

Semester: I/II				
FUNDAMENTALS OF MECHANICAL ENGINEERING				
Category: Engineering Science Course				
(Common to all Programs Except ME Stream Programs)				
(Theory)				
Course Code	:	ME113AT / ME123AT	CIE	: 100 Marks
Credits: L:T:P	:	3:0:0	SEE	: 100 Marks
Total Hours	:	40T	SEE Duration	: 3 Hours

Unit-I	08 Hrs
<b>Engineering Materials:</b> Introduction, Classification, Metals (Magnetic and Non-Magnetic), Materials. Properties & applications: physical, mechanical, optical, electrical and electronics, thermal, Chemical, Properties. Applications: Aerospace, Automotive, Electronic and Biomedical.	
Unit – II	08 Hrs
<b>Vision system in Manufacturing:</b> Introduction, Role of human vision in computer interaction, importance, types of computer vision in manufacturing, Architecture of a Vision System, Artificial Intelligent v/s Computer vision, applications of Computer vision in various industries, <b>A case study:</b> Computer inspection of Two-stage Soldering Defect in PCB board. <b>Joining process:</b> Welding- Arc welding & Gas welding, defects, types of flames, Soldering and brazing	
Unit –III	10 Hrs
<b>Automation in Manufacturing:</b> Automation, Types of Automation, Historical Development, Definitions, Introduction to CNC Machines. Relative Merits and Demerits, CNC- Elements, merits, de-merits. <b>Robotics in Manufacturing:</b> Robots - Basic Structure of Robots, Robot Anatomy, Complete Classification of Robots, Fundamentals about Robot Technology, Basic Robot Configurations and their Relative Merits and Demerits,	
Unit –IV	08 Hrs
<b>Mechanical Drives:</b> Classification of IC Engines, Working of 4-S direct injection engines, Performance characteristics, Classification of gears, velocity ratio for simple and compound gear trains. <b>Electrical Drives:</b> History, Well to Wheel analysis, Electric vehicles, Configurations, EV/ICEV comparison, Performance, Traction Motor Characteristics, Concept of Hybrid Electric Drive Trains, Classification of hybrid electric vehicles.	
Unit-V	06 Hrs
<b>Mechatronics:</b> Introduction: Evolution of Mechatronic system, measurement & control system, basic elements of control system, Applications-water level controller, washing machine, Engine management system (EMS), Anti-lock Braking System (ABS). <b>Energy Sources:</b> Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio- fuels, Environmental issues like Global warming and Ozone depletion.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the knowledge of various properties of Engineering materials and their Joining processes.
CO2	Elucidate the principles and operation of vision system in product inspection.
CO3	Illustrate the Energy sources, mechanical drives and electrical drives in industrial applications.
CO4	Understand about Mechatronics, Automation and Robotics in Industrial Applications.

Reference Books	
1	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, 18 <sup>th</sup> Edition. ISBN 5551234002884
2	Material Science & Engineering- William D Callister, 2 / 10 <sup>th</sup> Edition, ISBN 978-1-119-45520-2.
3	Welding Technology (PB), Khanna O P, Dhanpat Rai publication, 4 <sup>th</sup> Edition, ISBN 9383182555.
4	Electric and Hybrid Vehicles, Design Fundamentals – Iqbal Husain, CRC Press, 2 <sup>nd</sup> Edition, 2010. ISBN –13-978-1439811757.
5	Modern Electric, Hybrid Electric & Fuel Cell Vehicles, Fundamentals, Theory and Design – Mehrdad Ehsani, CRC Press, 1 <sup>st</sup> Edition, 2005. ISBN – 13- 978-0849331541.
6	Mechatronics – Electronic control systems in Mechanical and Electrical Engineering, William Bolton, Pearson, 6 <sup>th</sup> Edition, ISBN: 978-1-292-07668-3, 2015.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	COMPONENTS	MARKS
1	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20
2	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), <b>MATLAB (20) ADDING UPTO 40 MARKS.</b>	40
<b>MAXIMUM MARKS FOR THE CIE THEORY</b>		<b>100</b>

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	CONTENTS	MARKS
<b>PART A</b>		
1	Objective type questions covering entire syllabus	20
<b>PART B</b> (Maximum of TWO Sub-divisions only)		
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
<b>MAXIMUM MARKS FOR THE SEE THEORY</b>		<b>100</b>