

<b>COURSE TITLE</b>	<b>DESIGN ENGINEERING</b>
<b>COURSE CODE</b>	<b>01EC0119</b>
<b>COURSE CREDITS</b>	<b>1</b>

**Objective:**

- 1 The objective of this course is to introduce first-semester engineering students to the fundamentals of design thinking and innovation through hands-on, activity-based learning. It aims to cultivate a problem-solving mindset by encouraging students to observe their surroundings, empathize with real users, and identify meaningful challenges from everyday life. Through a structured design process involving problem definition, ideation, prototyping, and validation, students will develop creativity, critical thinking, and collaborative skills. The course provides a non-technical, multidisciplinary platform for students to express and present their ideas through low-cost physical or digital prototypes, thereby laying a strong foundation for engineering design and innovation in future coursework.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply design thinking to identify user-centric problems and communicate solutions through presentations, storytelling, and visual documentation. (Bloom's Level: Apply)
- 2 Analyze user needs through observation and empathy techniques to discover real-world challenges. (Bloom's Level: Analyze)
- 3 Evaluate design solutions based on user feedback, feasibility, and effectiveness to refine and improve the final outcome. (Bloom's Level: Evaluate)
- 4 Generate creative ideas using ideation tools and develop low-fidelity prototypes to represent design concepts. (Bloom's Level: Create)

**Pre-requisite of course:** Curiosity and willingness to explore real-world problems, Basic communication and interpersonal skills, Openness to teamwork and collaboration, No technical background required.

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
0	0	2	0	0	0	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
<b>Total Hours</b>		

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	<b>Introduction to Design Thinking</b> Orientation to course, ice-breakers, introduction to empathy-based design. , Group formation. Case studies from everyday life.	2
2	<b>Observation &amp; Empathy</b> Identify problems from campus, home, society. , Use empathy map and interaction logs. , Field observation or online interviews.	4
3	<b>Problem Definition &amp; Framing</b> Problem statement framing using “Point-of-View” and “How Might We...” techniques., Use Empathy Canvas as design tool.	4
4	<b>Ideation &amp; Creativity Tools</b> Conduct brainstorming, mind mapping, SCAMPER. , Use Ideation Canvas for documenting ideas. Idea clustering and selection.	4
5	<b>Prototyping (Low Fidelity)</b> Develop physical or digital prototypes using paper, clay, cardboard, TinkerCAD, or Canva. , Conduct peer feedback.	6
6	<b>Validation &amp; Iteration</b> Present design, gather user/instructor feedback, improve based on feedback., Build version 2 of the prototype.	4
7	<b>Presentation &amp; Reflection</b> Final team presentations, posters, reflective journals, Product Development Canvas can be used to capture development strategies	4
<b>Total Hours</b>		<b>28</b>

### Textbook :

- 1 The Design of Everyday Things, Don Norman, Basic Books, 2013
- 2 Design Thinking for Students: A Creative Approach to Problem Solving, M.J. Pontis, International Society for Technology in Education (ISTE), 2021

### References:

- 1 Change by Design: How Design Thinking Creates New Alternatives for Business and Society, Change by Design: How Design Thinking Creates New Alternatives for Business and Society, Tim Brown, HarperBusiness, 2009
- 2 Creative Confidence: Unleashing the Creative Potential Within Us All, Creative Confidence: Unleashing the Creative Potential Within Us All, Tom Kelley and David Kelley, Crown Business, 2013

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
5.00	5.00	30.00	15.00	15.00	30.00

### **Instructional Method:**

- 1 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and basis on deliverables term work marks shall be given.
- 2 Viva-voce examination will be conducted at the end of the semester for evaluation of overall understanding of students.
- 3 The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, Flipped class, Project based learning, Collaborative learning, MOOCs etc. for effective teaching.
- 4 Suggested Deliverables are: Empathy Map, Ideation Canvas, Sketches / Storyboards, Prototype Photos / Videos, Presentation Slides
- 5 Tools & Materials are: (1) Physical: Paper, cardboard, glue, sketch pens, scissors, LEGO blocks, thermocol, play dough, (2) Digital: Canva, TinkerCAD, Figma, PowerPoint, Miro (for online mind maps), (3) Templates: Empathy Map, Ideation Canvas, Product Development Canvas.

### **Supplementary Resources:**

- 1 Stanford d.school Design Thinking Bootleg Toolkit – Free PDF download : <https://dschool.stanford.edu/resources/design-thinking-bootleg> – Practical methods and tools for each phase of the design thinking process.
- 2 IDEO Design Kit – <https://www.designkit.org> – A beginner-friendly online guide to human-centered design with case studies and tutorials.
- 3 GTU Design Engineering Canvases (Empathy, Ideation, Product Development) – Available through GTU’s Innovation Council resources or faculty portals.