



**Type of course:** Engineering Science

**Prerequisite:** Zeal to learn the subject

**Rationale:** Identifying customer’s requirements, creating a design brief, planning design activities, creating and evaluating design options, creating detailed design and models using 2D and 3D software’s for design.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |    | Credits | Examination Marks |         |                 |     | Total Marks |
|-----------------|---|----|---------|-------------------|---------|-----------------|-----|-------------|
| L               | T | P  |         | Theory Marks      |         | Practical Marks |     |             |
|                 |   |    | ESE (E) | PA (M)            | ESE (V) | PA (I)          |     |             |
| 0               | 0 | 15 | 15      | 0                 | 0       | 100             | 100 | 200         |

| Sr. No. | Topic  | No. of Hours |
|---------|--|--------------|
| 01      | <p><b>Identify Customer’s Requirement and Develop Plan for Engineering Design Process.</b></p> <p>Various procedures used in the design process, Identify factors that should be taken into account for information dissemination, Examine problems that might occur during the design process, Develop contingency plans and explain its importance, Plan and schedule design activities, List resources required for the design activity, List detailed specifications to be incorporated in the design, Develop a schedule for the design process, Establish version control for the document</p>   | 20           |
| 02      | <p><b>Create and Evaluate Mechanical Engineering Design Options</b></p> <p><b>Create and Evaluate Mechanical Engineering Design Options.</b></p> <p>Interpret national and international standards and conventions used in the design, Engineering or manufacturing concepts and principles-Material properties, heat treatment techniques, stress analysis(Thermal and Mechanical), FEA (Finite Element Analysis), manufacturing methods, welding principles, fabrication principles, kinematics and design calculations and design calculations, Carryout cost estimation for the design process, Produce final design in the suitable format as per organization’s standards, Develop specific reports on the design process and communicate to the stake holders, Evaluate the design against the established criteria using appropriate evaluation methods.</p> | 20           |
| 03      | <p><b>Make or Modify 2D Mechanical Engineering Drawings using CAD.</b></p> <p>Analyse various types of projections Explain various symbols used in drawing, Distinguish between component/layout and assembly drawing, Select appropriate projection for the drawing as per the standards, Standards and conventions used in engineering drawings Basic principles of engineering manufacturing operations – casting, forging, machining, joining process, assembly and installation methods and kinematic principles, Identify Input and output devices of a system, Identify design features, as appropriate to the drawing being produced – function, material, clearances, operational environment, quality, aesthetics, interferences, tolerances etc., Select appropriate drawing tool(software), Create a drawing template to the required</p>                | 30           |



|           |   |    |
|-----------|---|----|
|           | standards, which includes all necessary detail using various drawing tools – layer, scale, paper size, colour setup, line types, dimension system, title, drawing number, date , text ,style etc.   |    |
| <b>04</b> | <p><b>Make or Modify 3D Mechanical Engineering Models using CAD.</b><br/>Applications of different 3D Modelling programs such as Surface modelling, solid modelling and wire frame modelling, Setup the equipment for 3D modelling, Choose the right application for 3D modelling, Set the drawing datum at a convenient point to create a modelling template with title, file number, material, date etc. Establish coordinate system, view and orientation Identify and use key features of solid modelling software package to produce models- extrude, extrude cut, solid model, revolve, wire frame, radius/chamfer, hide, rectangular pattern, fillet, cut/remove, circular pattern, shell, development view, motion analysis, animation, defining material properties, exploded view etc. Create 3-D views on the screen by manipulating drawing planes and inserting 3-D geometric shapes, Create swept, extruded and revolved solids in 3-D space Extract mass and area properties from solid model, Extract physical properties as per job requirement, including volume, mass and centre of gravity, Use PAN, isometric and Zoom CAD operations to highlight design areas in the modelling environment Modify parts in the assembly environment using the listed features – constrained parts and assemblies, straight lines, insertion of standard components, hidden details, dimensions, symbols and abbreviations, hatching and shading, angular surfaces, parts lists, texts, circles or ellipses, material colour, surface texts etc. Produce 3 –D drawings incorporating section views with all necessary annotations Produce a model for export to the manufacturing systems – DNC and CNC machines, 3D printer and other specific systems</p> | 60 |
| <b>05</b> | <p><b>Make or Modify Assembly of Mechanical Engineering Models using CAD.</b><br/>Assembly Modelling, Creating Bottom-Up Assemblies, Placing Components in the Assembly Document, Assembling Components, Creating Top-down Assemblies, Moving Individual Components Using the Move Component Tool, Rotating Individual Components, Moving and Rotating Individual Components Using the Triad, Assembly Visualization and various assembly mates.</p>  | 50 |

**Distribution of marks weightage for cognitive level:**

| <b>Distribution of Theory Marks</b> |           |           |           |          |          |
|-------------------------------------|-----------|-----------|-----------|----------|----------|
| R Level                             | U Level   | A Level   | N Level   | E Level  | C Level  |
| <b>10</b>                           | <b>15</b> | <b>40</b> | <b>10</b> | <b>5</b> | <b>5</b> |

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

1. Ibrahim Zied, CAD / CAM: Theory and Practice, McGraw-Hill
2. Hearn E J and Baker M P, Computer Graphics, Pearson.
3. Farazdak Haideri, Cad/Cam and Automation.



**GUJARAT TECHNOLOGICAL UNIVERSITY**

**Syllabus for Bachelor of Vocation (B.Voc), 5<sup>th</sup> Semester**

**Branch: Production Technology**

**OJT Elective Name: Designer – Mechanical**

**Subject Code: 1150308**

**With effective  
from academic  
year 2018-19**

**Course Outcome:**

| Sr. No. | CO statement   | Marks % weightage |
|---------|--|-------------------|
| CO 1    | Identify Customer's Requirement and Develop Plan for Engineering Design Process. | 10                |
| CO 2    | Create and Evaluate Mechanical Engineering Design Options.                       | 10                |
| CO 3    | Make or Modify 2D Mechanical Engineering Drawings using CAD.                     | 25                |
| CO 4    | Make or Modify 3D Mechanical Engineering Models using CAD.                       | 30                |
| CO 5    | Make or Modify Assembly of Mechanical Engineering Models using CAD.              | 25                |

**List of Open Source Software/learning website:**

<https://nptel.ac.in>