GUJARAT TECHNOLOGICAL UNIVERSITY

MANUFACTURING ENGINEERING (34)
PRODUCT DESIGN & DEVELOPMENT
SUBJECT CODE: 2183408
B.E. 8TH SEMESTER

Type of course: Under Graduate

Prerequisite: NIL

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	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	2	0	5	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total (Hours)	Weightage (%)
1	Design Fundamentals: The importance of engineering design – types of design –the design process – relevance of product lifecycle issues in design –designing to codes and standards- societal considerations in engineering design –generic product development process – various phases of product development-planning for products –establishing markets- market segments- relevance of market research.	**06**	**16**
2	Customer oriented design & Societal Considerations : Identification of customer needs- customer requirements- Quality Function Deployment Product Design Specifications- Human Factors in Design – Ergonomics and Aesthetics. Societal consideration - Contracts – Product liability – Protecting intellectual property – Legal and ethical domains – Codes of ethics - Ethical conflicts – Environment responsible design-future trends in interaction of engineering with society.	**10**	**24**
3	Material selection processing and Design: Material Selection Process – Economics – Cost Vs Performance – Weighted property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design for Manufacture – Design for Assembly –Designing for castings, Forging, Metal Forming, Machining and Welding – Residual Stresses – Fatigue, Fracture and Failure.	**08**	**16**

4	Design Methods: creativity and problem solving- creative thinking methods- generating design concepts - systematic methods for designing –functional decomposition – physical decomposition – functional representation – morphological methods-TRIZ- axiomatic design. Decision making theory- utility theory –decision trees –concept evaluation methods.	**10**	**24**
5	Industrial Design concepts: human factors design –user friendly design – design for serviceability – design for environment – prototyping and testing – cost evaluation –categories of cost –overhead costs – activity based costing – methods of developing cost estimates – manufacturing cost –value analysis in costing.	**08**	**20**
	Total	**42**	**100%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**10**	**20**	**20**	**5**	**10**

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, McGrawhill Inc
5. Engineering Design Process, by Yousef Haik, T M MShahin, 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 Tutorials:

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. To evaluate the any existing simple product through process selection criteria.
4. Case study of any one component through design for machining aspects.
5. Apply different techniques for Product design and put them in Drawing sheets
6. Students can do practices on different issues on Industrial design

Design based Problems (DP)/Open Ended Problem:
Propose the part/product for specified functional requirement by using engineering design aspectsand prepared the report on same.

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.