



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3162513**

**Design for Assembly and Manufacturing**

**6<sup>th</sup> SEMESTER**

**Type of course:** Departmental elective

**Prerequisite:** None

**Rationale:**

To impart comprehensive knowledge about consideration of manufacturing processes and assembly process during product design and development.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs
1	<b>Engineering Design and Product Development Process:</b> Engineering Design Process, Considerations of Good Design, Description Design Process, Computer Aided Engineering, Designing to Codes and Standards, Product Development Process, Product and Process Cycle, Organization for Design and Product Development, Technological Innovations	<b>05</b>
2	<b>Embodiment Design:</b> Product Architecture, Configuration Design, Parametric Design, Dimensions and Tolerances, Industrial Design, Human Factors Design, Design for Environment, Modelling and Simulation, Prototyping and Testing.	<b>04</b>
3	<b>Material Selection and Design:</b> Performance Characteristics of Material, Material Section Process, Economical Consideration, Recycling and Material Selection, Design for Brittle Fracture, Design for Fatigue Failure, Design for Corrosion Resistance, Design Against Wear, Design with Plastics	<b>06</b>
4	<b>Design for Machining :</b> Machining using Single Point Cutting Tool, Machining using Multi Point Tool, Machining using Abrasive Wheel, Standardization, Choice of Work Material, Shape of Work Material, Machining Basic Component Shapes, Assembly of Components, Accuracy and Surface Finish, Design Guidelines, Cost Estimating for Machined Components,	<b>06</b>
5	<b>Design for Injection Molding and Design for Sheet Metal Working:</b> Injection Molding Material, Molding Cycles, Molding Cycle Time, Mold Cost Estimation, Mold Cost Point System, Estimation of Optimum Number of Cavities, Design Guidelines, Assembly Techniques, Dedicated Dies and Pressworking, Press Selection, Design Rules	<b>05</b>
6	<b>Design for Casting:</b> Design for Die Casting: Die Casting Machines, Die Casting Dies, Determination of	<b>07</b>



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	Appropriate Machine Size, Die Casting Cycle Time Estimation, Die Cost Estimation, Design Principles Design for Sand Casting: Basics of Castings, Cost Estimating, Design Rules for Sand Castings, Design for Investment Casting : Fundamentals for Investment Casting, Design Guidelines for Investment Casting.	
7	<b>Design for Hot Forging:</b> Characteristics of Forging Process, Forging Allowances, Forging Cost Estimation, Forging Die Cost Estimation, Die Life and Tool Replacement Cost, Cost of Flash Removal	04
8	<b>Design for Assembly:</b> Product Design for Manual Assembly : General Design Guidelines for Manual Assembly, Effect of Part Symmetry, Part Thickness, Size and Part Weight on Handling Time, Effect of Chamfer Design on Insertion Operations, Effect of Obstructed Access and Restricted Vision during Fastening and Riveting, Design Guidelines for Assembly Design for High Speed Automatic Assembly and Robot Assembly: Design of Parts for High Speed Feeding and Orienting, General Rules for Product Design for Automation, Product Design for Robot Assembly	06

### Reference Books:

### References:

1. Product Design for Manufacture and Assembly, G. Boothroyd, P. Dewhurst, W. A. Knight, CRC Press.
2. Engineering Design, G. E. Dieter, L C. Schmidt , McGraw Hill Higher Education.
3. Design for Manufacturability Handbook, J G Bralla, McGraw Hill Education.
4. Product Design and Development, K. Ulrich and S. Eppinger and M. C. Yang, McGraw-Hill Education.

### Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	30
Analysis	30
Evaluate	20
Create	00

### Course Outcome:

After learning the course the students will able to:

Page 2 of 3



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Sr. No.	CO statement	Marks % weightage
CO-1	Interpret fundamental principles of engineering design and product development process.	20
CO-2	Identify proper material for machine components under various failure criteria like brittle failure, fatigue failure, wear, resistance to corrosion, etc.	15
CO-3	Inspect design considerations for manufacturing processes like machining, injection molding, sheet metal forming, forging and casting.	30
CO-4	Estimate cost for manufacturing processes like machining, injection molding, sheet metal forming, forging and casting.	15
CO-5	Evaluate the design criteria for smooth assembly of mechanical parts.	20

### List of Experiments:

1. Case Studies/ Brain storming for Embodiment design and product development.
2. Case studies for cost estimation of various manufacturing processes.
3. Study on life cycle of product.
4. Case study of design for machining and forming processes.
5. Case study of design for assembly.

### Major Equipment:

1. Mechanical Workshop.
2. Drawing hall

### List of Open Source Software/learning website:

1. <http://nptel.ac.in>