GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: ALL

Course / Subject Code : BE01000071

Course / Subject Name : Design Thinking

W. e. f. Academic Year:	2024-25
Semester:	Ist Year
Category of the Course:	ESC

Prerequisite:	**NIL**
Rationale:	This course is designed for students from all disciplines who seek to understand design thinking for brand, product, and service development. It covers essential concepts, methods, and techniques of design thinking, empowering students to drive innovation in both business and the social sector.

Course Outcome:

After Completion of the Course, the Student will be able to:

No	Course Outcomes	RBT Level
01	Understand the fundamental principles and importance of Design Thinking in fostering innovation and its relevance in engineering.	UN
02	Apply systematic problem identification, problem framing-articulation, and problem-solving approaches in the context of Design Thinking.	AP
03	Analyze and evaluate different tools and methodologies used in Design Thinking, such as observation, ethnographic research, and mind mapping, to gain insights into user unmet needs.	AN
04	Develop and refine product concepts by preparing product development canvases (PDC) that consider product experience, functions, features, and components. (Synthesis level)	AP
05	Create a final working prototype or an alternative prototype for projects with limitations, showcasing the functionality and features, Viability, Impact, Sustainability, Scalability, Costing, and Resources for the Creation	CR

Revised Bloom's Taxonomy (RBT)

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	**T**	**PR**	**C**	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
00	00	04	02	00	00	20	80	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Design Thinking for Engineers** What Sets Design Thinking Apart? Essential Design Thinking Skills, Core Principles of Design Thinking, Foundations of Design Thinking, Building an Effective Design Thinking Team, Design Thinking Workshops and Meetings Exercises and Case-Based Discussions	08	13
2.	**Stages of the Design Thinking Approach** Class Exercise: Review the Case Study **Observation:** Role of observation in understanding product and process challenges, Techniques for effective product and process observation **Exercise:** Based on the AEIOU Framework **Empathize** with Customers/Users **Exercise:** Engage with Customers/Users **Define the Problem,** Exercise: Review and Follow-Up, Define the Point of View **Ideate** Exercise: Develop Potential Solutions **Prototype Alternate Solutions** Exercise: Create a Prototype of the Solution **Test the Solutions** Exercise: Prepare and Conduct Tests of the Prototype and Solution	14	23

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	Exploring Design Thinking in Innovation: Understanding the Role of Design Thinking in Product and Process Innovation, Differentiating Engineering Design and Design Thinking Contrasting Approaches: Engineering Design vs. Design Thinking Stanford Design thinking process and Double Diamond model		
3.	**Design Thinking Techniques** Understanding Listening and Empathizing Techniques: Exploring observation methods, Utilizing a structured, open-ended approach for effective communication, Ideation Tools: Brainstorming techniques for idea generation, Applying innovation heuristics to foster creativity. **Introduction to SCAMPER technique:** Explanation of SCAMPER (Substitute, Combine, Adapt, Modify, put to another use, Eliminate, Reverse) and its application in diverse innovation contexts (product, system, process) Practical exercises and case studies demonstrating SCAMPER's effectiveness in idea generation Prototype and Test Techniques: Type of Prototype (PoC), Forms of testing in Design Thinking, Prepare and A/B Test of the prototype	14	23
4.	**Methods and Tools for Design Thinking Practice** Empathize: Ask five why questions, Empathy map, storytelling, critical items diagram, mind map, journey map Ideate: Brainstorming, 2X2 matrix, NABC Methods Prototype: Exploration map, Minimum Viable Product (MVP), Feasibility Testing, Viability Testing, Sustainability Testing Test: Collet Feedback, iterate and improve the ideas	14	23
5.	**Adopt and Adapt Design Thinking** Cautions and Pitfalls: Assumptions Exercise: Assumptions Pitfalls and Cautions in Design Thinking Workgroups Application of Design Thinking in Academic Projects Across Disciplines	10	18
Total		**60**	**100**

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Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
0	15	40	15	20	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:
1. Pavan Soni (2020), Design Your Thinking: The Mindsets, Toolsets, and Skill Sets for Creative Problem-solving, Penguin Random House India Private Limited
2. Gasparini, Andrea. "Perspective and use of empathy in design thinking." In ACHI, the Eight International Conference on Advances in Computer-Human Interactions, pp. 49-54. 2015.
3. Defining a Problem Statement — Design Thinking by Priyanka Jeph in QED42
4. Scamper: How to Use the Best Ideation Methods by Rikke Friis Dam and Teo Yu Siang in Interaction Design Foundation
5. Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn
6. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation."
7. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "Design Thinking for the Greater Good: Innovation in the Social Sector."

(b) Open-source software and website:
1. Google Workspace: Docs, Sheets, & Slides
2. Google Jamboard
3. Storyboard
4. Any other Relevant Tools

(c) Suggestive MOOC Course
1. B.K. Chakravarthy, Design Technology and Innovation, SWAYAM NPTEL (Online)
2. B.K. Chakravarthy, Innovation by Design, SWAYAM NPTEL (Online)
3. Nina Sabnani, Understanding Design, SWAYAM NPTEL (Online)
4. R T Krishnan and V Dhabolkar, Managing Innovation, SWAYAM NPTEL (Online)

Note:

1. Based on Design Thinking, individual BoS may propose mini projects in the relevant subject in higher semesters.