ELEMENTS OF MECHANICAL ENGINEERING

VI Semester: CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME551	Elective	L	Т	Р	С	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil			ses: Nil	Total Classes: 45		

COURSE OBJECTIVES:

The course should enable the students to:

- I. Familiarize with fundamentals of mechanical systems.
- II. Understand and appreciate the significance of mechanical engineering in different fields of engineering.
- III. Understanding of application and usage of various engineering materials.

COURSE OUTCOMES (COs):

- 1. Understand the laws of thermodynamics and determine thermodynamic properties, gas laws.
- 2. Visualize the basics of thermodynamics and components of a thermal power plant.
- 3. Understand the working related to 2S and 4S and injection systems for SI and CI engines.
- 4. Understand the concepts various metals cutting machines like lathe describe various driving mechanisms of lathe.
- 5. Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.

COURSE LEARNING OUTCOMES (CLOs):

- 1. Understand prime movers and concept of force, pressure, energy, work, power, system, heat, temperature, specific heat capacity.
- 2. Explain change of state, path, process, cycle, internal energy, enthalpy, statement of zeroth law and first law.
- 3. Understand the application, different types of energy sources.
- 4. Knowledge of Gas laws, Boyle's law, Charle's law, gas constant, relation between Cp and Cv, various non-flow processes like constant volume processes, constant pressure process, isothermal process, adiabatic process, polytropic process.
- 5. Demonstrate knowledge of formation of steam and use of steam table for identifying the various parameters at given conditions.
- 6. Derive the efficiency of various heat engines and problem solving.
- 7. Knowledge of different types of steam boilers and its mountings.
- 8. Explain the working principle of Internal combustion engines classification.
- 9. Demonstrate the working of pumps and air compressors.
- 10. Explain the refrigeration and air conditioning and their types.
- 11. Knowledge of various machining process of lathe, drilling and milling Machine tools
- 12. Explain the fundamentals of robotic and automation based on the coordinate systems.
- 13. Understand the concepts about flexible automation, NC/CNC machines.
- 14. Knowledge of Engineering materials and joining processes.
- 15. Understand the applications of ferrous metals, non-ferrous.
- 16. Knowledge of Composites and their applications in the aircraft and automobiles.

UNIT-I INTRODUCTION TO ENERGY SYSTEMS

Classes: 09

Introduction: Prime movers and its types, concept of force, pressure, energy, work, power, system, heat, temperature, specific heat capacity, change of state, path, process, cycle, internal energy, enthalpy, statement of zeroth law and first law; Energy: Introduction and application, of energy sources like fossil fuels, nuclear fuels, hydels, solar, wind, and bio-fuels, environment issues like global warming and ozone depletion; Properties of gases: Gas laws, Boyle's law, Charle's law, gas constant, relation between Cp and Cv, various non flow processes like constant volume processes, constant pressure process, isothermal process, adiabatic process, poly-tropic process.

UNIT -II	STEAM TURBINES, HYDRAULIC MACHINES	Classes: 09					
Properties of steam: Steam formation, types of steam enthalpy, specific volume, internal volume, internal energy and dryness fraction of steam, use of steam tables, calorimeters; Heat engine: Heat engine cycle and heat engine, working substances, classification of heat engines, description and thermal efficiency of carnot, Rankine, otto cycle, diesel cycles; Steam boilers: Introduction, cochran, lancashire, babcock, and Wilcox boiler, functioning of different mountings and accessories.							
UNIT -III	T -III INTERNAL COMBSUTION ENGINES, REFRIGERATION AND AIR-CONDITIONING						
Internal combustion engines: Introduction, classification, engine details, four stroke, two stroke cycle, petrol engine, diesel engine, indicated power, brake power, efficiencies; Pumps: Types, operation of reciprocating. rotary, centrifugal pumps, priming.							
Air compressors: Types, operation of reciprocating, rotary air compressors, significance of multi-staging; Refrigeration and air-conditioning: Refrigerant, vapor compression refrigeration system, vapor absorption refrigeration system, domestic refrigerator, window and split air conditioners.							
UNIT-IV	MACHINE TOOLS AND AUTOMATION	Classes: 09					
Machine tools and automation machine tools operation: Turning, facing , knurling, thread cutting, taper turning by swiveling the compound rest, drilling, boring, reaming, tapping, counter sinking, counter boring, plane milling, end milling, slot milling; Robotic and automation: Introduction, classification based on robot configuration, polar, cylindrical, cartesian, coordinate and spherical, application, advantages and advantages; Automation: Definition, types, fixed, programmable and flexible automation, NC/CNC machines, basic elements with simple block diagrams, advantages and disadvantages.							
UNIT-V	ENGINEERING MATERIALS, JOINING PROCESS	Classes: 09					
Engineering materials and joining processes: Types, applications of ferrous metals, non-ferrous metals, alloys; Composites: Introduction, definition, classification and application (Automobile and Air Craft).							
Text Books:							
 V. K. Manglik, "Elements of Mechanical Engineering", Prentice Hall, 1st Edition, 2013. Mikell P. Groover, "Automation, Production Systems and CIM", Prentice Hall, 4th Edition, 2015. 							
Reference Books:							
 S. Trymbaka Murthy, "A Text Book of Elements of Mechanical Engineering", University Press, 4th Edition, 2006. K. P. Roy, S. K. Hajra Choudary, Nirjhar Roy, "Element of Mechanical Engineering", Media Promoters & Publishers, 7th Edition, 2012. Pravin Kumar, "Basic Mechanical Engineering", Pearson, 1st Edition, 2013. 							
Web References:							
1. http://www.nptel.ac.in/courses/112107144/ 2. http://www.nptel.ac.in/courses/112101098/download/lecture37.pdf							

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