

### III Semester

#### THERMAL ENGINEERING - I M 201

##### UNIT – I

**Engineering Thermodynamics:** Laws of Thermodynamics: Zeroth, First, Second & Third and Corollaries of second Law. Thermodynamics Relations: Mathematical Theorems, Thermodynamic functions, Maxwell's Relations. Joule Thomson Coefficient.

##### UNIT – II (CYCLES)

**Vapour Power Cycles :** Rankine cycles, , calculation for work and efficiency, binary vapour cycles, Combined cycles.

**Gas Power Cycles :** Carnot cycle, Diesel cycle, Dual cycle, Brayton cycle, cycle calculations & Analysis

##### UNIT – III

**Steam Generators:** Boilers for power plants. Constructional details of modern boilers and their applications. Boiler Draught and Boiler Operations & performance.

**Nozzles:** Steady flow energy equation and its application to steam nozzle. Isentropic expansion of steam through convergent and divergent nozzles. Critical pressure, condition for maximum discharge, choking of nozzles, effect of back pressure. Super saturated flow through nozzles, flow with friction, nozzle efficiency.

##### UNIT – IV

**Steam Turbines:** Principle and working of impulse and reactions turbines, pressure and velocity compounding , Velocity triangles for various types, efficiency, diagram efficiency, steam speed to blade speed ratio for optimum performance, losses in steam turbines, performance at part loads and governing of turbines.

**Steam Condensers:** Classification and working; effect of air leakage ; calculation of wet and dry air pump capacities Cooling water requirements, vacuum and condenser efficiency, various components of condensing plant, requirements of a good condenser, important design parameters.

##### UNIT - V

**Gas Turbines & Jet Propulsion:** Cycle Analysis, intercooling, reheating and heat exchangers, turbine efficiencies. Jet propulsion: Calculation for thrust power, speed and efficiency turbojet and turbo propulsion system.

##### Books and References:

1. Thermal Engineering by S. Domkundwar
2. Thermal Engineering by R.K. Rajput
3. Thermodynamics by E.J. Lay
4. Gas Turbines by Cohen & Rogers
5. Introduction of Gas Dynamic by R. Rotty

## MECHANICAL ENGINEERING GRAPHICS M 202

### UNIT –I :

Computer Graphics: Introduction to general purpose graphics software, plotting techniques, coordinate system transformations, line drawing, polygon and circle generation. Drawing entity commands of Computer drafting. Sectional and dimensional drawing using computer.

### UNIT – II :

Isometric projections and interpenetration of surfaces.

### UNIT- III to V:

Orthographic projections of machine parts and assembly drawings of couplings, bearings, brackets, hangers, connecting rods, pistons, eccentric etc.

### Books and References:

1. Engg. Drawing with Auto CAD by T. Jayapoovam
2. Engg. Graphics including Autocad by Lakshminarayan and Vaishwanar
3. Machine Drawing by Lakshminarayan and Vaishwanar
4. Engineering Graphics by K.R. Mohan

**MATERIAL SCIENCE AND ENGINEERING**  
**M 203**

**UNIT – I**

Crystalline Nature: Crystal structure; Space lattice constants; Miller indices; Imperfections in crystals, point defects and line defects and surface defects. Effects of crystal structure and imperfection on properties.

**UNIT –II**

Plastic Deformation of Metals and Alloys: Mechanisms of plastic deformation, role of dislocation; slip and twinning. Effect on properties, theory of work hardening; Theories of recrystallisation and grain growth, Powder metallurgy – Theory and applications.

**UNIT – III**

Phase and Phase Equilibrium : Types of phases, Solid solution, Hume Rothery's rules, Solidification of alloys; Phase diagrams, Phase and Lever Rules relationship of micro- structure and properties, Iron- Carbon equilibrium diagram. Iron Carbon alloys, Effect of alloying elements.

**UNIT – IV**

Heat Treatment and Alloys: Phase transformation in steel. TTT diagram, Detailed study of various heat treatment Processes, Hardenability, case hardening, Applications of case hardening.

**UNIT – V**

Engineering Materials: Alloy steels for various applications. Tool steel, Spring steel, Corrosion resistant steel. Nonferrous alloys and their applications, National and International Standards. Polymers – different types, their properties, selection for various application, moulding techniques, Ceramics Introduction to composites, different types, properties and their applications. Introduction to nano materials and applications.

**Books and References:**

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|---------------------------------------|----|------------------|
| 1. Material Science<br>Gupta          | by | Narula, Narula & |
| 2. A first course on Material Science | by | Raghavan         |
| 3. Principles of Physical Metallurgy  | by | Reedhill         |
| 4. Material Science                   | by | by Callister     |

## KINEMATICS OF MACHINES M 204

### UNIT -I

**Kinematics** :Types of plane motion, kinematic concept of links, types of pair, types of chains, kinematics of chains ,mechanism and machines, equivalent linkages, constraints and degree of freedom, Grubler's equation, inversion of four bar, slider crank and double-slider crank chain, Movability Criterion.

### UNIT -II

**Motion synthesis**: Application to four link mechanisms, Transmission angle, chebyshev spacing of precision points, coupler curve, cognate linkages, pole method, relative pole method, overlay method, freudenstein's method, bloch's method, function generation, computer aided synthesis of mechanisms.

### UNIT -III

**Motion analysis**: Absolute and relative motion, kinematics quantities and their relationship: vector diagrams ,instantaneous centers and kennedy's theorem, velocity analysis, relative and absolute velocity methods, method of instantaneous centers, acceleration analysis, acceleration polygon, coriolis acceleration, slider crank mechanisms, mathematical analysis, special graphical method, motion graphics in determination of displacement ,velocity and acceleration of reciprocating parts. Computer aided analysis of mechanisms.

### UNIT -IV

**Toothed Gears**: Fundamental law of gearing, classification and terminology, geometry and kinematic considerations of various tooth profiles. The involute and cycloid profiles, spur gears and other types, standard in tooth forms, interference, path , arc of contact & Contact ratio.

### UNIT -V

**Cams**: Classification, types of motion curve and analytical construction of cam, profile for different followers, pressure angle and cam size, cam with specified contours, cam synthesis, Gyroscope,elements of Gyroscopic Motion,Gyroscopic Torque equation.

### REFERENCE BOOKS:-

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|-----------------------------------|----|--------------------|
| 1. Theory of machines             | by | Rattan             |
| 2. Mechanism & machine theory     | by | Rao & Dukkupati    |
| 3 Theory of mechanism & machines  | by | Ghosh and Mallik   |
| 4 Theory of machines              | by | Thomas Bevan       |
| 5. Theory of mechanism & machines | by | Shigley and Uicker |
| 6. Mechanics of Machines          | by | V.Ramamurti        |
| 7. Design of Machinery            | by | Norton             |

## THERMAL ENGINEERING – I LAB.

M 242

S. No.	Name of Experiment
1.	Study of Boilers.
2.	Study of surface condenser.
3.	Study of Rover's Gas Turbine.
4.	Study of Steam Turbine
5.	Study of Gas Turbine Combustion Chamber.
6.	Study of cut of cut model of 4 cylinder 4 stroke petrol engine.
7.	Study of Ignition System of S.I. Engine.
8.	Study of Fuel Injection System of Diesel Engine.
9.	Load Test on Ruston Diesel Engine

**MATERIAL SCIENCE AND ENGINEERING LAB  
AM 242**

**LIST OF EXPERIMENTS**

1. Preparation and Study of Models of Crystal Structure of Metals.
2. Preparation & Study of Models of Crystal Imperfections in Metals.
3. Preparation of Specimen for Metallographic Examination.
4. Study of Metallurgical Microscope.
5. Study of Microstructure of Steel.
6. Study of effects of Heat Treatment on the Microstructure and properties of Steel.
7. Determination of ASTM Grain size number.
8. Determination of Carbon and Sulphur in Steel.
9. Study of Alloy Analyser and Analysis of Alloys.
10. Effect of Shot peening/ Cold working on metals.
11. Effect of carburising on Microstructure of Steel.
12. Effect of Processing Parameters on Injection Moulding of elastics.
13. Effect of Processing Parameters on Blow Moulding of Plastics.
14. Effect of processing Parametrs on Compression Moulding of Plastics.

**Books and References:**

1. Experiments in Engineering Materials by Higgerson
  2. Experimental Physical Metallurgy by Kehl
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