THEORY OF PRODUCTION PROCESSES

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TYPE OF COURSE : Rerun | Core | UG
COURSE DURATION : 12 weeks (20 Jul' 20 - 9 Oct' 20)
EXAM DATE : 18 Oct 2020

PRE-REQUISITES : Introduction to manufacturing technology or manufacturing processes

INDUSTRIES APPLICABLE TO : Manufacturing Industries where casting/forming/welding takes place, for example SAIL, BHEL, Foundry and Forge industries like HEC, Bharat Forge etc.

COURSE OUTLINE :

The course focuses on understanding the science behind technology of primary production processes namely casting, forming and welding. Conventionally, the courses on manufacturing processes deal with study of operational procedures. The course has been divided into three sections namely casting, forming and welding, each being covered in 4 weeks of time. The underlying principles of solidification, fluidity, gating, risering, melting etc. will be covered in casting section whereas mechanics of metalworking, analysis of different metal working processes will be covered in the second section i.e. forming. In the third section i.e. welding, principles of welding processes, thermal effects, weldability etc. will be covered.

ABOUT INSTRUCTOR :

Dr Pradeep K. Jha is presently working as Associate Professor in the Department of Mechanical & Industrial Engineering at IIT Roorkee. He has been teaching the courses related to manufacturing technology and theory of production processes to undergraduate and postgraduate students for more than 12 years. He is actively involved in research work related to production processes, especially casting processes.

COURSE PLAN :

Week 1**:** Theory of casting and solidification, Fluidity of liquid metals

Week 2**:** Technology of patternmaking and mouldmaking, Pattern allowances, Testing of molding sand, cores

Week 3**:** Gating system design, Risering Design, different methods of calculating riser volume, Feeding distance calculations

Week 4**:** Theory of melting and production of ferrous and non-ferrous materials, Casting design, Casting defects

Week 5**:** Mechanical fundamentals of metalworking: Concept of stress and strain, stress and strain tensors, Hydrostatic and deviatoric stresses, Flow curve

Week 6**:** Yield criteria for ductile materials, plastic stress strain relationships, classification of metalworking, mechanics of metalworking

Week 7**:** Analysis and classification of rolling and forging processes, Force calculations in rolling and forging processes

Week 8**:** Analysis and classification of Extrusion process, Analysis of wire, rod and tube drawing processes, Forming defects

Week 9**:** Classification of welding processes, Thermal effects in welding, Basic metallurgy of fusion welds, Heat affected zone in welding

Week 10**:** Principles of welding processes: Arc welding, Gas metal arc welding, Solid state welding, Resistance welding, Soldering, Brazing and adhesive bonding

Week 11**:** Residual stresses in welding, Methods of measurement of residual stresses in welding, Welding distortion and its types, Methods of reducing residual stresses and distortion in welding

Week 12**:** Weldability of materials: Introduction and assessment of weldability, Test for weldability, Weldability of ferrous and non-ferrous materials