FIRST SEMESTER 2020-2021
Course Handout

Date: 16-08-2020

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.	: **DE G531**
Course Title	: **PRODUCT DESIGN**
Instructor-in-Charge	: **Dr. NITIN KOTKUNDE (HYDERABAD CAMPUS)**
	: **Dr. G. KARTHIKEYAN (GOA CAMPUS)**
Lab Instructor	: *Miss. GAURI MAHALLE (HYDERABAD CAMPUS)*

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

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.

Textbooks:

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

Reference books

1. Karl T. Ulrich and Steven D. Eppinger, "Product Design and Development", Tata McGraw-Hill Edition, 5th edition, New Delhi, 2016
2. George Dieter, Linda Schmidt, "Engineering Design" Tata McGraw-Hill Edition, 4th 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

Course Plan:

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 behavior of engineers, Product liability | RB 2: Chapter 16 |

Practical No.	Experiment Title
1	Case study on problem definition and analysis of customer requirements
2	Case study on defining a mission statement, design parameters and development of House of Quality
3	Case study on functional decomposition using generic black box method
4	Implementation of different concept generation techniques for concept development
5	Concept evaluation and product architecture building
6	Parametric Design: Material selection, Process selection, Bill of material, Failure modes and effects analysis (FMEA)
7	Online demonstration on Reverse engineering and 3D printing setup
8	Introduction to DFA: operational library, DFMA product worksheet/Redesign, Minimum part Criteria, DFA index and case study for DFA
9	Introduction to DFM: Defining Material, Defining process tree, Selection of machines, order of material, case study for DFM
10	DFMA: cost estimation vs life volume, Sustainability indicators, case study for DFM+DMA
11	Life Cycle Assesment: Introduction to SimaPro/OpenLCA, case study by SimaPro
12	Final lab/project demonstration – Oral Presentations

Evaluation Scheme:

Component	Duration (Minutes)	Weightage (%)	Date & Time	Nature of Component
Test-1	30	15	September 10 – 20, 2020[*] (During scheduled class hour)	Open Book
Test-2	30	15	October 09 – 20, 2020[*] (During scheduled class hour)	Open Book
Test-3	30	15	November 10 – 20, 2020[*] (During scheduled class hour)	Open Book
Lab & Case studies	-	15	Continuous assessment	Open Book
Surprise Quizzes	-	5	Continuous assessment	Open Book
Comprehensive Examination	120	35	08/12 FN	Open Book

[*]**The exact date and time for tests will be announced on CMS.**

- **Chamber Consultation Hour:** Each Friday between 3.00 PM – 4.00 PM (online mode) **Google meet link: meet.google.com/dvx-objv-pkk**
- **Lecture class google meet link: meet.google.com/prd-befg-hyi** (Tuesday, Thursday, Friday, 10.00 AM – 11.00 AM)
- **Lab google class room link: meet.google.com/wji-cqsa-qvr**

- **Notices:** All notices concerning the course are displayed on CMS only.
- **Make-up Policy:** No makeup for surprise Quizzes. Makeup for tests and comprehensive examination and other evaluation component will be given for genuine reason with prior permission. Student should always make sure about good internet connectivity and other relevant accessories for attending online classes and labs
- **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.

Nitin Kotkunde

INSTRUCTOR-IN-CHARGE

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