

IV B.Tech I Semester

15AME57-PRODUCT DESIGN

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**Course Objectives**

- To Design products creatively while applying engineering design principles
- To Apply principles of human factors, ethics and environmental factors in product design
- To Work in groups or individually in their pursuit of innovative product design
- To implement value design for optimum product cost.

**UNIT I**

**PRODUCT DEVELOPMENT PROCESS:** General problem solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behaviour.

**UNIT II**

**TASK CLARIFICATION:** Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and Extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

**UNIT III**

**CONCEPTUAL DESIGN:** Steps in Conceptual Design. Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem formulation, Identifying the essential problems from the requirements list, Establishing functions structures, Overall function, Breaking a function down into sub-functions. Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures. Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of developing concepts. Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

**UNIT IV**

**EMBODIMENT DESIGN** - Steps of Embodiment Design, Checklist for Embodiment Design  
Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force transmission, Principle of Division of Tasks, Principle of Self-Help, Principle of Stability and Bi-Stability, Principle of Fault-Free Design Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design for Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards. Evaluating Embodiment Designs.

**UNIT V**

**MECHANICAL CONNECTIONS, MECHATRONICS AND ADAPTRONICS:** Mechanical Connections - General functions and General Behaviour, Material connections, Form Connections, Force connections, Applications. Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solutions, Examples. Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples.

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**Course Outcomes**

- Ability to apply knowledge of basic science and engineering fundamentals
- Ability to undertake problem identification, formulation and solution
- Understanding of the principles of sustainable design and development
- Understanding of professional and ethical responsibilities and commitment to them

**TEXT BOOKS:**

1. Engineering Design: G.Pahl; W. Beitz, et.al, Springer International Education 2010.
2. Product Design And Development: Kevin Otto: K. Wood Pearson Education 2013.

**REFERENCE BOOKS:**

1. Product Planning Essentials: Kenneth B. Kahn, Yes dee Publishing 2011.
2. Product Design and Development: K.T. Ulrich TMH Publishers 2011.

