Course Abstract

Design Engineering – 1A (2130005) (3rd Semester)

Module 1: Understanding Design Thinking

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

Usual time of occurrence: ***3rd Semester***

Duration: ***Six (6) months***

Course category: ***Core - Basic***

Credits: ***03***

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

Prerequisites: ***Optimistic mind-set, Enthusiasm of learning new things, Un-learning***

Relevance

This course is meant for beginners. The course is designed to initiate Design Thinking understanding for the 3rd semester students.

Objective: Understanding Design Thinking

The course aims to expose students to the basic process and framework of Design Thinking and relevant tools & techniques for Creativity & Innovation.

Course Contents

This Course is designed to give very basic understanding of the Design Thinking methodology. 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.

In Design Engineering – 1A, student will select **very basic and small, individual or team project irrespective of their branch.** This project would be from very general topic/domain like designing something for yourself/parents/Teacher/Friends (Whole class may select single project topic or similar topic in different small groups to have healthy competition among the class). This kind of basic project would give good understanding of Design Thinking process. **In this module, student will use whole Design Thinking process as shown in guideline document to complete their projects but here the learning objective or focus would be more on Observation or Empathy process.** So students need to give more time to these phases and then reach up to the rough prototype phase. Students in 3rd semester need to follow below week-wise activities to complete the course requirement for 3rd semester.

Design Thinking Process – with Tools & Techniques

Module 1: DE-1A Understanding Design Thinking

Broad segment	Week	Description	Operational need
Design Thinking Introduction	1	○ Overview, objective and goal of this course ○ What is Design Thinking? - Its importance, socio-economical relevance ○ Design thinking to foster innovation ○ Relevance of design and design thinking in engineering ○ Systematic problem identification & problem solving approaches	○ Brief lecture/exercise ○ Hands on exercise to understand attributes of Design Thinking
	2	○ Domain Selection (general topic/products) ○ Team Building Exercise ○ Log book, documentation strategy – introduction, importance, preparation	○ Brief lecture/exercise ○ Hands-on sessions with cases/examples ○ Individual logbook is required
	3	○ **Learning tools** ✓ Design in nature/Bio-mimicry ✓ Design as a System approach ✓ Design as listening tool for mapping users' unmet needs	○ Brief lecture/exercise ○ Next week Students need to present on the learning from these topics
Empathization Phase	4,5,6	○ **Observation:** Through **AEIOU** framework ✓ Orientation to Field Work – Need for field visit? ✓ What/How/Where to Observe ✓ Ethnographic tools and its usage ✓ What difference it will make if the problem solved - partially or fully? ✓ Could solution be worse than the problem? ✓ Key pain and pleasure points ✓ Understanding of User Contexts ✓ Log book exercise	○ Students will be introduced to different observation/scouting methods in the theory session in class for all four weeks in different sessions ○ Then during weeks, they need to visit their selected domain/place for getting insights and define problems. ○ Minimum 4-5 field trips will be required to get

		✓ Analysis of Data - Mind Mapping ○ **Immerse via Role Playing** ○ **Interview:** ✓ Formal and Informal interview ✓ Students may use Stanford methods given in below link - http://dschool.stanford.edu/wp-content/uploads/2013/10/METHODCARDS-v3-slim.pdf	better insights on users' needs.
		○ Summary of AEIOU activity/inputs ○ Preparation of Mind Map, Empathy Map	○ Class as well as homework/field activity
Define Phase: Problem Definition by secondary research ,group work and presentation	7	○ Secondary research/Prior art search (prior art search is continuous activity and can be used in any phase to strengthen the idea) ○ Diachronic and Synchronic analysis ○ Group wise presentation followed by Discussion ○ Verification of problem identified by team through users/stakeholders	○ After rigorous and systematic field exercises, empathization and Secondary Research activities -student teams need to define their problem here (it can be further validate through Ideation phase)
Ideation Phase	8	○ Preparation of Ideation canvas ✓ Brainstorming (What, Why, How, When, For Whom) ✓ Situation/Context/Location ✓ Props/non-living things/tools/equipment ✓ Opportunity mapping	○ 2 hour – explanation of Ideation canvas to class ○ Then students will work on their Ideation canvas (min 3 hours continuous workshop)
	9	○ Combination of Ideas from opportunity mapping ○ *Design Thinking is a Convergent-Divergent process*	○ Student teams need to discuss their Ideation canvas with other teams, faculty guides and users and take feedbacks
	10	○ Prioritizing and finalizing Idea (After group discussion and consulting with faculty guide, student teams need to select their final problem & idea for further development)	○ Students team need to validate the final Problem & idea/concept with Users/Stakeholders after this activity

Product Development Phase	11	○ Preparation of Product Development Canvas (PDC) ✓ Product Experience ✓ Product Functions ✓ Product Features ✓ Components ○ Sketching of mock concepts in log book ○ Discussion on Product Development Canvas (PDC)	○ 1.5 hour – explanation of product development canvas to class ○ Then students will work on their PD canvas (min 3 hour continuous workshop) ○ Till 12th week of the course, Students team will discuss on their PDC with other groups and faculty guide ○ Refinement of PDC after discussion
	12	○ Customer/User Revalidation (Reject/Redesign/Retain) ○ Refinement	○ Till 13th week of the course, student team will consult the Users/Stakeholders for their inputs for concept finalization after various stages and incorporate necessary changes.
Proof of Concept	13	○ Rough Prototype ○ Here strategy is "fail fast to succeed faster"	○ Very early & rough prototype ○ Made up of paper, cardboard, thermocol etc. whichever material is available
Feedback & Final Report	14	○ Feedback & Final Report	○ As per the feedback received from Users/Stakeholders/other student groups/guide, student teams need to modify their design and further action plan. ○ Report writing should be continuous activity throughout the semester

Submissions by the end of 3rd 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-Centered 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)

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.

Appendix 1: The END SEMESTER Evaluation Scheme for

Design Engineering-1A (2130005) (3rd Semester)

BE II 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 right 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.

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 .

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 3rd semester examinations, the work of the students in Design Engineering – 1A is to be evaluated through 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.

(Please note that all the, other than DE subject, practical and viva voce examinations at the end of the 3rd semester will be conducted internally by the College/ Institute.)

EVALUATION SCHEME:

Sr. No.	Particular	Sub-Head Weightage
1.	**Understanding of Design Thinking methodology/ need** ✓ Importance of various Learning tools of Design Thinking	15
2.	**Observation towards Empathy** ✓ Field Activity/observation and outcome ✓ Mind Mapping-Summarization and data analysis ✓ Observation Technique (AEIOU Summary)	20
3.	**Log book** (Individual completed log book, duly signed by guide regularly)	10
4.	**Understanding of Canvases/Framework** ✓ AEIOU, Mind Mapping ✓ Empathy mapping ✓ Ideation Canvas ✓ Product development	15
5.	**Design Problem Definition** ✓ Secondary research/ Prior art search ✓ Diachronic and Synchronic analysis	10
6.	Compilation of work report (process report), Future action plan, Question and Answer, Communication Skill	10
		80

Note:

- ✓ Total Marks for the subject: 100 (Practical viva – 80 (External – 40 & Internal – 40), Internal continuous evaluation – 20)
- ✓ Minimum passing marks: 40/80
- ✓ Ratio of evaluation by internal & external examiner appointed: 50% in each sub-head
- ✓ 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 process properly with giving sufficient time for each project.
- ✓ Students need to explain all canvases prepared in hard copy to the panel of examiners (internal and external).
- ✓ Power point presentation is not mandatory.