FUNDAMENTALS OF MANUFACTURING PROCESSES

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INTENDED AUDIENCE : Any interested learners

COURSE OUTLINE :

It is proposed to include fundamental of following aspects of manufacturing technology

A) Understanding Manufacturing: concept of manufacturing, need, scope, advantages, limitation, application, materials and manufacturing, classification of manufacturing, process capabilities, selection, break even analysis of manufacturing processes

B) Casting: approach, steps, pattern, molding, gate and riser, melt treatment, solidification, casting processes: sand mould, shell mould, permanent mould casting, casting defect and their remedy

C) Forming: approach, hot and cold forming, rolling, forging, extrusion, drawing, sheet metal forming, press, dies, types of dies and die set sheet metal operations punching, blanking, notching, nibbling

D) Joining: approach, need, principle of fusion welding, gas welding, thermit welding, arc welding common arc welding processes, resistance welding, weldability of metals, solidification of weld, weld discontinuities and their remedy

E) Machining: approach, mechanism, classification, cutting tool, tool material, heat generation, cutting fluid, grinding, internal and external surface grinding, centerless grinding designation and selection of grinding wheel, trueing and balancing, honing, reaming, lapping, polishing etc.

F) Improving properties: heat treatment of steel and aluminum alloys, Fe-C diagram, TTT diagram, and CCT diagram, heat treatment processes annealing, normalizing, quenching tempering, surface modification methods namely without change chemistry, changing chemical composition and development of coating and cladding.

ABOUT INSTRUCTOR :

Prof. D K Dwivedi obtained BE (mechanical engineering), in 1993 from GEC Rewa, ME (welding engineering) from Univ. of Roorkee in 1997 and PhD in Met. Engineering from MNIT, Jaipur in 2003. He has about 9 years teaching experience at NIT Hamirpur and 14 years at IIT Roorkee in subjects related with manufacturing at UG level and welding engineering related subjects at PG level. He has published more than 120 research papers in SCI/SCIE indexed journals and undertaken 20 sponsored research and 50 industrial consultancy projects. He has authored two books entitled Production and Properties of Cast Al-Si Alloys with New Age International, New Delhi (2013) and Surface Engineering with Springer, New Delhi (2018).

COURSE PLAN :

Week 1 : Understanding Manufacturing
Fundamental approaches of manufacturing
Manufacturing process specific advantages and limitation
Materials and manufacturing processes
Classification of manufacturing processes

Week 2 : Selection of manufacturing processes
Application of manufacturing processes
Effect of manufacturing processes on properties of metals
Break-even point analysis in manufacturing processes
Metal Casting: Introduction & Suitability

Week 3 : Metal Casting: Steps of casting processes
Metal Casting: Terminology
Metal Casting: Pattern allowances I
Metal Casting: Pattern allowances II
Metal Casting: Sand Moulding I

Week 4 : Metal Casting: Sand Moulding II
Metal Casting: Core & Core Prints
Metal Casting: Gating System
Metal Casting: Yield
Metal Casting: Riser Design

Week 5 : Metal Casting: Cleaning of casting
Metal Casting: Casting defects & their prevention
Metal Casting: Shell molding
Metal Casting: Investment and permanent mould casting
Metal working processes: Hot and cold working

Week 6 : Metal working processes: Rolling
Metal working processes: Forging
Metal working processes: Extrusion
Metal working processes: Wire Drawing
Metal working processes: Press

Week 7 : Metal working processing: Sheet metal operations (Shearing)
Metal working processing: Sheet metal operations II
Metal working processing: Sheet metal operations III
Metal working processing: Dies and die set
Material removal processes: Machining

Week 8 : Material removal processes: Mechanism of the metal cutting
Material removal processes: Chip Formation
Material removal processes: Types of chips and power consumption
Material removal processes: Heat generation
Material removal processes: Tool failure and tool life

Week 9 : Material removal processes: Tool materials
Material removal processes: Cutting fluids
Material removal processes: Grinding I
Material removal processes: Grinding II
Material removal processes: Grinding III

Week 10 : Material removal processes: Grinding operations
Joining of metals: Fundamentals I
Joining of metals: Fundamentals II
Joining of metals: Welding processes I
Joining of metals: Brazing, soldering and weldability

Week 11 : Joining of metals: Weldability and welding defects
Heat treatment: Fundamentals
Heat treatment: Fundamentals II
Heat treatment: Fundamentals III
Heat treatment: Normalizing and hardening

Week 12 : Heat treatment: Tempering
Improving surface properties: Introduction
Improving surface properties: Surface modification processes I
Improving surface properties: Changing chemical composition
Improving surface properties: Coating