Lok Jagruti Kendra University
University with a Difference

Diploma in Mechanical Engineering

LJ Polytechnic

Course Code: 025060508

Product Design and Development

Programme / Branch Name	Diploma in Mechanical Engineering					
Course Name	Product Design and Development				**Course Code**	025060508
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Strength of materials
- ✓ Design of Machine Elements
- ✓ Computer-Aided Design
- ✓ Manufacturing Processes
- ✓ Machine tools and Techniques

3. 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. Impart skills to students for applying Design innovation, Design for quality and Design optimization for designing new products.

4. Objectives

- ✓ To enable the students to gain knowledge on the process of product development based on customer needs.
- ✓ To enable the students to understand the standard procedure available for concept development.
- ✓ To facilitate the students to use design process and level of design & development.
- ✓ To make the students to familiarize with the Intellectual property rights.
- ✓ Identify key concepts and principles concerning the activities and competencies involved in new product development.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1.	**Introduction**	1.1. Introduction to Product Development 1.1.1. Need for developing products 1.1.2. Product development Stages 1.1.3.Identification of new product & market 1.2. Product life cycle 1.2.1. Concept of Product life Cycle 1.2.2. Product Life Cycle Stages and their importance 1.3. Aesthetic look of Product 1.4. Strategic Planning and Opportunity	• To learn about thinking and innovative skills • To learn about different stages of new product development • To learn about different creative thinking methods for development	20	10
2.	**Identification of Customer Need**	2.1. The Process of Identifying Customer Needs 2.2. Gather Raw Data from Customers 2.3. Interpret Raw Data in Terms of Customer Needs 2.4.Organize the Needs into a Hierarchy 2.5. Establish the Relative Importance of the Needs 2.6. Reflect on the Results and the Process	• To study about need of customers • To learn about different methods of market survey	20	8
3.	**Creative Thinking & Concept Development**	3.1. Creative Thinking 3.1.1. Need of Creativity 3.1.2. Creative thinking method 3.1.3. Generating design concepts 3.1.4. Brainstorming 3.1.5. Morphological analysis 3.2. Concept generation 3.2.1. Need of Concept generation	• To learn about different creative thinking methods for development • To learn about Concept development stages of product • To learn about various methods of Concept selection and testing	20	8

		3.2.2. Various steps in concept generation 3.3. Concept Selection 3.3.1. Various steps in concept selection 3.4. Concept Testing 3.4.1.Various steps in concept testing			
4.	**Design Process**	4.1. Response and Interpretation. 4.2. Product Architecture 4.3. Platform planning 4.4. Design for serviceability 4.5. Design for environment 4.6. Prototyping and testing 4.7. Design for Quality - Reliability, Durability 4.8. Test and Inspection 4.9. Maintenance & warranty. 4.10. Intellectual Property Rights	• To Study about Product design stages • To learn about different methods of designing of product • To learn about Intellectual property rights about product	20	8
5.	**Planning for Manufacturing & Management**	5.1. Selection of manufacturing material and Processes 5.2. Design management 5.3. Project planning control 5.4. Establish and agree the work requirements with appropriate people 5.5. Utilize time effectively 5.6. Use resources correctly and efficiently	• Having design thinking Capability • Having a clear understanding of the subject related concepts and of contemporary issues and apply them to identify, formulate and analyze complex engineering problems • Having an ability to use techniques, skills, resources and modern engineering and IT tools necessary for engineering practice.	20	8
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/Programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Case studies related to Characteristics of successful product development, Design and development of products	Product development, Design, research, innovation	4
2.	Case studies related to different Development Processes and Organizations.	Sketch up, Drawing	4
3.	Case studies related to the product planning process, identify opportunities	Planning, need, Creative thinking	4
4.	Case studies related to Identifying Customer Needs.	Market research, user friendly product, Communication	4
5.	Case studies related to Concept Generation, Concept Selection, and Concept Testing.	Concept development, knowledge, technology	4
6.	Case studies related to Design for Manufacturing.	Design and Manufacturing attributes	4
7.	Case studies related to Prototyping, Product Development Economics.	Management, development, prototyping	4
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1	Introduction	16	35	25	8	8	8
2	Identification of Customer Needs	12	29	29	6	12	12
3	Concept Development	7	26	26	20	7	14
4	Industrial Design Process	16	29	29	6	6	14
5	Planning For Manufacturing and Management	18	35	29	6	6	6

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Product design and development "Karl T Ulrich; Steven D Eppinger" New York, McGraw-Hill Education, 2016
2) Product Design Kavin N Aotto, Kritine L Wood, Prentice Hall Publications 2013

9. Reference Books

1) G. E. Dieter, Engineering Design, McGraw – Hill International, 2013
2) Ken Hurst, Engineering Design Principles, Elsevier Science and Technology Books, 2014.
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
1) A.K. Chitale, R.C. Gupta, Product Design and Manufacturing, Sixth Edition, Prentice –Hall of India, 2013

10. Open Sources (Website, Video, Movie)

1) https://onlinecourses.nptel.ac.in/noc17_me16/preview
2) http://www.electrical4u.com/digital-electronics.htm
3) http://www.technologystudent.com/elec1/dig1.htm
4) https://www.edx.org/course/product-design-delft-design-approach-delftx-dda691x-1