

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**  
**HYDERABAD CAMPUS**  
**ACADEMIC-GRADUATE STUDIES AND RESEARCH DIVISION**  
**FIRST SEMESTER 2023-2024**  
**COURSE HANDOUT (PART-II)**

**Date: 28/07/2023**

In addition to Part-I (General Handout for all courses appended to the timetable), this portion gives further specific details regarding the course.

**Course Code : DE G531**  
**Name of the Course : PRODUCT DESIGN**  
**Instructor-In-Charge : Dr. NITIN KOTKUNDE (Theory)**  
**Mr. AARAJOO JAIMIN (Lab)**

**I. Course Description:** Introduction to creative design; user research and requirements analysis, product specifications, Computer Aided Design; standardization, variety reduction, preferred numbers and other techniques; modular design; design economics, cost analysis, cost reduction and value analysis techniques, design for production; human factors in design: anthropometric, ergonomic, psychological, physiological considerations in design decision making; legal factors, engineering ethics and society

**II. Scope and Objective of the Course:**

This course is designed to impart the knowledge required to develop a new product – understand the opportunity, develop and implement a concept. After the successful completion of this course, students shall be able to understand and implement the various processes, tools and techniques required for a product design and development like product specification development; product architecture; concept generation, concept selection, concept testing and embodiment; industrial design; design for X; analytical and numerical models.

**III. Textbook (TB):**

1. Kevin Otto and Kristin Wood, “Product Design: Techniques in Reverse Engineering and New Product Development”, 2004, Pearson Education, New Delhi

**IV. Reference Books (RB):**

1. Karl T. Ulrich and Steven D. Eppinger, “Product Design and Development”, Tata McGraw-Hill Edition, 5<sup>th</sup> edition, New Delhi, 2016
2. George Dieter, Linda Schmidt, “Engineering Design” Tata McGraw-Hill Edition, 4<sup>th</sup> edition, New Delhi, 2009
3. David G. Ullman, “The Mechanical Design Process”, McGraw-Hill Inc., Singapore, 1992
4. N. J. M. Roozenburg, J. Eekels, Roozenburg N. F. M., “Product Design: Fundamentals and Methods”, John Wiley and Sons, 1995

**V. Course Plan (Theory)**

Lecture No.	Topic	Learning Objectives	Source
1-2	Journeys in Product Development	Introduction to product design, Modern product development process, Examples of product development processes	TB: Chapter 1
3-4	Product Development Process tools	Product development teams, Product development planning	TB: Chapter 2
5-6	Scoping Product Developments: Technical and Business Concerns	Determining what to develop, Mission statement, Technical questioning, Business case analysis, Design drivers	TB: Chapter 3
7-8	Understanding customer needs	Customer satisfaction, Gathering customer needs, Organizing and prioritizing customer needs	TB: Chapter 4
9-10	Establishing product function	Functional decomposition, Simple approach, Black box method, functional modeling	TB: Chapter 5

11-12	Benchmarking and establishing engineering specifications	Benchmarking approach, Support tools for benchmarking, Product specifications	TB: Chapter 7
13-14	Product architecture	Architecture types, Product modularity, Clustering method, Advanced functional method	TB: Chapter 9
15-16	Generating concepts	Concept generation process, Institutive methods, Direct search methods, Morphological analysis	TB: Chapter 10
17-18	Concept selection	Concept selection process, Pugh concept selection, Measurement theory, Numerical concept scoring	TB: Chapter 11
19-20	Concept Embodiment	Refining geometry and layout, System modelling, Few case studies	TB: Chapter 12
21-22	Configuration design	Generating alterative configurations, Best practices for configuration design	RB 2: Chapter 8
23-24	Parametric design	Steps for parametric design, Failure Mode Effective Analysis (FMEA)	RB 2: Chapter 8
25-27	Design for manufacturing and assembly	Guidelines of design for manufacturing and assembly, Manufacturing cost analysis	TB: Chapter 14
28-29	Design for Environment	Design guidelines, Life cycle assessment, Techniques to reduce environmental impact	TB: Chapter 15
30-31	Detail Design	Introduction, final design review, Product life cycle management	RB 2: Chapter 9
32-33	Material selection	Performance characteristics of materials, Material selection process, Material performance indices, Recycling and material selection.	RB 2: Chapter 11
34-35	Industrial Design	Need for industrial design, Industrial design process, assessing the quality of industrial design	RB 1: Chapter 10
36-37	Physical Prototypes and Models and Experimentation	Prototype and model basics, Principles of prototyping, Rapid prototyping	TB: Chapter 17
38-39	Risk, reliability, safety	Reliability theory, Design for reliability and safety	RB 2: Chapter 14
40-41	Quality, Robust design and cost evaluation	Quality control and assurance, design guidelines for robust design	TB: Chapter 19 RB 2: Chapter 15
42-43	Legal and ethical issues in engineering design	Tort law, whistle-blowing, ethical behaviour of engineers, Product liability	RB 2: Chapter 16

### Course Plan (Lab)

Practical No.	Experiment Title
1-2	Understanding of the basics of CAD modelling
3-4	Part modelling and Assembly
5-6	Basics of Design for Manufacturing and Assembly (DFMA) software
7-8	Design for Assembly Analysis
9-10	Design for Manufacturing Analysis
11	Combined DFMA analysis for a particular product
12-13	Basics of Design for Environment using Simpro software
14	Reverse engineering analysis

**VI. Evaluation Scheme and Schedule:**

EC No.	Evaluation Component	Duration (min)	Weightage (%)	Date, Time & Venue	Nature of Component
1.	Mid-semester Exam	90	20	10/10 - 11.30 - 1.00PM	Closed Book
2	Lab Component	-	20	To be announced by IC	Continuous Assessment (Open Book)
	Classroom Interaction Tests (CIT)		10		
	Project and case studies	-	10		
3	Comprehensive Exam	180	40	09/12 FN	Partially closed book (20% - Closed Book, 20% - Open Book)

**Course Project:** A group of students will work together on the systematic design and development of any chosen commercial product.

**VII. Chamber Consultation Hour:** It will be announced in the class.

**VIII. Notices concerning the course:** All notices concerning the course are displayed on CMS only.

**IX Make-up Policy:** No makeup for Classroom Interaction Test (CIT), lab component evaluation. Makeup for Mid-semester tests, comprehensive examinations, project presentations and case study submissions will be given for genuine illness cases with prior permission.

**X. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor-In-Charge  
DE G531**