McGraw Hill

B.Tech. Third Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
3SMOE1C	OE-I-: Industrial Safety	03	00	00	03

Course Pre-requisites: NIL

Course Learning Objectives:

- 1: To learn the principles of safety, terminologies in accident prevention and its theories
- 2: To study the theory and practice of occupational, health, ergonomics and hygiene
- 3: To study the principle of fire engineering and fire fighting.

Course Outcomes:

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

1. Understand the Safety management system
2. Conduct Safety education and training for employees
3. Understand and apply Principles of accident prevention
4. Understand and contribute for Planning, organizing and directing for safety
5. Understand the Occupational health and hygiene
6. Understand the fire protection system

	Subject: Industrial Safety	L
UNIT I	Introduction to Safety Management System: Management: Concept, definition, nature and importance. Role and functions of Manager. Elements and functions of Management, Management Principles: General principles of Management	7
UNIT II	Development of safety movement: - Need for safety-safety and productivity-planning for safety planning procedure- safety policy-formulation of safety policy-safety budget-role and qualification of safety professional-safety committees-need, types and functions of committees safety organizations	6

UNIT III	Accident prevention: - Basic philosophy of accident prevention-nature and causes of accidents accident proneness-cost of accidents-accident prevention methods-Domino theory-safety education and training-training methods-motivation and communicating safety-personal protective equipments	7
UNIT IV	Safety management techniques: - Safety inspection-Safety sampling technique-Safety audit Safety survey-Incident recall technique-Job safety analysis-Damage control-Risk management. Involvement in safety: - Role of management-role of supervisors-role of workmen- role of unions-role of government	6
UNIT V	Occupational health and hygiene: - Functional units and activities of occupational health and hygiene-types of industrial hazards-physical, chemical, mechanical, electrical, social, biological, ergonomic and environmental hazards-factors impeding safety-housekeeping-hearing conservation programme	7
UNIT VI	Industrial fire protection: - Fire chemistry-classification of fires-fire prevention activities-fire risks-fire load -contributing factors to industrial fires-fire detection-industrial fire protection systems	6
	Total	39

Text Books:

1. Industrial Safety Health and Environment Management Systems by R. K. Jain, Khanna Publications
2. Industrial Safety and Health Management Sixth Edition C. Ray Asfahl David W. Rieske , Pearson Education, Inc
3. A course of Industrial Safety K U Mistry
4. Techniques of safety management Dar. Peterson
5. Industrial Safety and environment A K Gupta

B.Tech. Third Semester (Mechanical Engg)

Course ode	Course Title	L	T	P	C
3SMOE1D	Disaster Management	03	00	00	03

Course Prerequisite : Nil

Course Learning Objectives:

1. Basic conceptual understanding of disasters.
2. Different types of hazards and disasters and the challenges posed by disasters.
3. Approaches of Disaster Management.
4. Broad understanding about the basic concepts of safety and Disaster Management.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the basics about Disaster.
2. Understand hazards posed by various disasters.
3. Understand Disaster Management strategies.
4. learn the concept of safety in various disasters.
5. Learn about preparedness in a disaster.
6. Develop skills to respond to the disaster.

	Subject: Disaster Management	L
Unit-1	Introduction :Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, impact, prevention, mitigation.	07
Unit-2	Disasters : Categories of disasters - natural and manmade Natural disasters (origin, causes and their management) – earthquake, tsunami, cyclone, flood, land slide. Disaster Profile of India.	07
Unit-3	Disaster Impacts: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	07

Unit-4	Disaster Preparedness: Pre-Disaster – Risk Assessment and Analysis, Early Warning System; Awareness. During Disaster – Evacuation, Search and Rescue, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Early Recovery, Reconstruction and Redevelopment;	07
Unit-5	Disaster Management Mechanism: Institutional mechanism for Disaster Management, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Disaster Management Act 2005, Disaster Management Authority (NDMA). Role of Various Agencies. Key responsibility of engineers in disaster reduction techniques	07
Unit-6	Study of Important Disasters in India: Earthquakes in India, seismic zones of India, major fault systems of India plate. Major floods in India and various flood plains and rivers in India. Droughts in India, case study on Bhopal gas tragedy.	07
	Total	42

Text Book:

1. Action Plan for Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
2. Disasters in India Studies of grim reality, Rawat Publishers, Jaipur, 2005.

References:

1. Disaster management, Savindra Singh, Jeetendra Singh, Pravalika Publications, Allahabad, 2016
2. Natural Disasters, Mukta Girdhar, Amy publication, Dariyaganj, New Delhi, 2019.
3. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM01	Hydraulic Machines	03	00	00	03

Course Pre-requisites:

1. Knowledge of Fluid Mechanics

Course Learning Objectives:

- 1: To get fundamental background about the hydroelectric power plants
- 2: To learn the operation, working principle & performance characteristics of hydraulic turbines
- 3: To learn operation, working principle & performance characteristics of centrifugal pump, reciprocating pump and other hydraulic pumps
- 4: To learn the behavior of compressible fluid flow.

Course Outcomes:

At the end of course, Learner will be able to

1. Demonstrate basic concepts of prime movers and turbines
2. Apply acquired knowledge to design & performance characteristics of Hydraulic turbines.
3. Reveal the importance of other water lifting devices
4. Utilize the knowledge of centrifugal and reciprocating pumps for applications
5. Solve the elementary treatment on compressible fluid flow
6. Use the knowledge of hydraulics & pneumatics in developing project work.

	Subject: Hydraulic Machines	L
UNIT I	Hydraulic Turbines - Theory of impulse and reaction turbines. Pelton wheel Turbine	6
UNIT II	Francis and Kaplan turbines, their construction, classification, analysis, characteristics and governing, draft tube	6
UNIT III	Axial flow pump :- Basic theory, construction, & operation. 2. Other water lifting devices :- (a) Air lift pump. (b) Jet Pump. (c) Hydraulic Ram. 3. Computational Fluid Dynamics (CFD) 4. Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications	6
UNIT IV	Centrifugal pumps :- Basic Theory, classification, construction, operation, characteristics, multistage, NPSH and cavitations in pumps	6

UNIT V	Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels. Comparison of centrifugal and reciprocating pumps, performance characteristics	6
UNIT VI	Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic coupling, hydraulic torque converter	6
	Total	36

Text Books :

- 1 CSP Ojha, R. Berndtsson, Fluid mechanics and machinery; Oxford University.
- 2 Bansal R.K., Fluid mechanics and fluid machines; Laxmi publications.

Reference Books :

1. Jagdish Lal, Hydraulic machines; Metropolitan Book Co. Pvt. Ltd
2. Dr. Modi & Seth, Hydraulics and Fluid Mechanics; Standard house book.
- 3 Sen gupta, Computational fluid dynamics; Pearson Publishers.
- 4 Sameer sheikh, Iliyas Khan, Treaties on Hydraulics; Pneumatics, R.K. Publication.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM02	MATERIAL SCIENCE	03	00	00	03

Course Pre-requisites: NIL

Course Learning Objectives:

Students will

1. Learn the basic concepts of metallurgy, classification of materials & microstructures of metal materials.
2. Learn the alloying elements, their effects and applications
3. Learn the ferrous and non-ferrous metals and respective alloys
4. Learn the mechanical working of metals, heat treatment processes and process of powder metallurgy.

Course Outcomes:

At the end of course, Students will be able to–

1. Understand the basic concepts of metallurgy and types of materials.
2. Understand the Iron-Carbon Equilibrium Diagram, critical temperatures, formation of microstructures.
3. Understand the alloying elements, their effects and applications.
4. Understand the uses and practical applications of ferrous & non ferrous materials and their respective alloys.
5. Understand the various heat treatment processes and their industrial applications.
6. Understand the mechanical working of metals and process of powder metallurgy

	Subject: MATERIAL SCIENCE	L
UNIT I	Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification	7

UNIT II	Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications	7
UNIT III	Alloy Steels: Purpose of alloying, Classification of alloy steels, classification of alloying elements, Effect of alloying elements on eutectoid composition, Eutectoid temperature, and on the S curve, , alloying elements and their effect on properties of steels, OHNS steels, Hadfield's Manganese steels, High speed steels, their heat treatments and applications, Ferritic, Austenitic and Martensitic stainless steels, their properties and applications, weld decay in stainless steel	7
UNIT IV	Cast irons : Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabilizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons. Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening	7
UNIT V	Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso- thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martensite transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability	7
UNIT VI	Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening. Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth. Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms- Slip& twining, critical resolved shear stress. Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy	7
	Total	42

Text Books:

1. Introduction to physical metallurgy; Sidney H Avner, TATA Mc-Graw hill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication.
3. Material Science & Metallurgy, by V.D. Kodgire. Everest Publication House.

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Powder metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallurgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Metallurgy- C Daniel Yesudian, Scitech Publication.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM03	Manufacturing Technology	03	00	00	03

Course Prerequisites:

1. Knowledge of basic manufacturing processes.
2. Knowledge of Fundamentals of Mechanical Engineering.

Course Learning Objectives:

- 1: To study the mechanics of metal cutting, tool characteristics.
- 2: To study various machines and machining operations.
- 3: To study unconventional and modern machining processes.

Course Outcomes:

1. Apply the knowledge of theory of metal cutting and tool selection.
2. Demonstrate the knowledge of basics of turning operation
3. Understand the drilling and boring operations and working of drilling & boring machines
4. Illustrate the working of Grinding and milling machines
5. Understand the working of CNC and Modern Manufacturing processes
6. Apply the knowledge of unconventional machining processes

	Subject: Manufacturing Technology	L
UNIT I	Metal Cutting Theory Cutting Tools Classification, Mechanics of Metal Cutting and chip formation, Types of chip, Chip thickness ratio, Orthogonal and Oblique cutting, Influence of Tool geometry and Machining parameters on Tool life, , Tool wear, machineability, Tool materials and properties, Temperature in cutting and Cutting Fluids	7
UNIT II	Machine tool classification. Lathe Machine: Types of lathe machine, Construction, and Operations of centre lathe, accessories of centre lathe- Work holding, supporting, and driving devices & Cutting tool holding devices, methods of Taper Turning	7
UNIT III	a) Capstan & Turret lathe : Construction and Operations of capstan & turret lathe. Indexing mechanism, Bar feeding Mechanism b) Drilling Machines: Types of drilling machines, general purpose, Mass production and special purpose drilling M/cs. c) Boring Machines:- Types of boring machines, construction working & applications of Horizontal, Vertical and jig Boring Machines.	7
UNIT	Milling Machines: - Types of milling machine, up milling vs down milling,	6

IV	Types of Milling Cutters, applications of milling machines Grinding Machines: Operations and applications of surface, cylindrical and centreless grinding process. Dressing, Truing and balancing of grinding wheels, Selection of grinding wheels.	
UNIT V	CNC Machines: Introduction and working principle of CNC Machines, components of CNC machines, Applications of CNC machines, Additive Manufacturing: Introduction, applications and advantages of Additive Manufacturing	6
UNIT VI	Unconventional Machining Processes: Introduction, working principle and applications of Unconventional Machining Processes: abrasive jet machining, Ultrasonic Machining, Electron Beam Machining, Laser Beam machining, Plasma-arc machining, Electric discharge Machining	6
	Total	39

Textbook

1. Workshop Technology Vol II - By Hajra Choudhary Vol II.
2. Workshop Technology Vol II- By B.S Raghuwanshi.

References Books:

1. Modern Machining process - By Pandya & Shah, Tata McGraw Hill 1998.
2. Workshop Technology Vol-II- By W.A.J.Chapman
3. Workshop Technology (Manufacturing Technology) Vol.-II By Dr.R.K .Singal.
4. Manufacturing Technology – By R.L.Timings, S.P. Wilkinson; Pearson Publication.
5. Manufacturing Technology Vol. II - By P. N. Rao, McGraw Hill Publication
6. Manufacturing Technology – By M. Mahajan, Dhanpat Rai & Co.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM04	Industrial Management	02	00	00	02

Pre-requisites: Nil

Course Learning Objectives:

- 1:** To study basic concepts & techniques of management and concepts of Supply Chain Management.
- 2:** To study the concept & techniques of materials and marketing management.
- 3:** To understand the personnel management & study business finance and financial statements.

Course Outcomes:

At the end of course, Learner will be able to

1. Understand the basics of management techniques.
2. Understand the methods of supply chain management.
3. Apply standard and scientific techniques in materials management.
4. Understand basic concept of Marketing Management.
5. Understand the functions of personnel management department and their functions.
6. Understand the concept of Business Finance & Evaluate time, costs, cost sheet.

	Subject: Industrial Management	L
UNIT I	Concept, Principles and Techniques of Management; Evolution of management thoughts, functions of management, organization structure & relationship	5
UNIT II	Supply Chain Management: Concept of supply chain, Supply Chain Management, Value creation in supply chain, Activities in supply chain, Benefits of Supply Chain Management, E-commerce, E-business, E-governance, BPO, KPO	4
UNIT III	Materials management, classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material	4

	identification, store function	
UNIT IV	Marketing Management : Marketing strategy market research, buying, motives, types of market, new product development, Product life cycle, Sales Organization, advertising, methods of selling, consumer behaviour	4
UNIT V	Functions of personnel management, Human resource planning, Recruitment, training and development, workers participation in management, joint consultation, collective bargaining	4
UNIT VI	Financing of Business: - Basis of business finance, need of finance, Kinds of capital, sources of fixed & working capital. b) Financial statements :- Profit and loss statement, balance sheet	6
	Total	27

Text Books :

1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Industrial Engineering and Production Management: M. Mahajan, Dhanpat Rai & Co.

Reference Books:

1. Essentials of Management; Koontz, Harold; McGraw-Hill Education(India)
2. Marketing Management: Philip Kotler, Pearson

Term Work: (50 Marks)

Students should study a local industry and make a study report on following management aspects.

- i) SCM, ii) Material Management, iii) Marketing Management, iv) Personal management, v) Financial Management.

Marking Scheme: -

1. Industrial Visit- 05 Marks
2. Report based on Industrial Visit – 15 marks
3. PPT Presentation based on the Syllabus and delivery by students- 10 marks
4. MCQ Test based on Syllabus- 15
5. Attendance in theory Classes- 05

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM05	Technical Report Writing	02	00	00	02

Course Prerequisites: NIL

Course Learning Objectives:

1. The Characteristics of technical report.
2. To develop effective planning for technical reports.
3. The technical writing styles and terminology.

Course outcomes:

At the end of the subject, the students will be able to—

1. Explain the key characteristics of technical report, their types and importance.
2. Do effective planning for well-organized technical reports writing.
3. Understand and use different writing styles.
4. Understand technical reports formats.
5. Understand different phases of technical report.
6. Understand the process of sound technical presentation.

	Subject: Technical Report Writing	L
UNIT I	Introduction to Technical Writing Characteristics of Technical report, Importance and its types. Routine Reports. Considerations in Technical Writing.	5
UNIT II	Planning and Preparation Important Preparatory Steps, Sources of Data, Evaluation of Material, Note-Making, Organizing Material, Principles of organization, Making Outline.	5
UNIT III	Writing Style Definition of Style, The Scientific Attitude, Readability- Readability Formulas, Choice of words and phrases, Construction and Length of sentences, Construction and Length of paragraphs, Incorporating Visual Elements: Tables, Figures, and Graphs.	5

UNIT IV	Technical Report Structure and Layout Elements of Structure, Front Matter- Cover, Frontispiece, title page, copyright notice, forwarding letter, preface, acknowledgement, table of content, list of illustration, abstract. Main Body- Introduction, discussion, conclusion, recommendation. Back Matter- appendices, references, Bibliography, Glossary, Index.	5
UNIT V	Writing the Report Rough Draft, Process of Writing, Order of Writing, The Final Draft, Check-List for Reports. Different types of Report.	5
UNIT VI	Oral Presentation Importance of Acquiring Oral Presentation Skills, Body Language, Voice Modulation, Audience Awareness, Presentation Plan, Visual Aids, Use of Connectives, Checklist, Evaluation, Brochure, Conducting a Meeting, Participating in a Meeting.	5
	Total	30

Text Book

1. "Business Correspondence and Report Writing", by R. C. Sharma and Krishna Mohan. Tata McGraw Hill

Reference Books:

1. Technical Communication: Principles and Practice" by Meenakshi Raman and Sangeeta Sharma
2. "Business and Technical Communication: A Guide to Writing Professionally" by Paul V. Anderson
3. "Handbook of Technical Writing" by Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu
4. "Effective Technical Communication" by M. Ashraf Rizvi
5. "Technical English: Writing, Reading, and Speaking" by Nell Ann Pickett and Ann Appleton Laster
6. "Communication Skills for Engineers and Scientists" by Patrick J. Garrity

Term Work: (50 Marks)

Marking Scheme: -

1. Assignments based on syllabus - 15 Marks
2. Report Writing – 15 marks
3. Publication (Research paper in Journal/ Conference/ Paper Presentation Competition Or Copy Rights) - 15 marks
4. Attendance in theory Classes- 05

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM06	Hydraulic Machine –LAB	00	00	02	01

Course Prerequisites:

1. Knowledge of Fluid mechanics

Course Learning Objectives (CLOs)

- 1 Demonstrate basic concepts of hydraulic machines
2. Utilize knowledge of hydraulic machines for practical application
3. Reveal the importance of special water lifting devices.

Course Outcome (COs):

At the end of course, Students will be able to

1. Demonstrate basic concepts of prime movers and turbines.
2. Utilize the knowledge of centrifugal and reciprocating pumps for applications.
3. Use the knowledge of hydraulic and pneumatic in developing project work.

Practicals:

At least 6 from the below list.

- 1) Trial/Study of Pelton wheel
- 2) Trial/Study of Francis Turbine
- 3) Trial/Study of Kaplan Turbine
- 4) Trial/Study of centrifugal pump
- 5) Trial/Study of reciprocating pump
- 6) Trial/Study of axial flow pump
- 7) Trial/Study of hydraulic ram
- 8) Trial/Study of multistage pump
- 9) Trial/Study of special pumps (air lift pump/ jet pump)
- 10) Trial/Study of Gear pump
- 11) Any one practical based on CFD software

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM07	MATERIAL SCIENCE - LAB	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

1. To study the basic concepts of metallurgy, classification of materials & microstructures of metal materials.
2. To study the alloying elements, their effects and applications
3. To study the mechanical working of metals, heat treatment processes and process of powder metallurgy

Course Outcomes:

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

1. Understand the use of metallurgical microscope, and apply the knowledge for preparation of specimen for micro-examination.
2. Understand the Iron-Carbon Equilibrium Diagram, and micro structures of various metals.
3. Understand the various heat treatment processes and their industrial applications.

List of Practicals: - (At least eight (8) practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(Brasses, Bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.
10. Study different Heat Treatment Processes for steel.
11. Study of different surface Hardening processes for steels.
12. Study of the effect of alloying elements on the properties of steels.
13. Study of crystal structures & Miller Indices for crystallographic planes & directions

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM08	Manufacturing Technology Lab	00	00	02	01

Course Prerequisites:

1. Knowledge of Basic Manufacturing processes.

Course Learning Objectives:

- 1: To study the mechanics of metal cutting, tool characteristics and cutting forces
- 2: To study the turning operations using lathe and CNC machines
- 3: To study the working of drilling, milling, gear cutting and boring machine etc.

Course Outcomes:

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

- 1: Exhibit the concept of various machining processes & will know its importance related to the industry.
- 2: Understand and apply knowledge of operations related to lathe, shaper, slotter, drilling & grinding machines.
- 3: Demonstrate & perform various operations on lathe, planer, milling, shaper machine etc.

List of Practicals:

1. Study and demonstrate of lathe and drilling.
2. Study and demonstrate of boring machines, milling, shaper & planner slotter & grinding machines & unconventional machining process.
3. One job on lathe covering taper turning and threading.
4. One job on shaping covering plane and inclined surfaces. OR one Job on Milling machining for various operations.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SM09	Python Programming Lab	00	00	02	01

Course Prerequisite-

1. Basic Knowledge of computer

Course Learning Objectives:

Students will be expected to demonstrate their understanding of Introduction to Python by being able to do each of the following:

1. Develop fundamental understanding of the Python programming language, including its basic concepts, data types, operators, and control flow structures.
2. Gain proficiency in working with strings, functions, and various data structures such as lists, tuples, and dictionaries.
3. Acquire skills in file handling, data manipulation using Pandas and NumPy, and object-oriented programming principles.

Course Outcomes:

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

1. Understand the basic concepts of Python, including variables, data types, and operators.
2. Use different data structures in python to perform various operations on data.
3. Implement the concepts and procedures of file handling in Python for real-world scenarios and demonstrate the application of object-oriented programming principles in Python.

List of Experiments/ Practicals:

1. Introduction and Installation of Python.
2. Write a python program to find largest of three numbers.
3. Write a python script that prints prime numbers less than 20.
4. Write python program in which a function is defined and calling that function prints Hello World
5. Write python program to store data in list and then try to print them.
6. Write python program to print list of numbers using range and for loop
7. Write python program to demonstrate working with dictionaries in python.
8. Write python program to demonstrate working with tuples in python. Write python program to create, concatenate and print the string and accessing substring from given string.
9. Write python program to load data from dataset and analyze the data.
10. Write python program to subtract five days from current date.
11. Write python program to convert string to date-time.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMOE2B	OE-2 : Financial Planning	03	00	00	03

Pre-requisites: Nil.

Course Learning Objectives:

- 1: Basic concepts of finance and economic environment.
- 2: Financial Institutions and fundamentals of investment.
- 3: Money market & retirement planning.

Course Outcomes:

At the end of course, Learner will be able to

1. Learn the basics of financial planning.
2. Understand the Money and Economic Environment.
3. Understand basic concepts of Investment.
4. Learn the functions and working of financial institutes.
5. Understand the Money market.
6. Understand the concept of Retirement Planning.

	Subject: Financial Planning	L
UNIT I	Introduction to financial planning : Introduction to expenses & savings, Taxation : Taxes and Types of taxes, Utility of taxes, Income tax & it's computation	7
UNIT II	Money and Economic Environment : Inflation, Deflation, Kinds of money, Value of money, Economic liberalization, Privatization, Globalization	7
UNIT III	Investment: Meaning, Objectives and Significance & Mechanism of Investments, Issues and Dilemmas of Investments, Investment Options and Opportunities, Investment Return and Risk.	7
UNIT IV	Financial Institutions: Functions of bank, Types of bank, Working, Functioning and Relevance of Reserve Bank of India, Commercial Banking, Non-Banking Finance Companies, Development Banking, Insurance.	7

UNIT V	Money Market : Stock Market Constitution, Functions. Performance of Indian Stock Market. Sensex and Nifty: Construction and Significance, Stock Market as the Leading Indicator of an Economy, Initial public offering. Financial Derivatives : Concept, Participants, Products, Uses, features, History of Derivatives Market, Myth about Derivatives & its regulation in India.	7
UNIT VI	Introduction to Retirement Planning : Significance of Retirement Planning, Purpose and Need of Retirement Planning, Role of Financial Planner in Retirement Planning, Life expectancy vs Retirement age, Early retirements vs Delaying retirement, Post retirement activities and goals, Risk of living longer than expected.	7
	Total	42

Text Books:

- 1) Financial Planning : Theory and Practice by Sid Mittra, SAGE Texts

Reference Books:

- 2) Investment Science by David G. Luenberger, Oxford University Press.
- 3) Indian Financial System by M.Vora, Anmol Publication
- 4) Retirement Planning, R.K. Mohapatra, Blue Rose Publishers

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMOE2C	OE2: Introduction to Cyber Law	03	00	00	03

Course Prerequisite: Nil.

Course Learning Objectives:

1. Introduction to basics of Computer, Internet and Cyber Law.
2. Demonstrate the concepts of e-Commerce and Inspect the principles of Information Technology Act, 2000.
3. Describe Cyber Crimes and, Enlist and predict the types of Cyber Crimes.
4. Examine the Internet Security issues.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Describe the fundamentals of computer, internet and cyber law.
2. Outline the fundamentals of E-Commerce.
3. Illustrate the knowledge of cybercrimes.
4. Classify the cybercrimes.
5. Explain the principles of Information Technology Act.
6. Inspect the Internet security issues.

	Introduction to Cyber Law	L
Unit-1	Fundamentals of Computer, Internet and Cyber Law Functional Components of Computer, applications of computers, Internet architecture, world wide web, internet server and types, Need for Cyber Law, difference between Cyber Crimes and Conventional Crimes.	07
Unit-2	Introduction to E-Commerce Electronic data interchange and legal issues, e-commerce models, e-banking, credit card, e-mail, e-governance and objective, models and types.	07
Unit-3	Concepts of Cyber Crime Characteristics of Cyber Crime, Causes and Measures to combat Cyber Crimes, Cyber Crimes against Individuals, Institution and State.	07
Unit-4	Categories of Cyber Crimes Classification of Cyber Crimes, Hacking, Cracking, Digital Forgery, Cyber Stalking/ Harassment, cyber terrorism, Cyber Pornography and Obscenity, Identity Theft, Cyber Defamation, Virus attacks, Computer Fraud, Social Networking Crimes.	07

Unit-5	Information Technology Act, 2000 Silent features of Information Technology Act, 2000, Definitions, Digital Signatures and Certificates, Security Procedures, Electronic Contracts, Penalties and Adjudication, Liabilities of Service Providers.	07
Unit-6	Internet Security: Internet Security, ethical issues of Information Technology- software piracy, firewall and types of firewalls, biometrics and internet security products software.	07
	Total	42

Recommended Books:

1. Pavan Duggal, "Cyber Law", LexisNexis India Publication, 2023, ISBN: INK8196241070.
2. Pavan Duggal, "Cyber Frauds, Cybercrimes and Law in India", Cyber Law University Publication, 2023.
3. Nilakshi Jain, Ramesh Menon, "Cyber Security and Cyber Laws", Wiley India, 2020, ISBN: 9390395755
Sharma Vakul - Information Technology Law and Practice
4. Nandan Kamath, "Law Relating to Computer, Internet and E-commerce", LexisNexis India Publication, 5th Edition, 2016, ISBN: 9789350351819.
5. P. Soni, "Cyber Laws", Sony Prakashan, Nagpur, 2020.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMOE2D	OE2: Biodiversity	03	00	00	03

Pre-requisites: Nil

Course Objectives:

Students will be taught -

1. To introduce the importance and ethics of environment
2. To introduce scope, principal and types of ecology
3. To explain importance and threats of biodiversity
4. To understand the importance and need of biodiversity conservation

Course outcomes:

At the end of the subject the students will be able –

- 1: Understand the definition, importance and ethics of environment
- 2: Developed the knowledge of ecology and its types
- 3: Understand the concept, types and importance of biodiversity
- 4: Understand the concept and importance of conservation of biodiversity
- 5: Explain the Acts on biodiversity
- 6: Explain the national policy and sustainable utilisation of biodiversity

Unit No.	Content	L
1	Ecology: Definition, Scope & principles of ecology, Types of ecology - population ecology, community ecology, Ecological Succession.	05
2	Biodiversity: Introduction, Definition, need of biodiversity, Benefits of Biodiversity.	05
3	Types of Biodiversity (Species, Genetic and ecosystem diversity) importance of Biodiversity, Threader Threats of Biodiversity, Hotspots of Biodiversity (India). India as a mega diversity region.	05
4	Conservation of Biodiversity -In-Situ, Ex-situ conservation. Importance of biodiversity conservation, loss of biodiversity convention on biological diversity, Strategies for conservation of biodiversity.	05
5	Biodiversity Action Plan -Biodiversity legislation, The Wild Life (Protection) Act of 1972, Biological Diversity Act, 2002 Biological Diversity (Amendment) Act 2023.	05
6	Sustainable utilization of Biodiversity , National Policy and measurement	05

	estimation of the biological biodiversity, Biodiversity rules 2004.	
	Total	30

Recommended Books :-

1. Fundamentals of Ecology - E. P. Odum, Revised Edition 2003.
2. Biodiversity and Environment :- S.K. Agrawal, S. Tiwari & P.S. Dubey.
3. The Biological diversity Act 2002 and Biological diversity rules 2004:- National Biodiversity Authority INDIA 475, 9th South cross street, Kalpalocwar Nagar, Neelangarai Chennai - 608 600041
4. Environmental studies - Nidhi Dhawan, Kiran Bisht, I.K. International House. Put. Ltd.

B.Tech. Fourth Semester (Mechanical Engg) (Honors Course)

Course Code	Course Title	L	T	P	C
4SMH	Honor Courses: ENERGY AUDIT	03	00	00	03

Pre-requisites:

1. Basic knowledge of energy and various forms of energy.
2. Basic knowledge of applied mathematics and physics.

Course Learning Objectives:

Student will

1. Able to list out the various forms of energy sources.
2. Learn the energy fuel reserves and production and learn to calculate per unit energy consumption.
3. Understand the Energy audit instruments, Procedures and Techniques and analyze methods of field plotting.
4. Understand Material and Energy balance and analyze energy balance.

Course Outcomes:

At the end of the Course the student shall be able to

- 1 Understand the classification of Energy and importance of Energy Conservation.
- 2 Illustrate energy auditing methodologies.
- 3 Understand Material and Energy balance.
- 4 Carry out Material and energy balance.
- 5 Determine Energy Performance assessment of equipment.
- 6 Perform financial analysis for determining simple payback period.

	Subject: ENERGY AUDIT	L
UNIT I	INTRODUCTION: Classification of Energy – Primary and Secondary Energy, Commercial Energy and Non- commercial Energy and Renewable & Non-renewable energy; Various forms of Energy – potential (stored energy) and kinetic(working) energy; Basics of Electrical energy and thermal energy	6

UNIT II	ENERGY MANAGEMENT: Definition and objectives of Energy Management, Energy Audit – types and methodology; need for energy audit; energy auditing methodology; Benchmarking energy performance; Maximizing system efficiency; Energy Audit Instruments	6
UNIT III	MATERIAL AND ENERGY BALANCE: Basic principles of material and energy balance; Sankey diagram and its use; Material balances; Energy balances; Carrying out material and energy balance	6
UNIT IV	ENERGY PERFORMANCE ASSESSMENT: Purpose and parameters of performance of (a) boilers, (b) furnaces, (c) turbines, (d) fans and blowers, (e) pumps, (f) compressors and (g) lighting. Detailed performance analysis of boilers and pumps	7
UNIT V	PERFORMING FINANCIAL ANALYSIS: Introduction, fixed and variable costs, Interest charges, simple pay-back period, discounted cash flow methods- Net Present Value method and Internal rate of return method; Factors affecting analysis	7
UNIT VI	ENERGY CONSERVATION: Energy Conservation and its importance, Energy strategy for future, Energy Conservation Act 2001 and its features, Energy Pricing, Energy Sector Reforms, Energy And Environment, Energy Security	7
	Total	39

TEXT BOOKS:

1. General Aspects of Energy Management & Energy Audit, <http://www.em-ea.org/gbook11.asp>, National Certificate Examination for Energy Managers and Energy Auditors, National Productivity Council of India
2. Energy Performance Assessment for Equipment and Utility systems, <http://www.em-ea.org/gbook14.asp>, National Certificate Examination for Energy Managers and Energy Auditors, National Productivity Council of India

REFERENCE BOOKS:

1. Murphy, W.R. , Mckay, G. (1982) 'Energy Management ', London: Butterworth- Heinemann
2. K. Smith, C.B. (Ed. 4) (1981). 'Energy Management Principles : applications, benefits, savings', Amsterdam : Pergamon Press
3. Witte, L. C. (1988), ' Industrial energy management and utilization ', Washington: Hemisphere Pub. Corp.