

**SIKKIM MANIPAL UNIVERSITY**

**SYLLABUS OF**

**Ph.D ENTRANCE EXAMINATION**

**MECHANICAL ENGINEERING**

**STRENGTH OF MATERIALS** – Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and strain, thick and thin cylinders, shear force and bending moment diagrams, bending and shear stresses, torsion of circular shafts, strain energy methods and thermal stresses.

**DESIGN** – Design for static and dynamic loading; failure theories, principles of design of machine elements such as bolted, riveted and welded joints, shafts and spur gears.

**MATERIAL SCIENCE** – Iron carbon diagrams with emphasis on invariant reactions, isothermal and continuous cooling transformation diagrams (TTT and CCT curves). Heat treatment of ferrous alloys- Annealing, normalizing, homogenizing, hardening –quench hardening, case hardening, hardenability and tempering.

**FLUID MECHANICS** – Fluid properties, fluid statics, manometry, buoyancy, control volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum, Bernoulli's equation, viscous flow of incompressible fluids, flow through pipes, head losses in pipes, bends etc.

**THERMAL ENGINEERING** – Basic concept, Thermodynamic Laws, Energy Interactions: Work transfer of different forms, heat transfer – specific heat and latent heat; Carnot cycle and Carnot's theorem, absolute thermodynamic temperature scales, absolute zero temperature.

**IC ENGINES** - Air Standard cycles & their analysis (Otto and Diesel cycles); Valve timing diagrams for 4-stroke S.I. and C.I. engines, Stages of combustion in S,I, Engines, Detonation or knocking, Control of detonation, S,I, Engine combustion. Diesel knock, Methods of controlling Diesel knock, Comparison of Knock in S.I. and C.I. Engine. Indicated Mean effective pressure, Brake mean effective pressure, Advantages & disadvantages of two stroke and four stroke engines, Comparison of two Stoke S.I.& C.I. Engines, Valve timing diagrams for two stroke engines.

**PRODUCTION ENGINEERING** – Conventional and Non-conventional machining processes, Computer controlled machines, CAD/CAM, CNC, Mechanics of metal cutting, Tool wear and machinability, Economics of metal cutting, Powder metallurgy, Joining Processes, Finishing operations.

**OPERATIONS RESEARCH** – Linear programming, simplex and duplex method, transportation, assignment, network flow models, PERT and CPM.