



# GUJARAT TECHNOLOGICAL UNIVERSITY

## Design Engineering – 2B

### **General Guidelines for DE-2B 6<sup>th</sup> Semester (AY 2015-16)**

**To be used for the DE-2B project work by all the students of the 6<sup>th</sup> semester of BE**

Students have learnt the basics of Design Thinking methodology in 2<sup>nd</sup> year and have successfully gone through the process from Empathy mapping to rough prototypes of their concepts. During the 5<sup>th</sup> semester, all the teams have designed and developed their idea by considering five basic design principles viz. (1) Technical, (2) Ergonomics, (3) Aesthetics, (4) Cost and (5) Environment. Now in the 6<sup>th</sup> semester, students need to take their idea further in the development process to convert it into a final product/process. Designing something new involves several iterations of different stages/ components/ aspects. It will include several rigorous iterative efforts to make the final product/process.

All students' team need to work towards their final prototypes. Every team should then test it. Case-to-case wisdom will be required to implement the same.

(If a team of students wants to work on concepts dissimilar than those the team had taken up in the 5<sup>th</sup> semester, the team may consult the Faculty Guide. With the Guide's permission, the team should choose any branch specific small artefacts/machine to be designed based on Design Thinking Methodology. The team should start from the very first phase i.e. Observation (field activity) and reach up to the product development and the final prototype phases. It may be noted that for such teams also, the evaluation criteria would be the same as for those, who continue working on the product/ process, which they selected for their work during the 5<sup>th</sup> semester.)

In the 6<sup>th</sup> semester, student's team will validate their concept and detailed design part with reference to (1) Modelling and Analysis of their design (2) Prototyping and Proofing of concepts, (3) Engineering Economics of Design, (4) Design for Use, Reuse and Sustainability and (5) Test the prototype. And additionally students will also learn topic like (6) *Ethics in Design*. **Depending on the project cost and technical feasibility and branch, the prototype may be a physical model or a working model or a process model or programs etc.**

The following aspects should be taken into account while developing the project.

#### **1. Modelling and Analysis using Software:**

- ✓ *Branch Specific software can be used for simulation/analysis purpose to further refine the design before investing more time, money and resources*

### 2. Prototyping and Proofing of Concepts:

- ✓ *Prototypes, Models and Proof of concepts*
  - *Prototypes*<sup>[1]</sup>: Prototypes are the first full scale and usually a functional forms of design and in this sense, it is a working models of designed parts/artefacts. They are tested in the same environments in which they are expected to perform as final products.
  - *Models*<sup>[1]</sup>: A model is “a miniature representation of something”. They may be a paper model or computer model or physical model. Model are usually a smaller and made of different material than are of original products, and they are tested in laboratory or controlled environment to validate their expected behaviour.
  - *Proof of Concepts*<sup>[1]</sup>: A proof of concept, in this context, refers to a model of some part of a design that is used specifically to test whether a particular concept will actually work as proposed. Proof of concept test will validate the idea or concept in controlled environment.
- ✓ *Building a series of Prototypes to further refine the project*
- ✓ *How much will it cost?*

### 3. Engineering Economics of Design:

- ✓ *Cost Estimation*
- ✓ *Labour, Material and overhead cost*
- ✓ *The time value of money*
- ✓ *Standards for such products*
- ✓ *New materials*

### 4. Design for Use, Reuse and Sustainability

- ✓ *Design for USE* – How long this design will work?
  - Reliability
  - Maintainability
- ✓ *Design for Reuse*
- ✓ *Design for Sustainability*

### 5. Test the prototype

- ✓ *Test your design in real operational environment and then iterate if required.*

*Continued on the next page.....*

<sup>[1]</sup> Engineering Design – A project Based Introduction by Clive L. Dym, Patrick Little, Elizabeth J. Orwin – Wiley publications

# Post-graduate Research Centre for Industrial Design

## OPEN DESIGN SCHOOL

### 6. Ethics in Design

- ✓ *Codes of Ethics*
- ✓ *Ethics: Understanding Obligations*
- ✓ *Ethics: on engineering practice and the welfare of the public*
- ✓ *Ethics: Always a part of engineering practice*

Optional Areas:

GTU Innovation Council will help in the following areas for the students who want to develop their projects further.

- Design Support
- Intellectual Property Right
- Business Model Canvas
- Student Start-up
- Incubation and Co-working space

Please visit <http://www.gtuinnovationcouncil.ac.in/> for more info.

### **References for important documents for Design Engineering subject:**

- Design Engineering Help Manual:  
[http://gtu.ac.in/circulars/15Apr/04042015\\_Designmaual\\_2.pdf](http://gtu.ac.in/circulars/15Apr/04042015_Designmaual_2.pdf)
- Guidelines for AY 2015-16:
  - DE-1A (3rd Semester) - [http://gtu.ac.in/circulars/15June/19062015\\_01.pdf](http://gtu.ac.in/circulars/15June/19062015_01.pdf)
  - DE-2A (5th Semester) - [http://gtu.ac.in/circulars/15June/26062015\\_12.pdf](http://gtu.ac.in/circulars/15June/26062015_12.pdf)
- Report Format for AY 2015-16:
  - DE-1A (3rd Semester): [http://files.gtu.ac.in/circulars/15Oct/07102015\\_DE1A.pdf](http://files.gtu.ac.in/circulars/15Oct/07102015_DE1A.pdf)
  - DE-2A (5th Semester): [http://files.gtu.ac.in/circulars/15Oct/07102015\\_DE2A.pdf](http://files.gtu.ac.in/circulars/15Oct/07102015_DE2A.pdf)
- Evaluation scheme for AY 2015-16:
  - DE-1A (3rd Semester): [http://files.gtu.ac.in/circulars/15Oct/07102015\\_1a.pdf](http://files.gtu.ac.in/circulars/15Oct/07102015_1a.pdf)
  - DE-2A (5th Semester): [http://files.gtu.ac.in/circulars/15Oct/07102015\\_2a.pdf](http://files.gtu.ac.in/circulars/15Oct/07102015_2a.pdf)
- Guidelines for Design Engineering 2-B for detained students who will be regular in the 6<sup>th</sup> Semester, New Syllabus: [http://files.gtu.ac.in/circulars/15Oct/07102015\\_16.pdf](http://files.gtu.ac.in/circulars/15Oct/07102015_16.pdf)
- Note on AEIOU and LNM theory: [http://gtu.ac.in/circulars/15Apr/04042015\\_AEIOU.pdf](http://gtu.ac.in/circulars/15Apr/04042015_AEIOU.pdf)