VIT BHOPAL www.vitbhopal.ac.in	**Engineering Design and Modelling**	**Course Type**	**LTP**
Course Code:	**MEE2014**	**Credits**	**4**
Prerequisite:			

Course Objectives:

- To enhance the creative design knowledge and procedural plan.
- To understand the iterative engineering design process.
- To understand reliability, safety and regulation concerns in the product design.
- To develop written and oral communication skills.
- To develop professional behaviour, teamwork and leadership skills.
- To understand the importance of sustainable design solutions.

Course Outcomes (CO):

Students will be able to

CO1. Learn and apply the concept of engineering design and design thinking.

CO2. Understand the detailed design approaches knowledge in real-time and societal context

CO3. Understand the concept of sustainability and its implications.

CO4. Effectively articulate ideas, Work as a team, develop professional behaviour, teamwork and leadership skills.

CO5. Learn about Mechanical properties and modelling of various parts.

CO	Topics to be discussed	Hrs.
CO1	**Engineering Design Process and Design Thinking for Innovation** Design History; Dieter Rams Principles of Good Design; Overview of Engineering Design Process: Problem Formulation, Concept generation, Project Planning and Design Making; Human Centered Design (HCD); Design Thinking as Mindset, Process and Toolbox., Enhancing Design Thinking Through, Empathy, Interviewing, Questioning & Brainstorming Tools for Design Thinking: Mind Mapping, Innovation Flowchart - Question ladder – SCAMPER (for products) Journey Mapping,	**10**
CO2	**Engineering Design Approaches**: Professional and societal Context of Design; Different types of design – Conceptual, Embodiment designs and Detailed designs - Identification and Specifications, Standards and codes. Design Features - Design for Aesthetics, Production, Standards, Minimum risk, Ease	**10**

	of maintenance, Quality, Minimum cost and Optimum Design. Usability - User requirement; User experience; Usability testing; Customer Co-creation	
CO3	**Sustainable Design and Communication** Concepts of sustainable development, Sustainable design principles - Design for Environment; Life Cycle Assessment; Models of sustainable design- Biomimicry, Eco Design, Recycling; Social Innovation.	**8**
CO4	**Metaphors and Prototyping** Metaphor method: Theory and methodology of concept generation, Blend method & Thematic Method. Articulating design ideas: Storytelling; Introduction to Sketching & Dynamic Diagrams; K Scripts, Introduction to Prototyping & Visualization Design Tools	**5**
CO5	**Materials and Modelling** Classification of engineering material, Composition of Cast iron and Carbon steels, Alloy steels their applications, definition of stress, strain and its types, Poisson's ratio, Stress-strain diagram of ductile and brittle materials, Hooks law and modulus of elasticity, Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability etc. of materials, modelling of objects (Shaft, water glass, cylinder (hollow/solid), convergent/divergent nozzle etc.)	**10**
	Guest Lecture on Contemporary Topics	**2**
		45

Text books:

1.	Huge Jack, "Engineering Design, Planning, and Management" Academic Press, 2013.
2.	George E Dieter and Linda Schmidt "Engineering Design" Fifth edition, McGraw-Hill, 2012

Reference Books, Web reference:

1.	Barry Hyman, "Fundamentals of Engineering Design", 2nd edition, Pearson Education, 2003.
2.	Tracy Bhamra, Vicky Lofthouse, "Design for Sustainability: A Practical Approach", Taylor and Francis, 2017.
3.	Walter Brenner, Falk Uebernickel, "Design Thinking for Innovation: Research and Practice", Springer, 2016.
4	Jorge Paricio, Perspective sketching: Freehand and Digital Drawing techniques for Artists & Designers, Rockport Publishers
5	Dennis K. Lieu, Sheryl Sorby, Visualization, Modelling, and Graphics for Engineering Design, Delmar Cengage Learning, 2nd Edition

6	R.K. Bansal, Strength of Materials: Mechanics of Solids, 6th Edition, Laxmi Publication, 2018	
7	Callister's, Materials Science and Engineering, 10th Edition, 2019	
Recommendation by the Board of Studies on		
Approval by Academic council on:		
Compiled by:		Dr. Balaguru S.

Proposed experiment List

1. Exposure and training of students in fundamental concepts of sketching based visual representations.
2. Hand sketching of general products (water bottle, mouse, laptop stand, mobile stand, travel bag, etc)
3. Hand sketching of products of your discipline.
4. Bio-inspired study (sketching of leaves, observation of bio-mimic structures etc).
5. The students need to develop product prototypes / models using thermocol, wood and Plaster of Paris etc.
6. Creative design on paper (Origami, Collage) with waste material.
7. Digital design of various products (poster, scientific illustration, mind maps, empathy map etc).
8. Design of any product using CAD software