

SYLLABUS FOR Pre PhD EXAMINATION

DEPARTMENT OF MECHANICAL ENGINEERING

PAPER – II : STRENGTHENING MECHANISMS AND COMPOSITE MATERIALS

UNIT – I

Introduction to dislocations, types of dislocations, Burger's vector and dislocation loops, dislocations in common metallic crystals with cubic and hexagonal structures. Stress fields and energies of dislocations, forces and between dislocations, dislocation climb, intersection of dislocations, jogs, dislocation intersections, sources and dislocation pile ups.

UNIT – II

Introduction to strengthening Mechanisms- Mechanisms of deformation, Grain boundaries and deformation, Grain size significance and measurements, strengthening from grain boundaries, low angle grain boundaries, mechanism of strengthening by dislocations, yield point phenomenon.

UNIT – III

Strengthening due to super lattice structure, solid solution Strengthening, particle Strengthening, age hardening and dispersion Strengthening, fiber Strengthening, Strengthening due to point defects, martensitic Strengthening, strain hardening, strain aging, variations in annealing a cold worked metal, Bauschinger's effect and preferred orientation.

UNIT – IV

Concept of composite material – Introduction, particle reinforced composites, effect of particle size, shape and distribution on strength of composites, fiber reinforced composites, and their significance, influence of fiber length, orientation and concentration. The role of fiber and matrix phases, classification of fiber based on length to diameter ratio; interfacial defects.

UNIT – V

Introduction to polymer matrix, metal matrix and ceramic matrix composites, processing of fiber reinforced composites – pultrusion, pre-preg production process and filament winding techniques, structural composites – laminar composites and sandwich panels, need for green composites, fabrication of green composites, hand lay-up process, vaccum bag molding processes, mechanisms of failure in composite materials.

REFERENCE BOOKS:

1. *Foundations of Material Science and Engineering*, William, F.Smith, Mc-Graw Hill (International)
2. *Material Science and Engineering – An Introduction*, William, D.Callister, Jr. John Wiley and Sons, Singapore.
3. *Mechanical Metallurgy*, George, E.Dieter, Mc-Graw Hill Book Company, London.
4. *Structure of Metals*, Charles, S.Barrett, Mc-Graw Hill Book Company, London.

1. Sinu 2. Radika 3. SERG 4. K. Sri 9/4/19
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SYLLABUS FOR Pre PhD EXAMINATION
DEPARTMENT OF MECHANICAL ENGINEERING
PAPER-II
ADVANCED ENGINEERING THERMODYNAMICS

UNIT - I

Second Law of Thermodynamics: Cyclic Heat Engine, Energy reservoirs, Kelvin-Planck Statement and Clausius' statement of second law of thermodynamic and their equivalence, Reversible and Irreversible processes, Carnot cycle, Carnot's theorem and Thermodynamic efficiency.

UNIT - II

Entropy: Clausius' theorem, Concept of entropy, Inequality of Clausius, Irreversibility, Causes for the Irreversibility, Entropy changes in various processes and Third law of thermodynamics.

UNIT - III

Available Energy, Availability and Irreversibility: Available Energy, Available energy referred to a cycle, Quality of energy, Availability in steady flow processes, Irreversibility and Second law efficiency.

Exergy Analysis: Components of Exergy, Physical Exergy, Chemical exergy, Mechanical Exergy, Exergy Destruction, Exergy Destruction ratio, Exergy of product, Exergy of fuel, Exergy loss, Exergetic Efficiency of Various components of Thermal power plant

UNIT - IV

Vapour Power Cycles: Properties of steam and Use of property diagrams, Steam properties for various thermodynamic processes, Rankine cycle, Modified Rankine cycle, Reheat and Regenerative cycle.

Power Plant components: Steam generators and Steam nozzles.

UNIT - V

Steam Power Plant: Introduction, Selection of Site, Power plant layout, Advantages and disadvantages of steam power plants.

Power Plant Components: Steam condensers and Steam turbines.

1. Singh
2. Radha
3. S.S. S
4. K. Sri
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7. S. S
8. K. Sri
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Text Books:

1. A. Bejan, Advanced Engineering Thermodynamics, Tata McGraw Hill, New Delhi.
2. Moran, Shapiro, Advanced Engineering Thermodynamics, John Wiley Publications
3. Van Wylen, Advanced Engineering Thermodynamics, John Wiley Publications
4. Nag. P.K., Engineering Thermodynamics, Tata McGraw Hill, New Delhi.
5. Mathur M.L and Mehta F.S, Thermal Engineering, Jain Brothers, New Delhi.
6. D S Kumar, Thermal science and Engineering, S K Kataria and sons, New Delhi.
7. Vasandini V. P. and Kumar D.S., Heat Engineering Metropolitan Book Co., New Delhi.
8. Arora & Domakundwar , A Course in Power Plant Engineering, Dhanapat Rai & Sons, New Delhi.
9. R.K Rajput., A text book of Power Plant Engineering, Laxmi Publications (P) Limited, New Delhi.

PRE-PHD SYLLABUS
PAPER-II (MECHANICAL ENGINEERING)
MODERN MACHINING PROCESSES

UNIT I: INTRODUCTION

Need for modern machining processes, classification, physical parameters, properties of work material and shapes to be machined, process capability, economic considerations.

UNIT II: ELECTRIC DISCHARGE MACHINING

Basic principle and types, metal removal mechanism, spark erosion generators; electrode feed control, R-C circuit electrical parameters, dielectric fluids, selection of electrode material and design, performance measures- surface finish, metal removal rate, tool wear rate.

UNIT III: MECHANICAL PROCESSES

Ultrasonic machining principle, process parameters, tool feed mechanism, effect of parameters. Abrasive jet machining principle, variables and its influence on machining parameters, water jet machining.

UNIT IV: ELECTRO CHEMICAL METAL REMOVAL PROCESSES

Electrochemical machining principle, elements, power and control system, electrolytes, metal removal rate, surface finish and work material characteristics. Electrochemical grinding, electrochemical honing.

UNIT V: ADVANCED METAL REMOVAL PROCESSES

Plasma arc machining principle, metal removal mechanism, process parameters, electron beam machining and its process parameters, laser beam machining, thermal features and analysis.

Text Book:

Modern Machining Processes by P.C.Pandey and H.S.Shan, Tata McGraw-Hill, New Delhi.

Reference Book:

Advanced Machining Processes by V.K.Jain, Allied publishers, New Delhi.

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