UNIT - I

Chapter 1 : Mechanics of Sheet Metal Forming **1-1 to 1-30**

Syllabus : Theory of plasticity, yield criteria, work of plastic deformation, sheet metal forming, formability studies-conventional processes, effect of friction in forming operation, experimental techniques of evaluation of friction in metal forming, deep drawing, analysis (Numerical), surface defects identification and remedies, introduction to forming simulation, challenges in Forming.

1.1 Theory of Plasticity **1-1**

1.2 Theories of Failure or Yield Criteria **1-4**

1.3 Sheet Metal Forming **1-5**

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1.3.2 Effect of Friction in Forming Operation 1-6

1.3.3 Experimental Techniques of Evaluation of Friction in Metal Forming 1-7

1.4 Deep Drawing **1-8**

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1.5 Introduction to Forming Simulation **1-14**

1.6 Challenges in Forming **1-15**

1.7 Numericals on Deep Drawing **1-16**

UNIT - II

Chapter 2 : Special Forming Processes **2-1 to 2-43**

Syllabus : HVF, HERF (Explosive Forming) techniques- super plastic forming techniques-Hydro forming-Stretch forming, Laser beam forming-principles and process parameters Advantages, limitations and applications of different forming processes. Orbital forging-Isothermal Hot and cold isostatic pressing-High speed extrusion, Water hammer forming, Incremental Sheet forming, Magnetic Pulse forming, Metal Spinning, Electro Hydraulic Forming, Micro forming

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2.3 High Energy Rate Forming Processes (HERF) **2-3**

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2.4.1 Hydroforming : Materials and Design Considerations 2-9

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2.7 Orbital Forming 2-16

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2.16 Micro-Forming 2-39

UNIT - III

Chapter 3 : Weld Metallurgy 3-1 to 3-28

Syllabus : Weld thermal cycles and their effects, effects of pre and post weld heat treatments, concept of HAZ, concept of weldability and its assessment. Welding of dissimilar materials, Weld characterization, Weld decay and weld sensitization, Introduction to ASME, ASWE, IS Welding Standards, (welding skill levels).

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3.3.2 Controlling HAZ 3-14

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3.9 IS Welding Standards 3-25

UNIT - IV

Chapter 4 : Solid State Welding Processes 4-1 to 4-22

Syllabus : Cold pressure welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction stir welding, Forge welding, Roll welding and Hot pressure welding processes - features, advantages, limitations and applications, Advances in adhesive bonding, cladding.

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UNIT - V

Chapter 5 : Advanced Welding Processes 5-1 to 5-22

Syllabus : Electrogas, electroslag welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding - principle, working and applications, Cold Metal Transfer - concepts, processes and applications, Underwater welding, Welding automation in aerospace, nuclear and surface transport vehicles, Robotic Welding, Plasma Arc Welding, Plasma Transferred Arc Welding.

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5.9 Robotic Welding 5-18

5.10 Welding Automation in Aerospace, Nuclear, and Surface Transport Vehicles and Various Application 5-21

UNIT - VI

Chapter 6 : Sustainable Manufacturing 6-1 to 6-19

Syllabus : Sustainable Manufacturing: Introduction to sustainability and drivers for sustainable development and sustainable manufacturing, fundamentals of sustainable manufacturing, various tools, factors of sustainability, Principles of Life Cycle Assessment (Goal, Scope and Life Cycle Inventory), Approaches, Role in Industry 4.0, Green Manufacturing, Environment protection norms, ISO 14000, recycling techniques, safety norms in forming and welding, socio-economic aspects, case study on waste recycling, material recycling, etc

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6.2 Factors of Sustainability 6-2

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6.6 Fundamentals of Sustainable Manufacturing 6-4

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6.7.1 Approach and Scope of Sustainable Manufacturing 6-5

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