Manufacturing Processes I - Video course

**Metal Forming**


**Sheet Metal Working**

Applications of sheet formed products. Shearing mechanism. Processes like blanking, piercing, punching, trimming, etc. Forming processes like bending, cup drawing, coining, embossing, etc. Presses for sheet metal working; Part feeding systems; Elements of die; punch and die clearances; Progressive, compound and combination dies. High energy rate forming processes.

**Powder Metallurgy**


**Metal Casting**

Introduction: Brief History, Advantages and Limitations, Applications

Patterns: Pattern materials, allowances, types of pattern, color code scheme
Sand Casting: Green and dry sand casting process, types of sand, molding sand and its properties, molding sand composition.

Cores: Use, core material, types of cores, advantages and limitations, core prints, chaplets

Gating and Risering System: Element of gating systems, types of gates, Riser design considerations

Special Molding Processes: Carbon dioxide molding process, Investment casting process, Die casting process, shell molding process, Full molding process, Vacuum-Sealed casting process

Casting defects: Causes and remedies of defects such as blowholes, pinholes, blisters, hot tears, cold shut, metal penetration,

Melting Practices: cupola: charge calculations, construction; other furnaces: working of induction furnace, crucible furnace, and reverberate furnace

**Welding**

Introduction: Principle of welding, general applications such as construction of bridges, towers, automobiles & electronic circuits, etc.

Classification of welding processes - Classification based on application of filler material & without filler material, source of energy, fusion and pressure welding processes. Various joining processes such as
Soldering and brazing: Difference between both the processes, consumables used, methods of brazing, fluxes used, their purpose and flux residue treatment. Arc welding power sources; Conventional welding transformers, rectifiers & current and voltage. The influence of these power sources on welding.


Submerged arc welding (SAW): Process details, consumables such as fluxes and wires for welding mild steel, variations in submerged arc welding process like single wire, tandem wire, parallel wires, field of applications.

Gas metal arc welding (GMAW) or MIG/MAG welding: Process details, shielding gases, electrode wires, their sizes, and welding current ranges.

TIG welding: Process details, power sources requirements, electrode sizes and materials, current carrying capacities of different electrodes, shielding gases, application of process.


Lecture Details:
1. Elastic and plastic deformation. Concept of strain hardening. Hot and cold working
7. Elements of presses for sheet metal working. Sheet metal part feeding systems.
8. Elements of a die: punch and die clearances, Progressive, compound, and combination dies.
9. Introduction to high-energy rate forming processes.
11. Compaction and sintering of metal powders
12. Secondary and finishing operations of P/M parts. Design considerations for P/M parts. Economics, advantages and limitations of P/M parts.
13. Introduction: Brief History, Advantages and Limitations, Applications
15. Pattern allowances, types of pattern, color code scheme.
16. Sand Casting: Green and dry sand casting process
17. Types of sand and their properties, advantages and limitations.
18. Molding sand and its properties, molding sand composition.
19. Cores: Use, core material, types of cores, advantages and limitations, core prints, chaplets.
23. Die casting process, shell molding process, advantages and limitations.
24. Full molding process, Vacuum-Sealed casting process, advantages and limitations.
25. Casting defects: Causes and remedies of defects such as blowholes, pinholes, blisters, hot tears, cold shut, metal penetration.
27. Other furnaces: working of induction furnace, crucible furnace, and reverberate furnace.
28 & 29 Introduction : Principle of welding, general applications such as construction of bridges, towers, automobiles & electronic circuits, etc.
30 & 31 Classification of welding processes -Classification based on application of filler material & without filler material, source of energy, fusion and pressure welding processes. Various joining processes such as welding, brazing and soldering.
32 & 33 Soldering and brazing: Difference between both the processes, consumables used, methods of brazing, fluxes used, their purpose and flux residue treatment.
34 & 35 Arc welding power sources; Conventional welding transformers, rectifiers & current and voltage. The influence of these power sources on welding.
38 & 39 Submerged arc welding (SAW): Process details, consumables such as fluxes and wires for welding mild steel, variations in submerged arc welding process like single wire, tandem wire, parallel wires, field of applications.
40 & 41 Gas metal arc welding(GMA W) or MIG/MAG welding: Process details, shielding gases, electrode wires, their sizes, and welding current ranges.
42 & 43 TIG welding: Process details, power sources requirements, electrode sizes and materials, current carrying capacities of different electrodes, shielding gases, application of process.