CH/CE/EE/ME155	DESIGN THINKING	L	T	P	C	Int	Ext
		-	1	2	2.0	40	60

Semester I [First Year]

COURSE OUTLINE:

This course introduces first-year engineering students to the philosophy, mindset and methodology of Design Thinking as a human-centered approach to innovation and problem solving. Students progress through the five stages of Design Thinking - Empathize, Define, Ideate, Prototype and Test - applying them to real engineering and societal problems through hands-on activities, culminating in the design, prototyping and presentation of a working solution.

COURSE OBJECTIVES:

1. To introduce the origin, mindset and stages of Design Thinking and distinguish it from traditional problem-solving approaches.
2. To develop skills in empathizing with users and framing problems through structured research and definition techniques.
3. To build competence in divergent and convergent ideation techniques for generating and selecting innovative solutions.
4. To enable rapid prototyping and iterative user testing for validating design solutions.
5. To develop the ability to implement, pilot, iterate and effectively communicate a design solution as a team.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO	Course Outcome	RBTL
CO1	explain the mindset, stages and benefits of Design Thinking and apply empathy methods to identify user needs.	Understand (BL2)
CO2	synthesize user research using empathy maps, personas and affinity mapping to frame a clear problem statement.	Create (BL6)
CO3	generate and converge on innovative ideas using brainstorming, SCAMPER and related ideation techniques, and develop an MVP.	Apply (BL3)
CO4	build low-fidelity prototypes and conduct user testing to collect feedback and iteratively improve the solution.	Analyze (BL4)
CO5	implement, pilot-test and communicate a final design solution, demonstrating sustainability and ethical awareness.	Analyze (BL4)

CO - PO / PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	-	-	-	1	-	1	2	-	1	-	-
CO2	2	3	1	-	-	1	-	2	2	2	1	-	-
CO3	1	3	3	1	1	-	-	1	1	-	2	-	-
CO4	1	2	3	2	2	-	-	2	1	-	2	-	-
CO5	1	1	2	1	1	2	-	3	3	-	2	-	-

UNIT I

Introduction to Design Thinking & Empathy

Origins and mindset of Design Thinking; Human-centered Design; Need and benefits; Five stages overview; Design Thinking vs. traditional problem solving; Innovation fundamentals; Types of innovation; Sustainable business model examples; Engineering case studies.

Unit Learning Outcomes:

Opportunity identification, empathy interview and design preparation.

Practical Examples for In-Class Explanation:

1. Foundations of Design Thinking & Innovation (Use ChatGPT/Claude to research and summarize real-world case studies of Design Thinking-driven innovation for discussion.).

2. Applying Empathy Methods for User Research (Use an AI transcription tool (e.g., Otter.ai) to transcribe empathy interviews, then use ChatGPT/Claude to identify recurring patterns and insights.)

UNIT II

Problem Framing

Empathize and Define: User research methods; Observation; Interviews; 5 Whys; 5W+H; Stakeholder mapping; Empathy map; Persona building; Affinity mapping; Point of View (POV); How Might We (HMW); Problem statement.

Unit Learning Outcomes:

Apply empathy and define methods.

Practical Examples for In-Class Explanation:

Define Phase - Synthesizing Data to Finalize Problem Statement (Use AI-assisted affinity mapping boards (Miro AI / FigJam AI) to cluster research data, and ChatGPT/Claude to draft and refine POV and HMW statements).

UNIT III

Ideation

Divergent and Convergent Thinking; Brainstorming; Six Hats Technique; Mind mapping; SCAMPER; Creative Matrix; Storyboarding; Idea selection matrix; Mock-ups; Minimum Viable Product (MVP).

Unit Learning Outcomes:

Generate ideas and develop prototype.

Practical Examples for In-Class Explanation:

1. Divergent Ideation Techniques (Use ChatGPT/Claude or Microsoft Copilot for AI-assisted brainstorming to rapidly expand and diversify the idea list.)

2. Converging and Evaluating Ideas (Use AI-enabled spreadsheet add-ins (e.g., Copilot in Excel) to build and score an objective idea-selection matrix)

3. Minimum Viable Product (MVP) Development and Testing (Use AI prototyping/design tools (e.g., Uizard, Canva AI) to quickly generate MVP mock-ups and visuals for testing)

UNIT IV

Prototyping

Testing and Iteration: Rapid Prototyping; User testing methods; Think-aloud protocol; Feedback collection; Iterative improvement; Pilot implementation; Measuring success; Storytelling; Pitch preparation.

Unit Learning Outcomes:

Generate ideas and develop prototype. .

Practical Examples for In-Class Explanation:

1. Low-Fidelity Prototype Development and User Testing (Use Canva AI/Uizard for rapid low-fidelity mock-ups and AI survey tools (Google Forms AI, Typeform AI) to structure usertesting feedback forms)

2. Conducting a Pilot Test to Collect Feedback (Use AI sentiment-analysis tools to analyze open-ended pilot feedback and surface common themes.)

3. Iterating and Improving Based on Test Feedback (Use ChatGPT/Claude to synthesize feedback themes and suggest concrete design iterations.)

UNIT V

Testing, Iteration & Communication

Implementation and Innovation Project: Final prototype demonstration; Design communication; Sustainability and ethics; Project documentation; Team presentation; Reflection and continuous improvement.

Unit Learning Outcomes:

Final project submission and presentation. Student Exercises:

Practical Examples for In-Class Explanation:

Evolve Phase - Implementing and Sustaining Innovation (Use AI presentation tools (Canva AI, Gamma.app) to build the final pitch deck, and ChatGPT/Claude to refine project documentation and the storytelling narrative.)

LEARNING RESOURCES:

TEXT BOOK(s):

1. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Business.
2. Thomas Lockwood, "Design Thinking: Integrating Innovation, Customer Experience and Brand Value", Allworth Press.

REFERENCE BOOK(s):

1. Don Norman, "The Design of Everyday Things", Basic Books.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", Wiley.
3. Michael Lewrick, Patrick Link, Larry Leifer, "The Design Thinking Playbook", Wiley.
4. Jeanne Liedtka, Tim Ogilvie, "Designing for Growth: A Design Thinking Tool Kit for Managers", Columbia University Press.

WEB RESOURCES:

1. NPTEL course on Design Thinking - A Primer (nptel.ac.in).
2. IDEO Design Kit - Human-Centered Design Toolkit (designkit.org).
3. Stanford d.school - Design Thinking Bootleg and Resources (dschool.stanford.edu).