

# GUJARAT TECHNOLOGICAL UNIVERSITY

DESIGN ENGINEERING  
SUBJECT CODE: 2130005

## Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Mark s	
L	T	P		Theory Marks		Practical Marks			
			ESE (E)	PA (M)	PA (V)	PA (I)			
				PA	ALA	ESE			
0	0	3	3	0	0	0	80	20	100

## Design Engineering 1, 2 and 3

What is design? Design is a plan of a system, its implementation and utilization for attaining a goal. It is to change undesired situation into desired situation means to find solution for undesired/uncomfortable situation.

Designs can be for

- (1) Technical systems (power plant)
- (2) Educational systems (Montessori Method)
- (3) Aesthetic systems (logo designs, advertisements)
- (4) Legal systems
- (5) Social, religious or cultural systems
- (6) Theories, Models, etc.

Design thinking gives students a taste of the rich internal-remunerations associated with knowledge-creation and in curiosity and problem-driven contexts. Design need to satisfy technical functions, ergonomics functions, aesthetic functions, cost function and environment functions.

Essential features of Design:

Design solution of a problem starts with planned constructions for achieving goal/s. Designing means evolving goal oriented processes. At the beginning of the design process only goals are known while at the end, both the goals and plans are known and that to with more clarity. Goal and plans evolve together and they influencing each other. In designing process some goals are more important than others and similarly some plans are better than others. Designing does not guarantee that the design will work.

Design thinking process:

- (1) Find goals or need
- (2) Evaluate goals or need
- (3) Generate proposals to satisfy goals
- (4) Evaluate proposals
- (5) Improve goals and proposals

**Teaching methodology:**

The design engineering should be with fun and should create excitement. It should be integrated theme across the various courses. It should promote the team work. Design is thinking and doing. The complete design process should be included in design engineering 1, 2 and 3. The prototype design must consider technical, aesthetic, ergonomics, cost and environmental requirements.

**Content:**

Design Engineering 1: (3 credits in Semester 3, 3 credits in Semester 4)

Introduction to product innovation process (Need-requirement-concept-detail-prototype-services-business)

Modules on: Task clarification and conceptualization: Problem-idea-solution-evaluation

- Problem identification
- Ideation
- Consolidation
- Evaluation

Project: identifying need to developing proof of concept to demonstrate solution selected

Students can tackle simple design problems with engineering content – posed by the teacher or based on a survey of real life concerns of the public. The second is more effective – the students “own the problem” - but has to be accepted by the teacher.

Examples: (a) A device to help carry heavy luggage to the upper floors of a building – a building that has no lifts. (b) Systems to ensure that water does not come out as a jet from the taps in the lower floors of a tall building. One can insist on multiple realistic solutions and all should be part of the submission along with statements of their shortcomings or advantages. Teacher should not entertain fancy solutions – based on fancy ideas - with no engineering or scientific basis.

Short lectures on the topics in the syllabus should parallel the activity.

Design Engineering 2: (3 credits in Semester 5, 3 credits in Semester 6)

Introduction to detail design

Modules on

- Design for performance, safety, reliability
- Design for ergonomics and aesthetics
- Design for manufacturability
- Design for cost, environment

Project: developing the concept into a detailed design with a functional prototype

Here one could ask students to develop products based on themes - “Garbage compactors, Energy from kitchen waste, etc” making sure that the problems identified by the students within the themes possess an engineering content and insisting on some facets of design for assembly, for manufacturability, .....and so on while preparing the design and the prototypes. One could encourage students to innovate, arrive at multiple solutions and conduct a detailed design of one of the solutions.

Prototyping requires funds and effort, so it pays to identify one subsystem of the design of the whole machine. One can insist on prototyping demonstrating at least that sub-system, if not the whole system.

Design Engineering 3: (3 credits in Semester 7, 3 credits in Semester 8)

Introduction to services and business planning

Modules on

- Design of services
- Intellectual property
- Materials and recourse planning
- Business planning

Project: developing a business model

OR

Research or Technology Development project

Modules on

- Detailed literature survey and to find out technology gap
- Intellectual property
- Re-evaluate prototype of DE-2 and proposal of novel idea

Project: developing a novel functional prototype