List of New Course(s) Introduced

Department : Mechanical Engineering

Programme Name : B.tech

Academic Year: 2023-24

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	ME207TPE51	Engines and Combustion
02.	ME207PPE01	Engines and Combustion Lab
03.	ME207TIC11	Innovation & Design Thinking
04.	ME207TIC12	Maintenance Engineering and Management
05.	ME208TIC12	Environment-Friendly Power Generation from Coal
06.	ME208TPE63	Introduction to Industry 4.0
07.	MEUCTO1	Introduction to Thermodynamics
08.	MEUCTP2	Sustainable Energy Conversion
10.	MEUDTO1	Introduction to Fluid Mechanics
11.	MEUDTP1	Industrial Engineering and Economics
12.	MEUDTP2	Introduction to Composites
13.	MEUDPV1	Mini Project

Minutes of Meetings (MoM) of Board of Studies (BoS)

The scheduled meeting of members of the Board of Studies (BoS) of the Department of Mechanical Engineering, School of Studies of Engg. & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Final year (VII and VIII semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Soumya Gangapadhyay (External Academic Expert BoS, Dept. of Mechanical Engg., IIT Bhilai)
2. Prof. Prof. T. V. Arjunan (Chairman, BoS, Dept. of Mechanical Engg., GGV.)
3. Dr. Pankaj Kumar Gupta (Member, BoS, Assoc. Prof., Dept. of Mech. Engg)
4. Mrs. J. Poonam Ekka (Member BoS, Asst. Prof Professor, Dept. of Mech. Engg)

The following points were discussed during the meeting

1. The course syllabi for 7th and 8th semesters of B.Tech. IV Year was discussed. With the consent of all the members, the course scheme and syllabi for the 7th and 8th semesters in B.Tech. IV year Mechanical Engineering was finalized.
2. The committee discussed and approved the scheme and syllabi.

The following new courses were introduced in the B. Tech. Final year (VII and VIII Semesters):

The committee discussed and approved the scheme and syllabi. The following courses were revised in the B. Tech (VII and VIII Semesters) :

- ME207TPE51 Engines and Combustion
- ME207PPE01 Engines and Combustion Lab
- ME207TIC11 Innovation & Design Thinking
- ME207TIC12 Maintenance Engineering and Management
- ME208TIC12 Environment Friendly Power Generation from Coal
- ME208TPE63 Introduction to Industry 4.0

Signature & Seal of HoD

Minutes of Meetings (MoM) of Board of Studies (BoS)

The scheduled meeting of members of the Board of Studies (BoS) of the Department of Mechanical Engineering, School of Studies of Engg. & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur, was held to design and discuss the B. Tech. Final year (III and IV semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Soumya Gangapadhyay (External Academic Expert BoS, Dept. of Mechanical Engg., IIT Bhilai)
2. Prof. Prof. T. V. Arjunan (Chairman, BoS, Dept. of Mechanical Engg., GGV.)
3. Dr. Pankaj Kumar Gupta (Member, BoS, Assoc. Prof., Dept. of Mech. Engg)
4. Mrs. J. Poonam Ekka (Member BoS, Asst. Prof Professor, Dept. of Mech. Engg)
5. Mr. Roshan Singh Navlur (Member, Industry Expert, Director, CADMATIC, Absent)
6 Dr. T. G. Loganathan, (Member, BoS, Assoc. Prof., Dept. of Mech. Engg)

The following points were discussed during the meeting

1. The course syllabi for the 3rd and 4th semesters of B.Tech. II Year was discussed.
2. With the consent of all the members, the course scheme and syllabi for the 3rd and 4th semesters in B.Tech. II year Mechanical Engineering was finalized.

The following new courses were introduced in the B. Tech. II year (III and IV Semesters):

The committee discussed and approved the scheme and syllabi. The following courses were revised in the B. Tech (VII and VIII Semesters):

- MEUCTO1 Introduction to Thermodynamics
- MEUCTP2 Sustainable Energy Conversion
- MEUDTO1 Introduction to Fluid Mechanics
- MEUDTP1 Industrial Engineering and Economics
- MEUDTP2 Introduction to Composites
- MEUDPV1 Mini Project

❖

Scheme and Syllabus

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY)
CBCS-NEW, STUDY & EVALUATION SCHEME
PROPOSED W.E.F. SESSION 2023-2024
B.Tech. IV Year (SEMESTER VII)

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
1.	ME207TPC13	Refrigeration & Air Conditioning	3	1	-	30	70	100	4
2.		Professional Elective	3	-	-	30	70	100	3
3.		Open Elective	3	-	-	30	70	100	3
4.	ME207MC04	Mandatory Course	-	-	-	100	-	100	-
5.	ME207THS04	Production Planning and Control	3	-	-	30	70	100	3
6.		Industry Course	1	-	-	100	-	100	1
		Total	**13**	**1**	-	**320**	**280**	**600**	**14**
PRACTICALS									
1.	ME207PPC01	Refrigeration & Air Conditioning Lab	-	-	2	30	20	50	1
2.	ME207PPE01	Engines and Combustion Lab	-	-	2	30	20	50	1
3.	ME207PRJ03	Minor Project	-	-	4	100	-	100	2
4.	ME207PRJ04	Seminar on Summer Training	-	-	2	100	-	100	1
		Total	-	-	**10**	**260**	**40**	**300**	**5**
GRAND TOTAL			**13**	**1**	**10**	**580**	**320**	**900**	**19**

Total Credits : **19**
Total Contact Hour : **24**
Total Marks : **900**

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE –END SEMESTER EXAMINATION

Professional Electives		Industry Courses	
ME207TPE51	Engines and Combustion	ME207TIC11	Innovation & Design Thinking
ME207TPE52	Non-Destructive Testing	ME207TIC12	Maintenance Engineering and Management
ME207TPE53	Theory of Vibrations		

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA(A CENTRAL UNIVERSITY)
CBCS-NEW, STUDY & EVALUATION SCHEME
PROPOSED W.E.F. SESSION 2023-2024
B.Tech. IV Year (SEMESTER VIII)

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
1.	ME208TPC14	Power Plant Engineering	3	-	-	30	70	100	3
2.		Professional Elective	3	-	-	30	70	100	3
3.		Open Elective	3	-	-	30	70	100	3
4.	ME208THS05	Total Quality Management	3	-	-	30	70	100	3
5.	ME208TIC02	Industry Course	1	-	-	100	-	100	1
		Total	**13**	-	-	**220**	**280**	**500**	**13**
PRACTICALS									
1.	ME208PRJ05	Major Project	-	-	16	200	-	200	8
		Total	-	-	**16**	**200**	-	**200**	**8**
GRAND TOTAL			**13**	-	**16**	**420**	**280**	**700**	**21**

Total Credits : **21**
Total Contact Hour : **29**
Total Marks : **700**

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.
L-LECTURE,T-TUTORIAL,P-PRACTICAL, ESE –END SEMESTER EXAMINATION

Professional Electives		Industry Courses	
ME208TPE61	Automotive Engineering	ME208TIC11	High Speed Machining
ME208TPE62	Solar Energy	ME208TIC12	Environment Friendly Power Generation from Coal
ME208TPE63	Introduction to Industry 4.0		

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME207TPE51	3	-	-	3 hours	30	70	100	3

ENGINES AND COMBUSTION

Subject Code	Course Objectives
1	To understand air standard cycles and comparison with actual cycles,
2	To understand about the components & combustion phenomenon of SI and CI engines.
3	To understand cooling & lubrication systems in engines.
4	To understand performance parameters of IC engines.
5	To Evaluate the performance parameters of IC engines.

Syllabus Content:

UNIT-I:

Introduction of internal combustion engines: Engine classification, Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel, and Dual cycles. Two and four-stroke engines, SI and CI engines, Valve timing diagram, Fuel air cycle, factors affecting it, Actual cycle analysis, Actual Cycle.

UNIT-II:

SI Engines - Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, Combustion chamber design for SI engines, Carburetion, Mixture requirements, Carburetor types, Theory of carburetor, Ignition system requirements, Magneto and battery ignition systems, Scavenging in 2 Stroke engines, Supercharging and its effect.

UNIT-III:

CI Engine - Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines.

Fuel injection in CI engines Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

UNIT-IV:

Engine Cooling - Different cooling systems, Radiators, and cooling fans.

Lubrication - Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation,

Fuels -Fuels for SI and CI engine, important qualities of SI and CI engine fuels, Rating of SI engine and CI engine

UNIT-V:

Testing and Performance of IC Engines : Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power –

Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

Subject Code	Course Outcomes	Bloom's Taxonomy Level
	After successful completion of the course, the students shall be able to:-	
CO1	Demonstrate the components & combustion phenomenon of SI and CI engines.	Understand
CO2	Understand cooling & lubrication systems in engines	Understand
CO3	Calculate performance parameters of IC engines.	Apply
CO4	Evaluate the performance parameters of IC engines.	Analyze

Text/Reference Books:

1. I. C. Engines by Mathur & Sharma, Dhanpatrai
3. I. C. Engines by V.Ganeshan, Tata McGraw Hill
4. I. C. Engines by R. Yadav, Central Pub., Allahabad
5. A Text Book of Internal combustion engines by R.K. Rajput, Laxmi Pub, Pvt., 2006

Course Outcomes and their mapping with Programme Outcomes:

COs	PROGRAM OUTCOMES (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	I	II	III
CO1	**3**												**3**		
CO2	**3**												**3**		
CO3	**3**												**3**		
CO4	**3**	**1**											**3**		
CO5	**3**												**3**	**3**	
Average	**3**	**1**											**3**	**3**	

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME207TIC11	1	0	0	--	100	--	100	1

Innovation and Design Thinking (One Credit Course)

Course Objectives:

- To understand the concept of innovation and its importance in today's business world
- To identify the different categories of innovation and their applications in various industries
- To develop the skills required for creative problem-solving and idea generation
- To apply design thinking techniques and tools to identify, define, and solve complex problems in various contexts

Course Content:

CONCEPT OF INNOVATION - Why Innovation is important for businesses, What is Innovation, Difference between Innovation and Invention, Types of Innovation, Product Innovation, Process Innovation, and Business Model Innovation (2)

SKILL & PERSONALITY TRAITS FOR INNOVATION -Personality traits for innovation, Organisational Structure for Innovation. (1)

SPECIAL CATEGORIES OF INNOVATIONS - Disruptive Innovation, Reverse Innovation. (2)

TOOLS FOR FOSTERING INNOVATION - Value Chain Analysis, The 3 Box Approach to Innovation, Focus Groups and other tools, Software tools for Innovation. (3)

DESIGN THINKING - Design Thinking Mindset, Process of Design Thinking, Idea generation, Understanding the current situation, What if - alternatives, Prototyping, Testing, Cases of application of Design Thinking. (4)

Design Thinking & Innovation Projects in Groups. (4)

Total - 15

References:

1. Govindarajan, Vijay. The Three-Box Solution, Harvard Business Review Press, 2016.
2. Brown, Tim. "Design Thinking." Harvard Business Review, vol. 86, no. 6, 2008,
3. Larson, Chris. "Disruptive Innovation Theory: What It Is & 4 Key Concepts." Harvard Business School Online, January 26, 2021, https://online.hbs.edu/blog/post/disruptive-innovation-theory.
4. Christensen, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business Review Press, 1997
5. Soni, Pavan. Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving. Notion Press, 2018

Course outcomes

- Students will be able to define and explain the concept of innovation, its importance and role in modern businesses

Maintenance Engineering and Management
(ONE CREDIT COURSE)

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME207TIC12	1	0	0	--	100	--	100	1

Course objectives:

- To understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To provide the concept of the Horizons of Maintenance Management and strategies used in industries.
- To impart the knowledge in Maintenance of Mechanical Equipments / Items used in Mining industries.
- To understand the conceptual description of Equipments, Methods & Mechanical Maintenance procedures.

1.0 Organization and Management of the Maintenance Function. (3 HRS)

1.1. – Redefining Maintenance- Delivery Reliability.
1.2.- Effective Maintenance Organization.
1.3.- Operating Policies of effective Maintenance.
1.4.- SixSigma Concept in Maintenance- Application of Quality Management Principles.

2.0 The Horizons of Maintenance Management (5 HRS)

2.1.- Corrective Maintenance
2.2.- Reliability based Preventive Maintenance.
2.3.- Predictive Maintenance.
2.4.- Condition Monitoring based Maintenance.
2.5.- Computer based Maintenance Management System (CMMS).
2.6.- Total Productive Maintenance (TPM).

3.0 Maintenance of Mechanical Equipments / Items used in Mining (For indicative purpose). (4 HRS)

3.1.- Bearings.
3.2.- Flexible Coupling for power transmission.
3.3.- Cranes: Overhead& Gantry.
3.4.- Lifting and Pulling device (Chain Pulley Block)
3.5.- Belt Drives.
3.6.- Mechanical Variable Speed Drives.
3.7.- Gear Drives and Speed Reducers.
3.8.- Pumps.
3.9.- Introduction to Underground Mining Machineries in operation in SECL- Side Discharge Loader / Load Haul Dumper/ Continuous Miner/ High Wall Mining Equipment / Long wall Mining **Equipments – Conceptual description of Equipments, Methods & Mechanical Maintenance procedures.**
3.10.- Case Studies.

4.0 Tools of Maintenance Engineering (3 HRS)

4.1.- Root Cause Analysis.
4.2.- Plant Maintenance Module in System Application Product (SAP) in ERP Platform.

After studying this course, the students are able to:

CO1 Implement the principles, functions and practices adapted in industry for the successful management of maintenance activities.
CO2 Evaluate the concept of the Horizons of Maintenance Management and strategies used in industries.
CO3 Explain the knowledge in Maintenance of Mechanical Equipments / Items used in Mining industries.
CO4 Analyze the conceptual description of Equipments, Methods & Mechanical Maintenance procedures.

Reference:

1. Maintenance Engineering and Maintenance by Sri R C Mishra & Sri K Pathak
2. Maintenance Engineering and Management by Sri D R Kiran
3. Computerized Maintenance Management system made easy by Sri Kishan Bagadia.
4. Modern ERP by Marianne Bradford.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Evaluation system

Industry Integrated course / one credit courses will be evaluated by the course instructor / department faculty concerned and will carry a total of 100 marks for internal assessment such as assignments, seminars, quiz, projects, etc.

Course Prepared by

1. **Sri A K Jha**, GM(E&M)/HOD, SECL HQ, Bilaspur and
2. **Sri Durgadas Adhikary**, Chief Manager (E&M), SECL HQ, Bilaspur

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME207PPE01	-	-	2	2 hours	30	20	50	1

ENGINES AND COMBUSTION

Subject Code	Course Objectives
1	To understand about the components & combustion phenomenon of SI and CI engines.
2	To understand cooling, lubrication & Carburation systems in engines.
3	To Evaluate the performance parameters of IC engines.

List of Experiments:

S. No.	Experiment Details
1	To Study about Ignition System of SI Engine
2	To Study of Carburetion system in SI Engine
3	To Study about working of Single Cylinder 4 Stroke Petrol Engine with Test Rig
4	To Study about Working Model of Lubricating System
5	Single Cylinder 4 Stroke Diesel Engine Test Rig with Dynamometer
6	To Study about 4 stroke diesel Engine Components with Cut Section model
7	To Study about 4 stroke petrol engine with Cut Section model
8	To Study about 2 stroke petrol engine with Cut Section model
9	To Study about working of 4 Stroke Diesel Engine with Test Rig

Subject Code	Course Outcomes	Bloom's Taxonomy Level
	After successful completion of the course, the students shall be able to:-	
CO1	Demonstrate the components & combustion phenomenon of SI and CI engines.	Understand
CO2	understand cooling & lubrication systems in engines	Understand
CO3	calculate performance parameters of IC engines.	Apply
CO4	Evaluate the performance parameters of IC engines.	Analyze

Text/Reference Books:

1. I. C. Engines by Mathur & Sharma, Dhanpatrai
3. I. C. Engines by V.Ganeshan, Tata McGraw Hill
4. I. C. Engines by R. Yadav, Central Pub., Allahabad
5. A Text Book of Internal combustion engines by R.K. Rajput, Laxmi Pub, Pvt., 2006

Course Outcomes and their mapping with Programme Outcomes:

COs	PROGRAM OUTCOMES (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	I	II	III
	3	**10**	**10**	**11**	**1**	**5**	**3**	**3**	**12**	**5**	**12**	**12**	**3**	**1**	**1**
CO1	**3**												**3**		
CO2	**3**												**3**		
CO3	**3**												**3**		
CO4	**3**	**1**											**3**		
CO5	**3**												**3**	**3**	
Average	**3**	**1**											**3**	**3**	

Course: INTRODUCTION TO INDUSTRY 4.0

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME208TPE63	3	0	0	3 hrs	30	70	100	3

Course Objectives:

To introduce the basic ideas in Industry 4.0.

To make the students understand the applications of Industrial 4.0 System across the Industries.

UNIT I: INTRODUCTION TO INDUSTRY 4.0

Industrial Revolutions - Digitalisation and the Networked Economy - Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 - The Journey so far: Developments in different parts of the world - Comparison of Industry 4.0 Factory and Today's Factory - Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

UNIT II: ROAD TO INDUSTRY 4.0

Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services - Smart Manufacturing - Smart Devices and Products - Smart Logistics - Smart Cities - Predictive Analytics

UNIT III: IIOT

Fourth Revolution – Sustainability assessment of Manufacturing Industry – Lean Production system – Smart and connected business perspective – smart factories – cyber-physical systems – collaboration platform and PLM

UNIT IV: APPLICATIONS

Understanding Smart Appliances -Smart Operation-Smart Monitoring-Smart Energy Savings-Smart Maintenance in Industries; Smart Cars, Self-Driving Cars, Introducing Google's Self-Driving Car, Intellectual Property Rights.

UNIT V: BUSINESS ISSUES IN INDUSTRY 4.0

Opportunities and Challenges - Future of Works and Skills for Workers in the Industry 4.0 Era – Strategies for competing in an Industry 4.0 world

Total: 45 Hours

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME208TIC12	1	0	0	--	100	--	100	1

Environment friendly power generation from coal (One Credit Course)

Course Objectives:

- To understand the importance and challenges associated with power generation from coal in the context of environmental sustainability.
- To explore various technologies and techniques for mitigating the environmental impact of coal-based power generation.
- To examine the potential of clean coal technologies and their application in reducing emissions from coal-fired power plants.
- To promote critical thinking and problem-solving skills in identifying innovative solutions for reducing the carbon footprint of coal-based power generation

Course content

Session 1

Basic aspects of thermal power generation: Power plant cycle, Fuels and its handling, ash handling, Turbine, Feed water heaters, Generator, Condenser, Cooling tower and its types etc.,

Session 2 &3

Types of fuel and its preparation, constituents of fuel and its effect on emission.

Furnace, types of burner, Fuels combustion in boiler – Coal, biomass, co-combustion in the boiler, combustion arrangement, Tangential firing, front and rear wall firing systems.

Session 4 & 5

Air requirement in boiler – Primary, Secondary air, Flue gas generation, Gas velocity, Ash formation, types of waste generation in a power plant, non hazardous, hazardous, waste storage, waste disposal.

Session 6 & 7

Pollutant formation in the boiler, SOx, NOx, CO2, Particulate matter etc. measurement of pollutants, instruments, emission norms, various measures to reduce emission.

Session 8 &9

Heat transfer mechanism in boiler and in auxiliaries like air pre heater, Economiser, Water wall, Super heater, Reheater etc.,

Session 10 & 11

Particulate Matter formation and its control methods. – ESP, bag filter, ash handling systems, Dry and wet ash evacuation its effect on water consumption.

Session 12 & 13

SOx formation and its control techniques – different types, FGD, Wet FGD, Dry FGD, Ammonia FGD, effect of FGD on power plant operation, gypsum formation etc.,

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Evaluation 2023-24 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic year 2023-24)

III-SEMESTER SCHEME OF TEACHING & EVALUATION 2023-24

S. N.	Course Type	Course Code	Course Title	Teaching Hours/week			Examination				Credits
				Theory lectures	Tutorial	Practical/Drawi	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
				L	T	P					
1	Ancient Science/Management/ Psychology	MEUCTE1	Statistical and Numerical Methods	3	1	-	03	40	60	100	4
2	Department Core	MEUCTT1	Engineering Thermodynamics	3	1	-	03	40	60	100	4
3	Department Core	MEUCTT2	Mechanics of Solids – I	2	1	-	03	40	60	100	3
4	Department Core	MEUCTT3	Manufacturing Processes	3	-	-	03	40	60	100	3
5	Open Elective	MEUCTO1	Introduction to Thermodynamics*	3	-	-	03	40	60	100	3
6	Department Elective	MEUCTP1	Material Science and Metallurgy	3	-	-	03	40	60	100	3
		MEUCTP2	Sustainable Energy Conversion								
7	Practical	MEUCLT1	Manufacturing Processes Lab	-	-	2	03	25	25	50	1
8	Practical	MEUCLT2	Computer Aided Machine Drawing	1	-	2	03	25	25	50	2
Total				**18**	**3**	**04**	**25**	**290**	**410**	**700**	**23**
* **Not for ME students**											

Credit Definition:

- 1-hour lecture **(L)** per week per semester = **1 Credit**
- 1-hour tutorial **(T)** per week per semester = **1 Credit**
- 2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

- **Four credit** courses are to be designed for **50** hours of Teaching-Learning process.
- **Three credit** courses are to be designed for **40** hours of Teaching-Learning process.
- **Two credit** courses are to be designed for **30** hours of Teaching-Learning process.
- **One credit** courses are to be designed for **15** hours of Teaching-Learning process

Note: The above is applicable only to THEORY courses

CIA: Two internal Class Tests, each of 15 Marks. Assignment: 10 Marks

SEA: Semester End Assessment – 60 marks

List of Electives for ME Students:

1. **Green Buildings (CEUCTO1)**
2. **Engineering Materials (CHUCTO1)**
3. **Data Structure with C++ (CSUCTO1)**
4. **Data Communication (ECUCTO1)**
5. **Computer Organization and Architecture (ITUCTO1)**
6. **I.C. Engine (IPUCTO1)**

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Evaluation 2023-24 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic year 2023-24)

IV-SEMESTER SCHEME OF TEACHING & EVALUATION 2023-24

S. N.	Course Type	Course Code	Course Title	Teaching Hours/ week			Examination				Credits
				Theory lectures	Tutorial	Practical /Drawin	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
				L	T	P					
1	Department Core	MEUDTT1	Fluid Mechanics and Hydraulic Machinery	3	1	-	03	40	60	100	4
2	Department Core	MEUDTT2	Mechanics of Solids – II	2	1	-	03	40	60	100	3
3	Department Core	MEUDTT3	Kinematics of Machines	2	1	-	03	40	60	100	3
4	Department Core	MEUDTT4	CAD/CAM	3	-	-	03	40	60	100	3
5	Open elective/Institute Core	MEUDTO1	Introduction to Fluid Mechanics*	3	-	-	03	40	60	100	3
6	Department Elective	MEUDTP1	Industrial Engineering and Economics	3	-	-	03	40	60	100	3
		MEUDTP2	Introduction to Composites								
7	Practical	MEUDLT1	FMHM Lab	-	-	2	03	25	25	50	1
8	Practical	MEUDLT2	CAD/CAM Lab	-	-	2	03	25	25	50	1
9	Practical	MEUDLT3	Mechanics of Solids Lab	-	-	2	03	25	25	50	1
10	Project	MEUDPV1	Mini Project	-	-	2	03	25	25	50	1
Total				**16**	**3**	**08**	**30**	**340**	**460**	**800**	**23**
* Not for ME students											

Credit Definition:

- 1-hour lecture **(L)** per week per semester = **1 Credit**
- 1-hour tutorial **(T)** per week per semester = **1 Credit**
- 2-hour Practical/Drawing**(P)** per week per semester = **1 Credit**

- **Four credit** courses are to be designed for **50** hours of Teaching-Learning process.
- **Three credit** courses are to be designed for **40** hours of Teaching-Learning process.
- **Two credit** courses are to be designed for **30** hours of Teaching-Learning process.
- **One credit** courses are to be designed for **15** hours of Teaching-Learning process

Note: The above is applicable only to THEORY courses

CIA: Two internal Class Tests, each of 15 Marks. Assignment: 10 Marks

SEA: Semester End Assessment – 60 marks

List of Open Electives for ME department students

1. **Remote Sensing (CEUDTO1)**
2. **Energy and Environment Engineering (CHUDTO1)**
3. **Introduction to Information Science (CSUDTO1)**
4. **Introduction to Electronic Devices and Circuits (ECUDTO1)**
5. **Fundamentals of Python Programming (ITUDTO1)**
6. **Automobile Engineering (IPUDTO1)**

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CODE	COURSE NAME	HOURS PER WEEK			CIA	SEA	CREDIT
		L	T	P			
MEUCTO1	**Introduction to Thermodynamics**	**3**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

1 To understand the basic laws of thermodynamics and heat transfer

2 To understand the principle of operation of thermal systems like I C Engine, boilers, turbines, condensers etc.

UNIT-1 Introduction

Fundamental Concepts System, surrounding and universe, Concept of continuum, Property, State, Path, process, Cyclic process, Energy and its form, Work and heat, Enthalpy.

UNIT-2 Laws of Thermodynamics

Laws of thermodynamics: Concepts of Temperature, Zeroth law. First law of thermodynamics. Concept of processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow of process

Second law: Essence of second law, Thermal reservoir, Heat engines, COP of heat pump and refrigerator. Statements of second law, Carnot cycle, Concept of Entropy.

UNIT-3 Thermal Power Plant

Thermal Power Plant Layout; Rankine Cycle, Major components of thermal power plant, Condensers, Cooling Towers.

UNIT-4 Power Producing Machines

Internal combustion engines, basic cycles; Turbines: Basic cycle of turbines, Impulse and Reaction Turbines.

UNIT-5 Power Consuming Machines

Pumps, compressors; Basic of refrigeration cycles, Environmental- friendly refrigerants, and Air conditioners.

TEXT BOOKS:

1 P.K. Nag, Engineering Thermodynamics, Tata McGraw-Hill, 6th Edition , 2022

2 Sonntag, Borgnakke, Van Wylen, Fundamentals of Thermodynamics, Wiley, 8thEdition,2012.

3 Y.A.Cengel and M.A.Boles, Thermodynamics: an Engineering Approach, McGraw Hill, 9th Edition, 2019

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CODE	COURSE NAME	HOURS PER WEEK			CIA	SEA	CREDIT
		L	T	P			
MEUCTP2	Sustainable Energy Conversion	3	-	-	40	60	3

Course Objectives:

1 To understand the different energy resources like conventional and non-conventional sources of energy.
2 To learn about energy conversion systems like bio-energy conversion, bio methanation technology, Thermochemical Conversion, gasification, pyrolysis etc.
3 To know about various sustainable energies.

UNIT-1 Energy resources

Conventional and non-conventional sources of energy, basics of solar, wind, bio, hydro, tidal, ocean, thermal and other renewable energy sources.

UNIT-2 Energy conversion systems

Conversion routes, direct and indirect ways of energy conversion, electricity generation, distribution and use, basics of solar thermal conversion, technology of selective coating, fundamentals of flat plate collector and evacuated collector,

UNIT-3 Wind and PV System

Basics of wind energy conversion, wind machine, wind electric generator, wind pump, basics of photovoltaic conversion technology and PV systems.

UNIT-4 Chemical Energy System

Bio-methanation technology, thermochemical conversion through pyrolysis, gasification and esterification, bio-oil, application of ocean thermal gradient and geothermal gradient for power generation.

UNIT-5 Hydro and Fuel Cell System

Basics of hydropower, tidal and wave power, basics of hydrogen fuel, fundamentals of fuel cells, basics of fusion power.

TEXTBOOKS:

1 Rao Ashok, "Sustainable Energy Conversion for Electricity and Coproducts: Principles, Technologies and Equipment", Wiley, 1st Edition, 2015.

REFERENCE BOOKS:

1 Capareda Sergio, Introduction to Biomass Energy Conversions, CRC Press, 1st Edition, 2013.

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CODE	COURSE NAME	HOURS PER WEEK			CIA	SEA	CREDIT
		L	T	P			
MEUDTT1	Introduction to Fluid Mechanics	3	-	-	40	60	3

Course Objectives: The student shall

1 To familiarize with the properties of fluids and the applications of fluid mechanics
2 To formulate and analyze problems related to calculation of forces in fluid structure interaction
3 To understand the concept of fluid measurement, types of flows and dimensional analysis
4 To understand boundary layer concepts

UNIT-1 **Fundamentals**

Fundamentals of Fluid Mechanics: Introduction; Applications; Concept of fluid; Difference between solids, liquids and gases; Concept of continuum; Ideal and real fluids; Fluid properties

UNIT-2 **Fluid Statics**

Fluid Statics: Concept of static fluid pressure; Pascal's law and its engineering applications; Hydrostatic paradox; Pressure distribution in a liquids

UNIT-3 **Fluid Kinematics**

Fluid Kinematics: Classification of fluid flows; Lagrangian and Euler flow descriptions; Velocity and acceleration of fluid particle; Local and convective acceleration; Normal and tangential acceleration; Flow rate and discharge mean velocity; One dimensional continuity equation; Continuity equation

UNIT-4 **Fluid Dynamics**

Fluid Dynamics: Euler's equation of motion; Bernoulli's equation using principle of conservation of energy; equation of motion and its applications to steady state ideal and real fluid flows

UNIT-5 **Fluid Devices**

Fluid devices; Conversion of mechanical to fluid energy - applications

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CODE	COURSE NAME	HOURS PER WEEK			CIA	SEA	CREDIT
		L	T	P			
MEUDTP1	Industrial Engineering and Economics	3	-	-	40	60	3

Course Objectives:

1 Understand the essential principles and decision making tools of Engineering Economics (EC) for circulating Economics Production and Consumption

2 Perceive the thoughts and methods of micro EC, especially calculating the inflation rate, replacement of equipments, and depreciation value

3 Aware about the history & development of industrial engineering and architectures of productivity

4 Understand the process and application of method and work study

5 Familiarize from the different wage & incentives schemes

UNIT-1 **Basic Economics**

Basic Economics-Introduction to Economics, Type of Economics, Theory of Economics, Principles of Economics and its scope, Law of supply and demand and its type and features, Economic efficiency.
Cost and Decision-Costs, Element of costs-fixed-variable and others, Capital, Assets and its Type, Role of Engineers in Decision Making, Decision Tree and Sequential Investment Decisions, Decision Making Techniques, Cash Flow Diagram

UNIT-2 **Basic Methodologies of Engineering Economic Analysis**

Basic Methodologies of Engineering Economic Analysis-Introduction to Time Value of Money, Simple Interest, Compound Interest, Nominal Interest rate. Measuring Inflation, equivalence calculation under Inflation, assets replacement and its policy, Comparative Analysis of Alternatives and its methods for analysis, Depreciation- Introduction and its types and methods, value analysis

UNIT-3 **Introduction History & Development of Industrial Engineering**

Introduction history & development of industrial engineering: F.W.Taylor and Frank & Lillian Gilberth their contribution industrial engineering.
Productivity: Productivity definition; means of increasing productivity; productivity vs production, Productivity index and its types, numerical.

UNIT-4 **Method Study**

Method Study: Definition & basic procedure, selection of jobs, recording technique; and Principle of motion economy.

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CODE	COURSE NAME	HOURS PER WEEK			CIA	SEA	CREDIT
		L	T	P			
MEUDTP2	Introduction to Composites	3	-	-	40	60	3

Course Objectives:

1 To introduce the concept of composite materials and deliver the properties of composite materials.

2 To elaborate the role of constituent elements of the composite materials

3 To familiarize the students with various types of composite materials

4 To make students conversant with the making of polymer matrix composite materials

5 To create awareness about the mechanical testing methods of composites.

UNIT-1 Introduction

Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Functions of Reinforcement and desired properties of the reinforcement.

UNIT-2 Matrix and Reinforcement

Matrix: Role and Selection of Matrix material, Polymer (Thermosets and Thermoplastics), Metal, Ceramic etc. as matrix material.

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibers, Glass fibers, Carbon fibers, Aramid fibers, Metal fibres, Whiskers, Flakes etc.,

UNIT-3 Various types of Composites

Classification based on Matrix Material: Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC);

Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites

UNIT-4 Fabrication of Polymer Matrix Composites

Manufacturing Processes like Hand Lay-up, filament welding, compression moulding, resin-transfer method, and Pultrusion. Vacuum Bag Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

UNIT-5 Testing of Composites

Mechanical properties of fibers, Reinforcements. Mechanical testing of composites, tensile testing, Compressive testing, Inter-laminar shear testing, and Fracture testing.

TEXTBOOKS:

1 K.K.Chawla, Composite Materials, Springer, 3rd Edition, 2012
2 Ronald F. Gibson, Principles of Composite Material Mechanics, CRC Press, 2011
3 Bhargava, A. K. Engineering Materials: Polymers, Ceramics and Composites, Prentice Hall India, 2nd Edition, 2012

REFERENCE BOOKS:

1 K.K. Chawla, Ceramic Matrix Composites, Kluwer Academic Publishers, 2003
2 N. Chawla, K.K. Chawla, Metal Matrix Composites, Springer-Verlag, 2006
3 C. Seferis, L. Nicolais, (Eds.) The Role of the Polymeric Matrix in the Processing and Structural Properties of Composite Materials, Plenum Press, New York 1983.

WEB RESOURCES

1 https://www.intechopen.com/chapters/71222
2 https://compositeskn.org/KPC/A100
3 https://archive.nptel.ac.in/courses/112/104/112104229/

Course Outcomes (COs): At the end of the course, the student will be able to	
CO1	Describe the evolution of composite materials.
CO2	Describe the constituents of composite materials.
CO3	Classify the types of composite materials.
CO4	Describe the manufacturing of polymer matrix composite materials.
CO5	Determine the strength characteristics of composite materials.

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3						2						3		
CO2	3												3		
CO3	3												3		
CO4	3		3				2			3			3		2
CO5	3	3	2	2	2					3			3		2