All students of 3rd semester shall use the following guidelines for Design Engineering 1(a).

Design Engineering is based on globally accepted Design Thinking methodology. Design thinking phases may be divided into six simple yet iterative steps shown below:
Steps to follow in 3rd semester:

**Design Thinking**
- What is Design Thinking?
- Its importance, socio-economical relevance
- Design Thinking to foster innovation
- Relevance of Design and Design Thinking in engineering

**Observation**
- Through AEIOU Framework
- Ethnographic tool
- Role playing, Interview
- Mind Mapping
- Notes, Photos, Videos, Interviews

**Empathy Mapping**
- Identify User and Stakeholders
- Mapping all observation on Empathy Mapping Canvas
- Story boarding
- Secondary Research
- Diachronic and Synchronous Analysis

**Ideation**
- Brainstorming
- Opportunity Mapping
- Combination of Ideas
- Validation of idea by users
- ideation Canvas

**Product Development**
- Product Experience
- Product Functions
- Product Features
- Components
- Sketching of Concepts
- Revalidation of Concept
## Design Engineering – 1 (a)

### General Guidelines _3rd Semester_

<table>
<thead>
<tr>
<th>Broad segment</th>
<th>Week</th>
<th>Description</th>
<th>Operational need</th>
</tr>
</thead>
</table>
| **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 process  
- Systematic problem solving approaches | - Brief lecture/exercise  
- Hands on exercise to understand attributes of Design Thinking |
| | 2    | - Learning tools  
- Design in Nature/Bio-mimicry  
- Design as a System approach  
- Design as listening tool for Mapping users’ Unarticulated needs  
- Learning by Analogy, Artefactual, Heuristic and Gestalt Model | - Brief lecture/exercise  
- Next week students will make presentation on these topics |
| | 3    | - Team Building, Domain Selection (Society/Industry project)  
- Hands-on practice sessions with cases/examples |
| **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 | - Students will be introduced to different observation/scouting methods in the theory session in class for all the four weeks |
## Design Engineering – 1 (a)

### General Guidelines _3rd Semester_

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>What difference it will make if the problem solved - partially or fully?</td>
</tr>
<tr>
<td>✓</td>
<td>Could solution be worse than the problem?</td>
</tr>
<tr>
<td>✓</td>
<td>Key pain and pleasure points</td>
</tr>
<tr>
<td>✓</td>
<td>Understanding of user contexts</td>
</tr>
<tr>
<td>✓</td>
<td>Log book exercise</td>
</tr>
<tr>
<td>✓</td>
<td>Analysis of Data - Mind Mapping tool</td>
</tr>
<tr>
<td>✓</td>
<td>Then during the week, students will visit their domain/place of work for getting insights and define problems. 2-3 field trips will be required to get better insights on users’ needs.</td>
</tr>
<tr>
<td>✓</td>
<td>Immerse:</td>
</tr>
<tr>
<td>✓</td>
<td>Role playing</td>
</tr>
<tr>
<td>✓</td>
<td>Interview:</td>
</tr>
<tr>
<td>✓</td>
<td>Formal and Informal Interview</td>
</tr>
<tr>
<td>✓</td>
<td>Summary of AEIOU activity/inputs</td>
</tr>
<tr>
<td>✓</td>
<td>Preparation of Empathy Mapping</td>
</tr>
<tr>
<td>✓</td>
<td>Class as well as homework/field activity</td>
</tr>
</tbody>
</table>

### Problem Definition by Secondary Research ,Group work and Presentation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Secondary Research/Prior Art Search</td>
</tr>
<tr>
<td>7</td>
<td>Diachronic and Synchronous Analysis</td>
</tr>
<tr>
<td>7</td>
<td>Group wise presentation followed by discussion</td>
</tr>
<tr>
<td>7</td>
<td>Verification of problem identified by team through users/stakeholders</td>
</tr>
<tr>
<td>7</td>
<td>After rigorous and systematic field exercises, empathization and Secondary Research activities -student teams need to define their problem for further validation through Ideation phase.</td>
</tr>
</tbody>
</table>
### Design Engineering – 1 (a)

#### General Guidelines _3rd Semester_

| Ideation Phase | 8 | o Preparation of Ideation Canvas  
| | | ✓ Brainstorming (What, Why, How, When, for Whom)  
| | | ✓ Situation/Context/Location  
| | | ✓ Props/Non-living things/Tools/Equipment  
| | | ✓ Opportunity Mapping  
| | | | o 2 hour – explanation of Ideation Canvas to class  
| | | | o Then students will work on their Ideation Canvas (min 3 hours continuous exercise)  
| | 9 | o Combination of Ideas from Opportunity Mapping  
| | | | o Students’ teams will discuss their combination of ideas from Ideation Canvas with other teams, faculty guides and users and take feedback.  
| | 10 | o Prioritizing and finalizing Idea/Concept  
| | | | o After Group Discussion and consulting with faculty guide, students’ teams will select their final problem/idea/concept for further development  
| | | | o Students’ team will validate the final idea/concept with users/stakeholders  
| Product Development Phase | 11 | o Preparation of Product Development Canvas (PDC)  
| | | ✓ Product Experience  
| | | ✓ Product Functions  
| | | ✓ Product Features  
| | | ✓ Components  
| | | o Sketching of Mock Concepts in Log book  
| | | | o 1.5 hour – explanation of Product Development Canvas to class  
| | | | o Then students will work on their PD Canvas (min 3 hours continuous exercise)  

### Design Engineering – 1 (a)

#### General Guidelines _3rd Semester_

<table>
<thead>
<tr>
<th>Week</th>
<th>Task</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Discussion on Product Development Canvas (PDC)</td>
<td>- In this week, students’ team will discuss on their PDC with other groups and faculty guide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Refinement of PDC after discussion</td>
</tr>
<tr>
<td>13</td>
<td>Customer/User Revalidation</td>
<td>- Till the 14th week of the course, student team will consult the Users/Stakeholders for their inputs for concept finalization after various stages and incorporate necessary changes.</td>
</tr>
<tr>
<td>14</td>
<td>Reject/Redesign/Retain</td>
<td>- As per the feedback received from users/stakeholders, students’ teams need to modify their design and further action plan. In case the whole thing needs to be relooked it has to be iterated with new prospective.</td>
</tr>
</tbody>
</table>

**Note:** For preparation of Empathy Mapping, Ideation and Product Development Canvas and its related case study, students may refer: [http://gtu.ac.in/circulars/15Apr/04042015_Designmaual_2.pdf](http://gtu.ac.in/circulars/15Apr/04042015_Designmaual_2.pdf)