Semester: I/II			
Course Title	Introduction To Mechanical Engineering	**CIE Marks**	50
Course Code	BMEESC114/214	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ESC	**SEE Duration**	03hrs
Hours per week	3L:0T:0P	**SEE Types**	Written
Total Hours	40 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
• To understand the scope of mechanical engineering.
• To explain the principles, operations and processes of mechanical engineering systems.
• To familiarize the impact of mechanical engineering practices on the environment
• To demonstrate the working of machines & equipment.
Pre-Requisites
• Basics of physics and material science principles and phenomena.
• Significance of Power generation system.

Module-1: Introduction to Energy and its Conversion	**(8 hours)**
Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in solving the real case problems (with examples), careers in mechanical engineering. Applications of Mechanical Principles using Pulley- Lever, and Gear Systems (with schematic diagrams) **Energy conversion:** Introduction and basic working principles of Pelton Turbine and Centrifugal pump. Working Principles of hydel Power Plants, Thermal Power plant, solar cell and Hydrogen fuel cell. Refrigeration and air conditioning principles (Vapor compression refrigeration (VCR), Room air conditioner only).	
Module-2: IC Engines and Electric Vehicles	**(8 hours)**
IC Engines and Electric Vehicles: Introduction, petrol engine, diesel engines, Working of four Stroke engines, applications. Identification of parts of vehicle systems such as steering system, brake system, working principle of Power steering, Emission Standards. Introduction, components of electric and hybrid vehicle, Types of hybrid vehicle, Fully hybrid vehicle. Advantages and disadvantages of EV's and hybrid vehicles. ADAS (Advanced Driver Assistance System) **Power Transmission systems:** Classification of gears, simple & compound gear trains, concepts of automatic and CVT (Continuously Variable Transmission).	
Module-3: Engineering Materials	**(8 hours)**
Engineering Materials: Introduction, Properties and Application **Ferrous and Non-Ferrous Metals**: Overview of Carbon Steel, Cast Iron, Stainless Steel, and Alloys of Aluminum and Copper. **Composite materials:** Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials. **Smart materials:** Introduction, Types, Advantages, Disadvantages and Applications - Piezoelectric materials, MR fluids, Shape memory alloys, Semi-conductor	

Module-4: Machine Tool Operations & Joining Processes	(8 hours)

Machine Tool Operations: Introduction, classification of Manufacturing processes process selection criterion. Working Principle of lathe, Lathe operations- Turning, facing, knurling. Working principle of Drilling Machine, drilling operations- drilling, reaming, and tapping. Working principle of Milling Machine, Milling operations- End milling, face milling. (No sketches of machine tools, sketches to be used only for explaining the operations).

Joining Processes: Introduction, classification of welding process, electric arc welding, gas welding, soldering and brazing.

Module-5: Advances in Mechanical Engineering	(8 hours)

Automation, Mechatronics and Drones: Definition, types of automation, reasons for automation, Introduction to CNC, components of CNC, benefits and applications of CNC. Introduction to 3D Printing, Steps involved in 3D printing.

Mechatronic systems: Definition of mechatronics, elements of mechatronics systems, Open loop and closed loop control system. Classification, basic parts involved in drone making, working principle of Drones.

Robotics: Introduction, robot anatomy, robot configuration- Cartesian coordinate, cylindrical, polar and spherical configuration.

Text Books:	
1.	A textbook of Elements of Mechanical Engineering by K. R. Gopalakrishna, Subhash Publishers, Bangalore, 2018.
2.	"Electric Vehicle Technology Explained by James Larminie and John Lowry, John Wiley & Sons Ltd, 2003.
3.	An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
Reference Books:	
1.	Material Science and Engineering by R K Rajput, S K Kataria & Sons-New Delhi, 2013.
2.	Workshop Technology, Volume I & II, by S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy, 11th edition, Media Promotors and Publishers, Mumbai, 2001. 4
3.	Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Grover, Prentice Hall of India Pvt. Ltd, 2002
4.	Modern Electric, Hybrid Electric and Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Li Emadi, CRC Press LLC, 2005.

Course Outcome Statements: After the successful completion of the course, the students will be able to	
CO1	Describe the fundamentals of energy sources and their conversion, mechanical devices, manufacturing technology & automation.
CO2	Analyze the working of IC engines and electric/hybrid vehicles, recognize vehicle systems and emission standards, and learn the basics of power transmission and ADAS
CO3	Understand the properties and applications of engineering, composite, and smart materials, including ferrous and non-ferrous metals
CO4	Explain the working principles and operations of machine tools, and classify various welding and joining processes used in manufacturing.
CO5	Students will be able to apply course knowledge through learning activities that enhance holistic development, higher-order thinking, and application-based learning

Course Articulation Matrix

CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2										
CO2	2										
CO3	2										
CO4	2				2				2		2
CO5	2				2	2		2	2	2	2
Avg	**2**				**2**	**2**		**2**	**2**	**2**	**2**