

B.Tech III Year I Semester

**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19AME54c – DESIGN FOR MANUFACTURING**

(Professional Elective – I)

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Course Objectives: The objectives of the course are to make the students learn about

- Explain the product development cycle and manufacturing issues to be considered in design.
- Familiarize manufacturing consideration in cast, forged, and weld components.
- Describe the manufacture of sheet metal components.
- Impart knowledge plastics as substitution to metallic parts

UNIT – I

12 Hrs

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design.

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Implement various steps in design process. L6
- Apply economical considerations at design stage. L2
- Develop creativity attitude in designing. L5
- Use Ashby charts for material selection. L3
- Apply process selection charts. L2

UNIT II

10 Hours

Machining processes: 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.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall various machining processes. L1
- Assign dimensional tolerances and surface roughness values. L4
- Identify the necessity of redesigning of the components. L3
- Summarize the design rules for machining. L2
- Assign recommendations for machining of components. L4

UNIT III

10 Hours

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

Learning Outcomes:

At the end of this unit, the student will be able to

- List various casting processes. L1
- Assign tolerances for various casting processes. L5
- Simulate sand casting design. L4
- Prescribe pre and post treatment of welds. L5
- Discuss the effects of thermal stresses in weld joints and brazed joints. L2

UNIT IV**8 hours**

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

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the difference between open and closed die forging. L2
- Identify the problems in parting lines of dies. L3
- Apply the design guidelines the extruded sections. L2
- Apply the design principles for various sheet metal operations. L2
- Utilize sheet metal effectively for blanking operations. L3

UNIT V**8 Hours**

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain visco elastic and creep behavior in plastics. L2
- Discuss various plastic molding processes. L6
- Apply the design considerations for injection molding. L2
- Use the design guidelines in machining of plastics. L3

Text Books:

1. George E Dieter and Linda Schmidt, Engineering Design, 4th Edition, McGraw Hill (2015)
2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, 5th Edition, PHI Learning (2011)
3. David M Anderson, Design for Manufacturability, CRC Press (2013)

Reference Books:

1. James G Bralla, Design For Manufacturability Handbook, 2nd Edition, McGraw Hill (2004).
2. Dr.P.C.Sharma, Production Technology, S.Chand & Company (2009).

Course Outcomes:

At the end of this Course the student will be able to

- Design mechanical components with economical consideration. L6
- Select materials and machining processes. L6
- Identify the necessity for redesigning components out of manufacturing considerations. L3
- Consider the manufacturing considerations while designing cast, forged weld and sheet metal components. L3
- Design plastic parts with manufacturing considerations. L6