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| Course code | Course Title | Core/ Elective | | | | | |
| 4ES204ME | PRINCIPLES OF MECHANICAL ENGINEERING | Core | | | | | |
| L | T | P/D | Credits | CIE | SEE |
| 3 | 0 | 0 | 3 | 40 | 60 |
| **Prerequisite:** ---  **Course Objectives:** The objective of this course is to make the student   * To understand the basic concepts and applications of Thermodynamics * To understand the basic concepts of IC Engines * To understand the working principles of hydraulic turbines * To understand the working principles of hydraulic pumps. * To understand the basic principles of major manufacturing Processes such as casting, welding, forming.   **Course Outcomes:** After completion of the course, the student will be able to   * CO.1. Define the fundamental concepts in thermodynamics * CO.2 Classify the IC Engines and Gas turbines * CO.3. Demonstrate the operating principles of hydraulic turbines * CO.4. Distinguish the working principles of Centrifugal pump and Reciprocating pump * CO.5 Explain the different manufacturing techniques, such as welding,   casting and forming. | | | | | | | |
| **UNIT-I:**  **Sources of Energy:** Introduction and application of energy sources like fossil fuels hydal, solar, wind, nuclear fuels and bio-fuels; environmental issues like globa warming and ozone depletion  **Basic concepts of Thermodynamics:** Concept of system, Process & Properties, Firs law of thermodynamics, concept of Heat Engine, Heat Pump & Refrigerator. Steady flow energy equation for an open system, Second law statements, Concept of entropy. **UNIT-II:**  **Internal Combustion Engines:** Introduction, Classification, Engine details, Otto cycle, Diesel-cycle, Difference between Otto cycle and Diesel cycle, Two-stroke cycle engine, Difference between two-stroke and four-stroke engines, indicated power, brake Power, friction power & Efficiencies.  **Steam power plant cycles:** Carnot and Rankine cycles of operation and their efficiencies. Analysis of Rankine cycle.  **Gas Turbines**: Simple gas turbine plant, Ideal cycle, Actual cycle, essential components, Parameters of performance.  **UNIT-III:**  Introduction to Bernoulli’s equation, applications- Venturi meter, Orifice meter, Flow  through pipes-Hygen’s formula, Friction loss in pipes, Dracy’s formula, Reynolds number and it’s significance. | | | | | | | |

**Hydraulic Turbines**: Classification- Working principle- Pelton wheel, Francis, Kaplan – Work done, power output, efficiency, specific speed- Unit quantities, Draft tube, Performance characteristic curves.

**UNIT-IV:**

**Centrifugal pumps**: Classification, working, work done – barometric head-losses and efficiencies, specific speed – performance characteristic curves, NSPH **Reciprocating pump:** Working, Discharge, slip, indicator diagrams.

### UNIT-V:

**Welding:** Definition of Welding, Types of welding processes. Brief description of important welding processes like: Arc welding, GMAW, GTAW, Gas welding & Resistance welding.

Principle of operation of Brazing, Soldering.

**Casting:** Basic concepts of casting process. Principle, process and applications of sand and die casting processes.

**Forming:** Basic concepts of metal forming processes: Extrusion, rod/wire drawing and rolling.

Text books:

1. Thermal Engineering, RK. Rajput, Laxmi Publications Tenth Edition (2018)
2. Fluid mechanics & Hydraulic machines by, R.K.Bansal, Laxmi Publications Ninth Edition (2018)
3. Manufacturing Technology, Vol-1 by P. N. Rao, McGraw Hill Publications, Fifth Edition (2018)

References:

1. Internal combustion engines by V. Ganesan, McGraw Hill Publications, Fourth Edition (2012)
2. Hydraulic fluid mechanics and fluid machines by S. Ramamuratham, Dhanapathi rai publications, Ninth Edition (2014)
3. Production Technology 4ED by Pakirappa First Edition(2015)