Amrita School of Engineering, Coimbatore
Department of Mechanical Engineering

Ph.D. – Entrance Examination Syllabus (June 2018)

Part 'B' - Department Specific – Mechanical Engineering ($12 \times 5 = 60$ Marks)

Subject	Topics
Design Engineering	**Engineering Mechanics:** Free body diagrams and Equilibrium, Trusses and Frames, Kinematics and dynamics of particles and of rigid bodies in plane motion, Impulse and Momentum, Center of gravity, Moment of Inertia, Friction, Energy formulations, Virtual work. **Mechanics of Materials**: Stress and strain, Elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; Shear force and bending moment diagrams, Deflection of beams. Torsion of circular shafts; Euler's theory of columns; energy methods, Failure theories. **Theory of Machines:** Kinematic and Dynamic analysis of linkages, Balancing of reciprocating and rotating masses, Fly wheel, Free vibration and forced vibration of single degree of freedom systems, Effect of damping; Vibration isolation; Resonance; Critical speeds of shafts. **Machine Design:** Design for static and dynamic loading; S-N diagram; Design of machine elements for bolted, riveted and welded joints; Design of shafts, gears, brakes and springs.
Thermal Engineering	**Thermodynamics:** Basic concepts and definitions-Properties of gas and pure substance- First law for closed system; Application of steady state flow process; Second law of thermodynamics; Carnot cycle; Otto cycle; Diesel cycle; Rankine cycle; Brayton cycle, Vapour compression refrigeration cycle. **Heat transfer:** Basic modes of heat transfer; General heat conduction equation; Steady and unsteady heat conduction; Natural and forced convection; Laws of radiation. Heat exchanger performance, LMTD and NTU methods. **Fluid Mechanics:** Fluid properties- Viscosity; Hydrostatics- Buoyancy; Bernoulli's equation, Differential equation of continuity and momentum; boundary layer; Flow measurement– Pipes and pipe fittings-Pumps, Compressors and Turbines
Manufacturing and Industrial Engineering	**Materials Science:** Atomic packing factor; Volume, planar and linear atomic density-Crystallographic planes and directions-Gibbs phase rule; Cooling curves; Lever rule; Invariant reactions in $Fe-Fe_3C$ phase diagram; Stress and strain in metals. **Manufacturing:** *Theory of metal cutting*: Tool wear & tool life; Machining time calculation. Lathe, Drilling and Milling operations. *Metal forming processes*; Blanking and Punching force measurement; Calculation of Bending force. Principles of powder metallurgy. **Industrial Engineering:** Constraint and unconstraint optimization techniques, Practical aspects of optimization-Forecasting, Aggregate production planning and scheduling, Inventory analysis and control, Project planning, Linear programming; Transportation-Assignment models; Sequencing; Simple queuing.

Reference Books:

1. Vikas Slariya, "Mechanical Engineering for GATE/PSUs'' Third Edition, Mc-Graw Hill Education, June 2013, ISBN: 978-1-25-906434-0
2. Ajay Kumar Tamrakar and Dineshkumar Harursampath, "Wiley Acing the GATE – Mechanical Engineering", Willey India Pvt. Ltd, April 2014, ISBN - 9788126545421