## DESIGN FOR MANUFACTURING, ASSEMBLY AND ENVIRONMENT
## (Elective-I)

**Subject Code: 13ME2204**

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**Course Outcomes:**

At the end of the course, the student will be able to

CO1: Outline the appropriate design for economical production and select the materials

CO2: Select between various machining and metal joining processes

CO3: Apply a systematic understanding of knowledge in the field of metal casting and forging

CO4: Fabricate basic parts and assemblies using powered and non – powered machine shop equipment in conjunction with mechanical documentation

CO5: Integrate the knowledge of compliance analysis and interference analysis for assembly and also use visco-elastic and creep in plastics

**UNIT-I**

Introduction: Design philosophy – steps in design process – general design rules for manufacturability – basic principles of designing for economical production – creativity in design, application of linear & non-linear optimization techniques.

Materials: Selection of materials for design – developments in material technology – criteria for material selection – material selection interrelationship with process selection – process selection charts.

**UNIT-II**

Machining process: Overview of various machining processes – general design rules for machining - dimensional tolerance and surface roughness – design for machining – ease – redesigning of components for machining ease with suitable examples, general design recommendations for machined parts.

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints.

**UNIT-III**

Metal casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

**UNIT-IV**

Extrusion and sheet metal work: Design guidelines for extruded sections - design principles for punching, blanking, bending, and deep drawing – Keeler Goodman forming line diagram – component design for blanking.

**UNIT-V**

Assembly: Compliance analysis and interference analysis for the design of assembly – design
and development of features for automatic assembly – liaison diagrams.

Environment: Introduction to environment; motivations for environment principles of environment - eco-efficiency, product life cycle perspective, environment tools and processes, environment design guidelines.

**TEXT BOOK:**

1.A K Chitale and R C Gupta , " *Product Design and Manufacturing*", PHI, New Delhi, 2003.

**REFERENCES :**

1. George E Deiter, " *Engineering Design*", McGrawHill International, 2002.

2. Boothroyd G , "*Product design for Manufacture and Assembly*", First Edition, Marcel Dekker Inc, New York, 1994.