

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL ENGINEERING (19) PRODUCT DESIGN AND VALUE ENGINEERING SUBJECT CODE: 2181913 B.E. 8<sup>TH</sup> SEMESTER

**Type of course:** Under Graduate

**Prerequisite:** NIL

**Rationale:** The product development through engineering aspects is always remains challenges to engineers. The aim of present course is to introduce the students about the basic product design process based on mechanical aspects applying innovative thinking and fundamentals of mechanical engineering.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA	ALA	ESE (V)	OEP	PA (I)		
3	2	0	5	70	20	10	30	0	20	150

### Content:

Sr. No.	Content	Total (Hours)	Weightage (%)
1	Product Design: Introduction, Product life cycles, Characteristics of Successful Product development, Design and development of Products, Types of Design and Redesigns, Engineering Designs, Duration and cost of product development, the challenges of Product development.	05	10
2	Product Design for Manufacturing and Assembly: Methods for designing for manufacturing and assembly, design for Maintainability, Design for Environment, Legal factors and social issues, Engineering Ethics and Issues of society related to design of products, Design for safety, Vision and Illumination design: Climate, Noise, Motion, Sound and Vibration, Product Costing.	10	22
3	Product Development Processes and Product Planning: A Generic development process, concept development, the front end process, adopting the generic product development process, The Product Planning Process,	05	10
4	Product Analysis and Material Selection: Tools and charts used for product analysis like bill of materials, gozinto chart, performance characteristics of materials, material selection process, sources of information on material properties, economics of materials, evaluation methods for material selection	06	12
5	Identifying Customer Needs: Customer Satisfaction, Voice of customer, Customer Populations,	08	18

	Types of customer needs, Customer need models. Gathering Customer needs: Need Gathering Methods, Conducting Interviews: Like Dislike Method, Articulated-Use Method, Product feel and Industrial Design, Organizing and Prioritizing Needs: Grouping Interpreted needs, Affinity Diagram, Determining need Importance, Customer use patterns, Customers need Documentation.		
<b>6</b>	Value Engineering: Definition, Value Engineering Function: Approach of Function, Evaluation of Function, Determining Function, Classifying Function, Evaluation of costs, Evaluation of Worth, Determining Worth, Evaluation of Value, FAST Diagramming	<b>08</b>	<b>18</b>
<b>7</b>	Case Studies on Product Design Development and Value Engineering	<b>04</b>	<b>10</b>
	<b>Total</b>	<b>46</b>	<b>100%</b>

**Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>5</b>	<b>10</b>	<b>20</b>	<b>20</b>	<b>5</b>	<b>10</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**References:**

1. Product Design, by Kevin Otto, Kristin wood, Pearson Education Inc.
2. Product design and development, by K.T. Ulrich and S.D. Eppinger, Tata McGraw Hill
3. Product Development, by Chitale & Gupta, Tata McGraw Hill
4. The Mechanical Process Design, by David Ullman, McGraw hill Inc
5. Engineering Design Process, by Yousef Haik, T M M Shahin, Cengage Learning
6. Product design & process Engineering by Niebel & deeper, McGraw hill
7. Value Management by Heller, Addison Wasley
8. Value Engineering A how to Manual S. S. Iyer, New age International Publishers
9. Value Engineering : A Systematic Approach by Arthur E. Mudge - Mc GrawHill
10. New Product Development Timjones. Butterworth Heinmann, Oxford.
11. Value Engineering A how to Manual S. S. Iyer, New age International Publishers
12. Value Engineering : A Systematic Approach by Arthur E. Mudge - Mc GrawHill
13. Assembly automation and product design – by Geoffrey Boothroyd, CRC Taylor & Francis

**Course Outcome:**

1. Confidence to create new product based on mechanical design engineering.
2. Students will have knowledge of all mechanical aspects of product design by incorporating concept, creativity, structural, manufacturing, esthetic etc.
3. Students will have ability to solve open-ended problem belongs to design engineering that meet the requirements.

4. Students will have ability to understand contemporary issues and their impact on provided solution.

**List of Experiments:**

1. To study the types of design and engineering design process.
2. Case study on material selection of any existing product having one/two component(s).
3. Case study on shape selection.
4. To evaluate the any existing simple product through process selection criteria.
5. Case study of any one component through design for machining aspects.
6. Apply different techniques for Product design and put them in Drawing sheets
7. Students can do practices on different issues on voice of customer
8. Case problems on Value engineering

**Design based Problems (DP)/Open Ended Problem:**

Propose the part/product for specified functional requirement by using engineering design aspects and prepared the report on same.

**(Hints:** It is expected that student should apply the phases of engineering design process like; concept generation and its development process, conceptual design, shape selection, material selection, process selection, structural aspects, design for manufacturing, human factors, environment factors etc.)

**Major Equipment:**

Not mandatory

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

<http://www.nptel.ac.in>  
<http://www.ocw.mit.edu>

**ACTIVE LEARNING ASSIGNMENTS:**

Preparation of power-point slides/Canvases/Drawing sheets with different color pens for graphical representation of for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.