Course Title:	**INTRODUCTION TO MECHANICAL ENGINEERING**		
Course Code:	22ESC144/244	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

Course Learning Objectives

CLO 1. Acquire a basic understanding about scope of mechanical engineering, fundamentals about steam and non-conventional energy sources.

CLO 2. Acquire a basic knowledge about conventional and advanced manufacturing processes.

CLO 3. Acquiring a basic understanding about IC engines, propulsive devices and air-conditioner.

CLO 4. Acquiring a basic knowledge about power transmission and joining processes.

CLO 5. Acquiring a basic insight into future mobility and mechatronics and robotics.

Teaching-Learning Process

- Adopt different types of teaching methods to develop the outcomes through Power Point presentations and Video demonstrations or Simulations.
- Arrange visits to show the live working models other than laboratory topics.
- Adopt collaborative (Group Learning) Learning in the class.
- Adopt Problem Based Learning (PBL), which foster students' Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.

Module-1 (8 hours)

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

Steam Formation and Application:
Modes of heat transfer, Steam formation, Types of steam, Steam properties and applications of steam (simple numerical problems).

Energy Sources and Power Plants:
Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant.

Module-2 (8 hours)

Machine Tool Operations:
Lathe: Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest,
Drilling Machine: Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,
Milling Machine: Working and types of milling machine, milling operations: plane milling, end milling and slot milling.
(No sketches of machine tools, sketches to be used only for explaining the operations).
Introduction to Advanced Manufacturing Systems: Introduction, components of CNC, advantages and applications of CNC, 3D printing.

Module-3 (8 hours)
Introduction to IC Engines: Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numerical). **Introduction to Refrigeration and Air Conditioning**: Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners
Module-4 (8 hours)
Mechanical Power Transmission: **Gear Drives**: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems) **Belt Drives**: Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems) **Joining Processes**: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames), TIG welding, MIG welding and Fusionwelding.
Module-5 (8 hours)
Insight into future mobility technology; Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles. **Introduction to Mechatronics and Robotics:** open-loop and closed-loop mechatronic systems. Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly andinspection.
Course outcome (Indicative) At the end of the course the student will be able to:
CO1 Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources CO2 Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration. CO3 Explain different gear drives, gear trains, aspects of future mobility and fundamentals of robotics CO4 Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems. CO5 Explain the Working Principle of EV vehicles and concepts of Mechatronics and Robotics

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Three Unit Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester
- Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours) t the end of the 13th week of the semester.

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.

- The question paper will have 10 questions. Two questions per module. Each question is set for20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.

Suggested Learning Resources:

Test Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, MediaPromotersand Publishers Pvt. Ltd., 2010.

Reference Books

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rdEd., 2003.
3. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1

Web links and Video Lectures (e-Resources):

- https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
- https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/Fundamental-Applications-of-Steam
- https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing- and-process-industry/)
- Videos | Makino (For Machine Tool Operation)

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Visit to any manufacturing/aero/auto industry or any power plant
2. Demonstration of lathe/milling/drilling/CNC operations
3. Demonstration of working of IC engine/refrigerator
4. Demonstration of metal joining process
5. Video demonstration of latest trends in mobility/robotics

COs and POs Mapping (CO-PO mappings are only **Indicative)**

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

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped,

Level 0- Not Mapped