GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2023 (COGC-2023)
Semester-V

Course Title: Mechnaical Engineering (CAD/CAM) Project-I
(Course Code: 4356502)

Diploma program in which this course is offered	Semester in which offered
Mechnaical Engineering (CAD/CAM)	5th Semester

1. RATIONALE

Functionality, Reliability, Durability, Safety, Maintainability, Sustainability, Ergonomics, Aesthetics, Cost-effectiveness, Manufacturability etc. of a product is always a prime concern for a designer. Even the well-designed product has the scope of improvement looking to situation's demand. It is a moral duty of an engineer to work proactively to provide new class of product to the customer or modify the existing product for a safer, qualitative, cost effective, or sustainable solution. This course provides an opportunity to the students to demonstrate his/her abilities to address at least one of such problems in a product. This course also aims to acquire an engineering skill like diagnose the problem, design an innovative, optimal solution and management skills like conduct the visit or survey, leadership, coordination, team-work, decision making, planning for the resources, reporting etc. in a student.

2. COMPETENCY

The course content should be taught and implemented to develop different skills so that students can acquire the following competency.

- Apply systematic approach for problem identification and its selection; to provide qualitative, cost effective, sustainable solution for the selected problem.

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge, and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

CO	CO Statement
CO-1	Conduct the visits and/or surveys to search the project.
CO-2	Select the project and outline conceptual model of a solution.
CO-3	Modify conceptual model of a solution based on quality, cost, sustainability etc. and prepare plans and estimates for a solution.
CO-4	Prepare Project-I report.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	4	2	0	0	50	50	100

5. Legends: L-Lecture; T– Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, CA -Continuous Assessment; ESE-End Semester Examination.

6. SUGGESTED PRACTICAL EXERCISES

Following practical outcomes (PrOs) are the subcomponents of the Course Outcomes (COs). Some **POs** marked **'*'**are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to the 'Psychomotor Domain.'

A project awareness program will be arranged at the end of semester 4 or well before the start of semester-5 to initialize the Project-I Activities

Guide students to follow steps given below to gather the data in search a project:

1. Go through the syllabus of Mechnaical Engineering (CAD/CAM) Project-I and Project–II.
2. Start by conducting a thorough research in the field or explore an online platform to get an idea of what type of mechanical engineering projects are currently being done. Show case them previously completed projects. Look for relevant resources such as journals, websites, and blogs that focus on mechanical engineering projects.
3. Seek advice from faculties, guide, industry professionals or anybody who have expertise in the field of mechanical engineering. They can guide you in finding suitable projects and even suggest potential project topics.
4. Attend workshops or seminars related to mechanical engineering projects, if any to learn about the latest trends and techniques used in this field.
5. Check with local companies or industries to see if they have any projects that you can work on.

Pr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs.
01	**Data collection for the project:** a. Understand the importance of a project. b. Overview the previously completed projects. c. Understand Project domains/areas and project constraints. d. Understand Dos and Don'ts in context of the project. e. Understand Product design criterion and parameters on which the performance of a product depends. f. Conduct a site visit or literature survey to gather the information for the project selection. g. Record key findings and/or collect key data from the site visit or literature survey. Note: 1. This exercise will be done by each student, individually. 2. Activities **a** to **e** may be completed during project awareness program. 3. Students may work on any real-life problem connected with the mechanical engineering domain. It may be an User Defined Problem (UDP) or live problem	1	16

Pr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs.
	from industry (IDP). Extension or modification of existing product/project should be allowed. It should not necessarily be a physical model only.		
02	**Project Selection.** Refer to the data collected during an exercise-01 and do the following. a. Finalize Project-I groups. b. Prepare group's schedule covering all project tasks for entire term duration. b. Apply relevant product/system design and management technique like Root Cause Analysis (RCA), Finite Element Analysis (FEA), Failure Mode and Effects Analysis (FMEA), Computational Fluid Dynamics (CFD), Fault Tree Analysis (FTA), Critical examination (5W2H), Ishikawa (Fishbone) Diagram, Pareto Analysis, Statistical Process Control (SPC), Design of Experiments (DOE), Value Stream Mapping (VSM), Simulation and Modeling, 5-S strategies, 7-S framework, SWOT analysis, Life Cycle Management (LCM), Lean Manufacturing, Six Sigma, Total Quality Management (TQM) etc. and outline the conceptual model of the project with key data. c. Prepare project definition. Note: 1. Preferably, student's group size will be in a range of 3 to 8; based on the project's requirement. 2. Interdisciplinary groups may be allowed as per the project's demand. 3. Each project group will be assigned a guide. Preferably all or majority of the department's faculties should be assigned duty of Project-I guide-ship.	2	12
03	**Plans & estimates of the project.** Refer to the details collected during an exercise-02. a. Prepare specifications of a project item. b. Prepare detail and assembly production drawing of a project item. c. Prepare manufacturing, financial and management plans like an OPC, Resource requirement Plans, Process plan, Cost estimation etc. for the project item. d. Prepare a user manual of a project item.	3	16
04	**Project-I report.** a. Prepare a computerized project report with following guidelines. PAGE : A4 (print both side) MARGIN : TOP 15mm BOTTOM 15mm RIGHT 15mm LEFT 30mm (mirror margining) FONT : ARIAL FONT SIZE: TITLE:12 BOLD, CONTENT:12, SPACING :18pt HEADER: PROJECT TITLE, PAGE No ON TOP RIGHT. FOOTER : ACADEMIC YEAR, SHORT NAME **SAMPLE FORMAT OF PROJECT-I REPORT** • The Report may include the following. Text shown in the square bracket [] is an explanation on the chapter/topic. Certificate (in the Format given in Appendix-C)	4	12

Pr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs.
	Acknowledgement Index 1. Abstract: [A brief summary of the project, including its objectives, methodology, and results.] 2. Introduction: [An introduction to the project, including its background and scope.] 3. Literature Review: [A review of the existing literature related to the project, including any relevant theories or concepts. This may include Prior Art Search.] 4. Methodology: [A description of the research methodology used in the project, including data collection and analysis methods.] 5. The Outline of the solution: [This may include Product specification, Details & Assembly production drawing, User Manual, Operation Process Chart (OPC), Group's work allocation for entire Project-I duration, statements/plans of soft/hard resources requirement at various stages of manufacturing, Process Plans, Budget/cost estimation etc.] 6. Results and Discussion: [A presentation of the project's probable results, including any statistical analyses, charts, or graphs. This section should also include a discussion of the results and their implications.] 7. Conclusion: [A summary of the project's main findings and conclusions.] 8. Recommendations: [Suggestions for future research or improvements to the project.] 9. References: [A list of all sources cited in the report.] 10. Appendices: [Any additional materials that support the report, such as photographs, technical drawings, circuits, software or data sets.] b. Print Project-I report in required numbers, after guide's approval. c. Submit Hard copy of Project-I report, Original Project-I Logbook, Soft copy of Project-I report/records. Note: 1. Each project group will present their work after completion of each exercise as per department's plan. 2. Projects may be showcased in Institutional/regional level events.		
Total (Hours)		**-**	**56**

Note:

I. More **Practical Exercises** can be designed and offered by the concerned course teacher to develop the industry-relevant skills/outcomes to match the COs. The above table is only a representative list**.**

II. Care must be taken in assigning and assessing the study report as it is a Second-year study report. The study report, data collection, and analysis report must be assigned to a group. A teacher has to discuss the type of data (which and why) before the group starts their market survey.

The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above-listed **Practical Exercises** of this course required, which are embedded in the Cos and ultimately the competency.

7. Sample rubrics Performance Indicators for the PrOs

Criteria	%	5	4	3	2
Logbook	10%	Always maintains proper order of meetings and assigned tasks	Consistently maintains proper order of meetings and assigned tasks	Sometimes maintains proper order of meetings and assigned tasks	Rarely maintains proper order of meetings and assigned tasks
Literature Survey	10%	Always lists journals, websites etc. and generate idea with scope of product	Consistently lists journals, websites etc. and generate idea with scope of product	Sometimes lists journals, websites etc. and generate idea with scope of product	Rarely lists journals, websites etc. and generate idea with scope of product
Concept development and finalization of topic	10%	Always compares existing concepts and derives final topic	Consistently compares existing concepts and derives final topic	Sometimes compares existing concepts and derives final topic	Rarely compares existing concepts and derives final topic
Drawings	20%	· Always provides 3 views of each part with required dimensions · Always shows components assembled in 3D drawing	· Consistently provides 3 views of each part with required dimensions · Consistently shows components assembled in 3D drawing	· Sometimes provides 3 views of each part with required dimensions · Sometimes shows components assembled in 3D drawing	· Rarely provides 3 views of each part with required dimensions · Rarely shows components assembled in 3D drawing
Budget Analysis	10%	Always list parts used assembly and costing with competitive rates	Consistently list parts used assembly and costing with competitive rates	Sometime list parts used assembly and costing with competitive rates	Rarely list parts used assembly and costing with competitive rates
Oral Presentation	10%	Always discuss all content with outline and methodology used	Consistently discuss all content with outline and methodology used	Sometime discuss all content with outline and methodology used	Rarely discuss all content with outline and methodology used
Report write-up	10%	Always preparer basic category/section and summary	Consistently preparer basic category/section and summary	Sometime preparer basic category/section and summary	Rarely preparer basic category/section and summary
Conclusion, Future Scope & Planning.	10%	Conclusion derived appropriately	Conclusion derived but partial	No relevant conclusion	No conclusion

8. MAJOR EQUIPMENT/INSTRUMENTS REQUIRED

Sr. No.	Equipment Name	PrO. No.
1.	Computer with word processor software	4

9. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above COs and PrOs. More can be added to fulfill the development of this course competency.

a. Work as a leader/team member.

b. Follow safety practices.

c. Follow ethical practices

d. Maintain tools and equipment

e. Practice environment-friendly methods and processes.(Environment Related)

10. SOFTWARE/LEARNING WEBSITES

- https://www.theengineeringprojects.com/
- https://asmedigitalcollection.asme.org/mechanicaldesign
- https://blog.creationcrate.com/mechanical-engineering-projects/

11. PO-COMPETENCY-CO MAPPING

Semester V	Pos						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Competency & Course Outcomes	Basic & Discipline-specific knowledge	Problem Analysis	Design/development of solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability & environment	Project Management	Life-long Learning
Competency	**Apply systematic approach for problem identification and its selection; to provide qualitative, cost effective, sustainable solution for the selected problem.**						
Conduct the visits and/or surveys to search the project.	3	-	-	-	-	2	2
Select the project and outline its conceptual model.	2	2	-	-	2	2	2
Modify conceptual model; based on quality, cost or sustainability.	3	2	3	2	2	2	2
Prepare a project report.	-	-	-	2	-	2	2

Legend:'3' for high, '2' for medium, '1' for low, and '-'for no correlation each CO with PO.

12. COURSE CURRICULUM DEVELOPMENT COMMITTEE (GTU Resource Persons)

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	Jitendra P Parmar, Lecturer Mechanical Engineering	609 - C U Shah Polytechnic Surendranagar	9429942662	jpparmar66@gmail.com
2.	Muhammad Azharuddin U Badi, Lecturer Mechanical Engineering	627 - Government Polytechnic, Porbandar	9558800951	muhammadabadi92@gmail.com

13. BOS Resource Persons

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1	Dr. S. H. Sundarani, BOS Chairman & HOD Mechanical	Government Polytechnic, Ahmadabad	9227200147	gpasiraj@gmail.com
2	Dr. Rakesh D. Patel, BOS Member & HOD Mechanical	B. & B. Institute of Technology, V. V. Nagar	9825523982	rakeshgtu@gmail.com
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