GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL ENGINEERING (19)
PRODUCT DESIGN AND VALUE ENGINEERING
SUBJECT CODE: 2181913
B.E. 8TH 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:

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Credits</th>
<th>Examination Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory Marks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESE (E)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA (M)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ALA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESE (V)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA (I)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>70</td>
<td>20</td>
<td>150</td>
</tr>
</tbody>
</table>

Content:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Content</th>
<th>Total (Hours)</th>
<th>Weightage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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.</td>
<td>05</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>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,</td>
<td>05</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>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</td>
<td>06</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Identifying Customer Needs: Customer Satisfaction, Voice of customer, Customer Populations,</td>
<td>08</td>
<td>18</td>
</tr>
</tbody>
</table>

6  Value Engineering:  
08  18

7  Case Studies on Product Design Development and Value Engineering  
04  10

Total  46  100%

Suggested Specification table with Marks (Theory):

<table>
<thead>
<tr>
<th>Distribution of Theory Marks</th>
<th>R Level</th>
<th>U Level</th>
<th>A Level</th>
<th>N Level</th>
<th>E Level</th>
<th>C Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>20</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

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:

6. Product design & process Engineering by Niebel & deeper, McGraw hill
7. Value Management by Heller, Addison Wasley
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.