| | |
|---|---|
| **COURSE TITLE** | **DESIGN THINKING AND PROBLEM SOLVING SKILLS** |
| **COURSE CODE** | **01ME3304** |
| **COURSE CREDITS** | **1** |

**Objective:**

1 The main objective of this course is to inculcate interdisciplinary engineering skills in students for taking real time engineering problem available in our society/industry and to come-up with the grass root innovation, can be helpful to all level of human beings.

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

1 Apply design thinking tools to solve engineering problems and compare with traditional methods.

2 Apply team formation and domain selection strategies in real-world contexts.

3 Use AEIOU, empathy mapping, and brainstorming to generate innovative ideas.

4 Analyze forward and reverse engineering to assess product design and innovation.

5 Analyze mechanical problems using reasoning and computational tools to evaluate solutions.

6 Apply design thinking and economic analysis to develop a functional mini project.

**Pre-requisite of course:**Zeal to learn subject

**Teaching and Examination Scheme**

| Theory Hours | Tutorial Hours | Practical Hours | ESE | IA | CSE | Viva | Term Work |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 2 | 0 | 0 | 0 | 50 | 50 |

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| **Total Hours** | | |

**Suggested List of Experiments:**

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| 1 | **Design Thinking Introduction**<br>Introduction, Need of Design Thinking, Traditional Problem Solving versus Design Thinking, Phases of Design Thinking, Tools for Design Thinking, Design Thinking in Engineering. | 4 |
| 2 | **Domain Selection**<br>Formation of Team and aspects for the selection, Domain selection (Society/Industry project), Strategic Design thinking. | 6 |

**Suggested List of Experiments:**

| Contents : Unit | Topics | Contact Hours |
|---|---|---|
| 3 | **Design Thinking Exercise**<br>Observation exercise, Design activities through Canvas (AEIOU, Mind Mapping , Empathy, Ideation, learning need matrix), Brainstorming for the problem, Users Interview conduction, generation of records. | 6 |
| 4 | **Reverse Engineering**<br>Forward Engineering Design, Design Thought and Process, Design Steps, Reverse Engineering Steps, System level Design , Engineering Specifications, Product Architecture, Schematic Drawings. | 6 |
| 5 | **Capstone Project**<br>Mini project exercise based on understanding of modules contents, Analyze the economics of the innovation., Project work | 8 |
| **Total Hours** | | **30** |

**Textbook :**

1 Design Thinking: A Guide to Creative Problem Solving for Everyone, Andrew Pressman, Routledge, 2019

2 Design Thinking for Strategy, Claude Diderich, Springer, 2020

**References:**

1 The Design Thinking Playbook, The Design Thinking Playbook, The Design Thinking Playbook, The Design Thinking Playbook, Michael Lewrick & Patrick Link & Larry Leifer, Wiley, 2018

2 Strategies for Creative Problem Solving, Strategies for Creative Problem Solving, H. S. Fogler and S. E. LeBlanc, Pearson, 2014

3 Problem Solving & Comprehension, Problem Solving & Comprehension, A. Whimbey and J. Lochhead, Lawrence Erlbaum, 2013

4 Effective Problem Solving, Effective Problem Solving, M. Levine, Prentice Hall, 1994

5 Reverse Engineering: Technology of Reinvention, Reverse Engineering: Technology of Reinvention, Wego Wang, CRC Press, 2010

**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 | | | | | |
|---|---|---|---|---|---|
| **Remember / Knowledge** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Higher order Thinking / Creative** |
| 0.00 | 0.00 | 60.00 | 40.00 | 0.00 | 0.00 |

**Instructional Method:**

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. Students will use supplementary resources such as online videos, SWAYAM, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation
2. https://onlinecourses.nptel.ac.in/noc20_mg38/preview