



# GUJARAT TECHNOLOGICAL UNIVERSITY

Course Abstract for

DESIGN ENGINEERING - II A

(5<sup>th</sup> Semester)

Course initiated by:

Centre for Industrial Design

**(OPEN DESIGN SCHOOL)**

For any query, please write us at: [design@gtu.edu.in](mailto:design@gtu.edu.in)

## Design Engineering – II A (3150001) (5<sup>th</sup> Semester)

### Module 3: Applying Design Thinking

Name of the Discipline & the Programme: **Every discipline of the Engineering**

Usual time of occurrence: **5th Semester**

Duration: **Six (6) months**

Course category: **Core Advance**

Credits: **03**

Examination Pattern: **External Practical/Viva exam at the end of semester**

Prerequisites: **Design Engineering – 1A, Design Engineering – 1B**

**Relevance:** This is a mid-level course designed for those who have undergone the fundamentals of Design Thinking process in 2nd year and understand the importance and process completely.

**Objective: Understanding Design Thinking:** The course aims to validate the learnings from the understanding Design Thinking course, by translating the concepts into exercises. In this module, students will work upon community-based projects to validate their learning of Design Thinking process.

**Course Contents:** Students have learnt the fundamentals of Design Thinking methodology in 2nd year and successfully gone through the process twice while working on general as well as branch specific topics. Now in 5th and 6th semester, being a socially responsible engineer, students need to work on community/society-based project using Design Thinking process. Here in 5th semester emphasis would be on Observation, Empathy, Ideation and Product Development; while in 6th semester emphasis will be on detail design, prototyping and validation of the solutions in real environment. At this stage, it is essential to identify parameters and check five basic design principles viz. 1) Technical, 2) Ergonomics, 3) Aesthetics, 4) Cost and 5) Environment keeping System Approach in mind. Designing something new involves several iterations on different stages/ components/ aspects. Before investing further resources in terms of time/ money/ manpower it is important to strengthen these five principles to advance for novelty. It will include several rigorous iterative efforts to make final product/process.

It is essential for students to enhance and refine their learning by using Design Thinking process, keeping System Approach in mind while working on projects.

The content is divided into week-wise activities to better understand the course and to give enough time to all the learning aspects, but depending upon the type and nature of projects,

students and guide may re-schedule the activities. Students in 5th semester need to follow below week-wise activities to complete the course requirement for 5th semester.

## Design Thinking Process – with Tools & Techniques

### Module 3: DE-2A Applying Design Thinking

Broad segment	Week	Description	Operational need
Orientation with revision of Design Thinking	1,2	<ul style="list-style-type: none"> <li>• Domain Selection (Community/Society based topic)</li> <li>• Students need to decide their community/society-based problem (here community people would be main stakeholder for the project)</li> <li>• Team Building Exercise</li> <li>• Log book</li> </ul>	<ul style="list-style-type: none"> <li>• Brief lecture/exercise</li> <li>• Government, NGO or any Social agencies can be contacted for project</li> <li>• Individual logbook is required</li> </ul>
Empathization Phase	3,4,5	<ul style="list-style-type: none"> <li>• <b>Observation:</b> Through AEIOU framework</li> <li>• <b>Immerse via Role Playing</b></li> <li>• <b>Interview:</b> <ul style="list-style-type: none"> <li>✓ Formal and Informal interview</li> <li>✓ Students may use Stanford methods given in below link –</li> </ul> </li> </ul> <p style="margin-left: 20px;"><a href="http://dschool.stanford.edu/wp-content/uploads/2013/10/METHODCARDS-v3-slim.pdf">http://dschool.stanford.edu/wp-content/uploads/2013/10/METHODCARDS-v3-slim.pdf</a></p>	<ul style="list-style-type: none"> <li>• Students will use different observation/scouting methods for Observation and Empathy</li> <li>• Then, they need to visit their domain/place of interest for getting insights and define problems.</li> <li>• Several field trips will be required to get better insights on users' needs.</li> <li>• Class as well as homework/field activity</li> </ul>
		<ul style="list-style-type: none"> <li>• Summary of AEIOU activity/inputs</li> <li>• Preparation of Mind Map, Empathy Map</li> </ul>	
Problem Definition by secondary	6	<ul style="list-style-type: none"> <li>• Secondary research/Prior art search</li> <li>• Diachronic and Synchronic analysis</li> <li>• Group wise presentation followed by Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• After rigorous and systematic field exercises, empathization and Secondary Research</li> </ul>

<b>research, group work and presentation</b>		<ul style="list-style-type: none"> <li>Define Problem statement (format is given in reference PPT on DE portal)</li> <li>Verification of problem identified by team through users/stakeholders</li> </ul>	activities -student teams need to define their problem here (it can be further validated through Ideation phase)
<b>Ideation Phase</b>	7,8,9	<ul style="list-style-type: none"> <li>Preparation of Ideation canvas <ul style="list-style-type: none"> <li>✓ Brainstorming (What, Why, How, When, For Whom)</li> <li>✓ Situation/Context/Location</li> <li>✓ Props/non-living things/tools/equipment</li> <li>✓ Opportunity mapping</li> </ul> </li> <li>Combination of Ideas from Ideation Canvas</li> <li>Sketching of mock concepts in log book</li> <li>Design Thinking is a Convergent Divergent process</li> </ul>	<ul style="list-style-type: none"> <li>students will work on their Ideation canvas</li> <li>Student teams need to discuss their combination of ideas from Ideation canvas with other teams, faculty guides and users and take feedbacks.</li> </ul>
	10	<ul style="list-style-type: none"> <li>Prioritizing and finalizing Idea (After group discussion and consulting with faculty guide, student teams need to select their final problem &amp; idea for further development)</li> </ul>	<ul style="list-style-type: none"> <li>Students team need to validate the final Problem &amp; idea/concept with Users/Stakeholders after this activity</li> </ul>
<b>Product Development Phase</b>	11	<ul style="list-style-type: none"> <li>Preparation of Product Development Canvas (PDC) <ul style="list-style-type: none"> <li>✓ Product Experience</li> <li>✓ Product Functions</li> <li>✓ Product Features</li> <li>✓ Components</li> </ul> </li> <li><b>SCAMPER tool</b></li> </ul>	<ul style="list-style-type: none"> <li>students will work on their PD canvas</li> <li>Till 12th week of the course, Students team will discuss on their PDC with other groups and faculty guide</li> <li>Refinement of PDC after discussion</li> </ul>
	12	<ul style="list-style-type: none"> <li>Customer/User Revalidation (Reject/Redesign/Retain)</li> <li>Refinement</li> </ul>	<ul style="list-style-type: none"> <li>Till 13th week of the course, student team will consult the Users/Stakeholders for their inputs on concept and incorporate necessary changes</li> </ul>
<b>Proof of concept</b>	13	<ul style="list-style-type: none"> <li>Pre-Design</li> <li>Iteration &amp; Modification based on feedbacks</li> <li>Rough Prototype</li> <li>Iterate, Iterate, Iterate.....</li> </ul>	<ul style="list-style-type: none"> <li>Design Thinking is iterative and experimental in nature, so before investing in material, money, resources and time, one should have all possible iterations</li> </ul>

	14	• Upload duly signed Continuous Assessment Card	• As per the feedback received from
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<b>Feedback &amp; Final Report</b>		<ul style="list-style-type: none"> <li>• Feedback, Online certificate generation through DE portal</li> <li>• Final Report</li> </ul>	<p>Users/Stakeholders/other student groups/guide, student teams need to modify their design and further action plan.</p> <ul style="list-style-type: none"> <li>• Report writing should be continuous activity throughout the semester</li> </ul>
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By the end of 5th semester, student's team will be ready with their well-defined Design Problem and probable solutions to that problem as shown in above table.

◆ **Submissions by the end of 5th semester shall be:**

A. Process Report comprising:

- a) Introduction (Describe your project in detail including domain – type, place, why and how team selected this domain and why this domain is important in relation to Design Thinking/Human-centred process etc.)
- b) Preparation of canvases based on different phase of Design Thinking
- c) Feedback analysis with the user shall be clearly included in the report
- d) Summary of findings of Prior Art Search on purpose/project theme (2 summary papers per student)
- e) Summary of the learning from Design Thinking
- f) Summary on validation process and refinement in the rough prototype
- g) Any other important aspects you feel should be included

B. AEIOU framework

C. Mind Map

D. Empathy Map

E. Ideation Canvas

F. Product Development Canvas (PDC)

G. Rough prototype model/Conceptual Plan-Layout for process related branches

H. Individual Log Book (duly signed by faculty guide)

I. Continuous Assessment Card for Internal Evaluation (Document separately available on GTU website)

**Note:** As per the guidelines and evaluation schemes given in this document, students need to prepare report for their projects. Separate report format will not be provided by University, students and faculty members may create their own creative formats. However, in general guidelines document uploaded on GTU website, there are some report format links are given which may help for report format.

## Appendix 1: The END SEMESTER Evaluation Scheme for

### Design Engineering-2A (3150001) (5<sup>th</sup> Semester)

#### BE III year – all branches

To,

The Principals/Directors of Colleges/Institutes, the Heads of Departments and GTU/Design Engineering coordinators:

Students deserve a proper practical/ viva/project examination of the work that they have done over the semester (or over the year for a 2-semester project). It is the responsibility of the University and Colleges that all its examinations are conducted fairly, sincerely and with due diligence. So please look into the following:

1. Please make proper arrangements so that all the examinations start in-time. If due to any reason, the exam should not start at the scheduled time, please inform the examiners that they should take extra time. But in no case the viva/ practical exam be conducted in a hurry without giving sufficient time for evaluation of every student. If an exam is scheduled to be held over two days, please make the necessary arrangements.
2. The University expects the Deans (and or special teams headed by the Dean or his/ her nominee) to visit the Colleges during the practical/ viva examinations. **As it came to University's notice that some examiners and colleges are completing viva exam in 1- or 2-hours' time of entire class which is not acceptable in any case and its immoral practice for any education institute. So, all stakeholders need to take extra care of this issue.**
3. Please see that all the necessary help and information is provided. Please receive them so that they can do their job properly without wasting their time in searching for the place and in contacting the concerned examiners and students. If they should want to visit the laboratories/ workshops, please make the necessary arrangements.
4. Please inform the external examiner that he/she must note down **the best 3 projects of the department** and convey the details of such projects by uploading the details of the project or/ and the complete project report on the University's server or send it to [design@gtu.edu.in](mailto:design@gtu.edu.in).
5. In case Internet or the server should not work, please provide the technical help to the external examiner for preparing a CD of the reports of the best three projects of every department and please make arrangements to deliver the CD to the examination department of the University.

**PROCESS OF EVALUATION:** At the ensuing 5th semester examinations, the work of the students in Design Engineering – 2A is to be evaluated by **External VIVA** and the evaluation is to be out of 80 marks.

A Viva-Voce examination will be conducted at the end of the semester by **a team of two examiners**, one of whom will be an internal Faculty Member, who may have taught the subject.

(Internal examiner must remain the same throughout the entire of examination for batch). The other will be an external examiner to be appointed by the University. Both examiners must be trained in Design Thinking through the FDP conducted by University.

### EVALUATION SCHEME

Sr. No.	Particular	Sub-Head Weightage
1.	<b>Observation towards Empathy</b> <ul style="list-style-type: none"> <li>➤ Field Activity/observation and outcome</li> <li>➤ Mind Mapping - Summarization and data analysis</li> <li>➤ Observation Technique (AEIOU Summary)</li> </ul>	20
2.	<b>Log book</b> (Individual completed log book, duly signed by guide regularly)  <b>Continuous Assessment Card for Internal Evaluation</b> (Complete and duly signed by guide regularly)	10
3.	<b>Design Problem Definition</b> <ul style="list-style-type: none"> <li>➤ Secondary research/ Prior art search</li> <li>➤ Diachronic and Synchronic analysis</li> </ul>	10
4.	<b>Canvases/Frameworks</b> <ul style="list-style-type: none"> <li>➤ AEIOU, Mind Mapping</li> <li>➤ Empathy mapping</li> <li>➤ Ideation Canvas</li> <li>➤ Product development</li> </ul>	15
5.	Pre-Design Calculations	15
6.	<b>Report:</b> Compilation of work report (process report), Online Certificate generated through DE Portal, Future action plan, Question and Answer, Communication Skill, Attitude	10
		<b>Total: 80</b>

**Note:**

1. Total Marks for the subject: 100 (Practical viva – 80 (External – 40 & Internal – 40), Internal continuous evaluation – 20)
2. Minimum passing marks: 40/80
3. Ratio of evaluation by internal & external examiner appointed: 50% in each sub-head
4. Examiner essentially needs to evaluate the learning process of the student during the semester, not only the final outcome. As outcome is important for any project but during the student stage, projects are intended for practical learning and “Learning by doing” is the Mantra for Design Engineering subject (One should celebrate the failure also and learn from it to get success). So please evaluate the Design Thinking process and their learning properly with giving sufficient time for each project.
5. Students need to explain all canvases prepared in hard copy to the panel of examiners (internal and external).
6. Power point presentation is not mandatory.

For any query & suggestions, kindly contact : [design@gtu.edu.in](mailto:design@gtu.edu.in)