DESIGN FOR MANUFACTURING, ASSEMBLY AND ENVIRONMENT

(Elective-I)

Course Code: 15ME2203

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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 (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

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.