Semester: I/II			
Course Title	Introduction to Mechanical Engineering	**CIE Marks**	50
Course Code	BMEESC 104D/204D	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ESC	**SEE Duration**	03 hrs
Hours per week	2L:2T:0P	**SEE Types**	Written
Total hours	40 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
• To develop basic Knowledge on Mechanical Engineering, Fundamentals and Energy Sources.
• Understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3D printing.
• To know the concept of IC engines and Future Mobility vehicles.
• To give exposure in the field of Engineering Materials and Manufacturing Processes Technology and its applications
• To acquire a basic understanding role of Mechanical Engineering in the Robotics and Automation in industry.
Pre-Requisites
• Basics of physics and material science principles and phenomena.
• Significance of Power generation system.

Module-1	**(8 hrs)**
Introduction to Energy and its Conversion **Introduction**: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Application of Artificial Intelligence in mechanical Engineering **Energy:** Introduction, types of energy sources like fossil fuels, bio-fuels and Hydrogen powered fuel cell. **Power Plants**: Basic working principles of hydel power plant, Thermal power plant, Nuclear power plant, Wind power plant and Solar cell **Self-Study Components**: Environmental issues like global warming and ozone depletion **(CIE only)**	
Module-2	**(8 hrs)**
Machine Tool Operations **Machine Tool and Operations:** Working Principle of lathe, Lathe operations- Turning, facing, knurling. Working principle of Drilling Machine, drilling operations- drilling, boring, reaming. Working principle of Milling Machine, Milling operations- plain milling and slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Introduction to Computer Controlled Machine Tools:** Introduction, Basic elements of CNC. Advantages, Disadvantages and applications of CNC. **Introduction to Advanced Manufacturing System**: Working principle of 3D printing **Self-Study Components:** Gain knowledge by visiting a CNC machine shop. **(CIE only).** **Self-Study Components:** Advantages and applications of 3D printing. **(Only for CIE)**	

Module-3	(8 hrs)
IC Engines, Electric & Hybrid Vehicles **Introduction to IC Engines:** Components of IC Engine, working principle of 4-stroke Petrol and Diesel engines, application of IC engines. **Electric and Hybrid Vehicles:** Introduction, components of electric and hybrid vehicle, Types of hybrid vehicle, Plug in hybrid vehicle. Advantages and disadvantages of EV's and hybrid vehicles. **Self-Study Components:** Fully hybrid vehicle. (CIE only)	
Module-4	**(8 hrs)**
Engineering Materials & Joining Processes **Engineering materials:** Introduction, Properties and application of engineering materials: Ferrous and nonferrous Metals: Carbon steel, Cast iron, Stainless steel and aluminium, Titanium and copper alloys. **Composites:** Classification of composites. Optical fibers, Shape memory alloys, Graphene. **Joining Processes:** Introduction, classification of welding process, arc welding, gas welding, Soldering and brazing. **Self-Study Components:** Nano carbon materials. **(CIE only)**	
Module-5	**(8 hrs)**
Automation **Automation:** Reasons for automation, fixed, programmable, and flexible automation. Basic elements of automated system. Advantages and disadvantages of automation. Open loop and closed loop control system. **Robotics:** Introduction, robot anatomy, robot configuration- Cartesian coordinate, cylindrical, polar and spherical configuration. **Self-Study Components:** Pick and place robots. (CIE only)	

Text Books:	
1.	"Elements of Mechanical Engineering", K R Gopala Krishna, Subhash Publications, 2008
2.	"An Introduction to Mechanical Engineering", Jonathan Wickert and Kemper Lewis, Third Edition, 2012
Reference Books:	
1.	"Elements of Workshop Technology" (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
2.	"Manufacturing Technology- Foundry, Forming and Welding", P.N. Rao Tata McGraw Hill 3rd Edition, 2003.
3.	"Internal Combustion Engines", V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017
4.	"Robotics", Appu Kuttan K, KK International Pvt Ltd., volume 1
5.	https://www.thomasnet.com/articles/custom-manufacturing-fabricating/understanding-cnc-machining/ (For Machine Tool Operation)

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Understand the concepts of Role of Mechanical Engineering and Energy sources.
CO2	Apply the knowledge of the Machine Tool Operations and advanced Manufacturing process.
CO3	Explain the Working Principle of IC engines, Electric and Hybrid vehicles.
CO4	Illustrate the Properties of Common Engineering Materials and various Metal Joining Processes and Explain the Concepts of Mechatronics, Robotics and Automation.
CO5	Prepare a report on activities performed using real-life models within the mechanical lab's machinery.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-		1	2	-	-	1	-	1
CO2	2	-	-	-	2			-	-	1	-	1
CO3	2	-	-	-	1	1	1	-	-	1	-	1
CO4	2	-	-	-			1	-	-	1	-	1
CO5	2	-	-	-	2	1		-	2	2	-	1
Avg.	**2**	-	-	-	**1.66**	**1**	**1.33**	-	**2**	**1.2**	-	**1**

3: High, 2: Medium, 1: Low

Suggested Activity Based Assessment (ABA) Methods

- Demonstration of lathe/milling/drilling operations
- Demonstration of working of IC Engine.
- Study of arc welding, oxy-acetylene gas flame structure.
- Demonstration of developing models on machine tools

Note: A comprehensive consolidated report must be submitted at the end of the course.