GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER AIDED DESIGN
(Code: 3341904)

Diploma Programme in which this course is offered	Semester in which offered
Mechanical Engineering	4th Semester

1. RATIONALE

The students of mechanical engineering programme are mainly involved in modelling, designing, manufacturing, inspection and planning activities (such as preparing design and production drawing, process plans, preparing bill of materials, etc.) in industries. For all such activities, reference document is the modelling and drawing of component/assembly to be manufactured. In this context, it is of utmost importance to prepare, read and interpret these drawings correctly for production of components and assemblies accurately and precisely. The industrial practices of modelling and designing are also important for the students to make them aware of modelling and designing practices, symbols, codes, norms and standards generally used in industries.
This course has been introduced at Diploma level in order to develop the skills in student so that they can generate various modelling and digital production drawings as required by industry using appropriate CAD software.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Develop production drawings and solid models using codes, norms, standards and CAD software**.

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Select configuration of CAD workstation.
ii. Select type of modeling technique for given part.
iii. Design, develop and model the given part using various CAD software like- Creo/Catia /Unigraphics/Solid edge/Inventor/ AutoCAD, etc.
iv. Prepare solid models & assembly of mechanical parts.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
2	0	2	4	70	30	20*	30	150

Legends: L -Lecture; **T** -Tutorial/Teacher Guided Student Activity; **P** -Practical; **C** - Credit; **ESE**-End Semester Examination; **PA** -Progressive Assessment
* WITH EXTERNAL EXAMINER.

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I **Fundamentals of CAD**	1a. Appreciate the need of CAD and its application.	1.1 Computer graphics & its terminology. 1.2 CAD definition, concept & need. 1.3 CAD process. 1.4 Functional areas of CAD. 1.5 Coordinate systems.
	1b.Perform Geometric 2D transformation.	1.6 Geometric transformation-concept and types. 1.7 2 dimensional (2D) geometric transformation- translation, scaling, rotation and mirror with numeric examples.
Unit- II **CAD Hardware**	2a. Describe functions of CAD Workstation, its types, and configuration. 2b. Use input/output CAD devices.	2.1 CAD Workstation-types, functions and configuration. 2.2 Input and output devices (including voice, gesture, 3 dimensional (3D) printer, etc)-types, configuration and applications.
Unit – III **Geometric modeling**	3a.Explain types of solid modeling.	3.1 Difference between 2D & 3D models. 3.2 Geometric modeling – concept, types, features and applications. 3.3 Solid modeling methods like Constructive Solid Geometry, Pure primitives & Boundary Representation
	3b.Describe characteristics of features based CAD packages.	3.4 Feature base modeling-concept, illustrative examples.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	3c.Differentiate graphics packages used for modeling	3.5 Parametric & non parametric modeling-concept, differences and illustration.
Unit – IV **3D Modeling using AutoCAD**	4a. Use appropriate UCS for the given situation.	4.1 Introduction to AutoCAD-3D features and 2D commands overview. 4.2 3D primitives-types and defining parameters. 4.3 User coordinate system (UCS) and its options.
	4b. Prepare solid model of industrial parts and its assembly using Auto CAD.	4.4 3D draw commands. 4.5 3D modify and editing commands. 4.6 3D viewing & views generation.
	4c. Prepare simple surface model using AutoCAD.	4.7 Surface modeling commands.
Unit – V **3D parametric modeling**	5a Prepare solid model of industrial parts and its assembly using parametric modeling software.	5.1 Introduction to parametric modeling software. (Any one from Creo, Unigraphics, CATIA, Solid Edge, Inventor etc). 5.2 Sketching interfacing overview. 5.3 3D working plane introductions. 5.4 3D modeling. 5.5 Assembly modeling. 5.6 Views generation.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Fundamentals of CAD	4	5	5	0	10
II	CAD Hardware	2	2	3	0	5
III	Geometric modeling	4	2	4	4	10
IV	3D Modeling using AutoCAD	8	4	6	10	20
V	3D parametric modelling	10	5	6	14	25
	TOTAL	28	18	24	28	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised taxonomy)

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.

General Notes:

a. If midsem test is part of continuous evaluation, unit numbers I, II, III and IV (Up to point number 4.2 only) are to be considered.

b. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.

c. For theory paper, examiner has to give options of "Select and specify any one software from Creo, Unigraphics, CATIA, Solid Edge, Inventor etc" while asking the questions from Unit V.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit Number	Practical/Exercises (Outcomes' in Psychomotor Domain)	Hrs. required
1	ALL	**Preperatory Activity** Prepare a 2D drawing using AutoCAD and 2D parametric sketcher environment.	02
2	IV	**3DSolid Modeling-I** Prepare 3D solid models using AutoCAD (Three mechanical components).	04
3	IV	**3D Surface Model** Prepare simple surface model using AutoCAD (Two mechanical components).	02
4	V	**3D Solid Modeling-II:** Prepare 3D solid model using any one (from Creo, Unigraphics, CATIA, Solid Edge, Inventor etc) parametric software. (Three models that includes base features, Extrude/Protrude/Revolve).	05

5	V	**3D Solid Modeling-III:** Prepare 3D solid models using any one (from Creo, Unigraphics, CATIA, Solid Edge, Inventor etc) parametric software. (Four models that includes engineering features).	05
6	V	**Mini Project And Presentation Using Any One (From CREO, Unigraphics, CATIA, Solid Edge, Inventor) Parametric Software.** a. Prepare solid models of dismantled parts of an assembly (selected as student activity 1). b. Assemble the parts. c. Get orthographic production drawings of solid models prepared at "a" above. d. Get orthographic production drawings of assembly model prepared at "b" above. e. Prepare the bill of material (BOM) . f. Present the project.	10
Total Hours			**28**

Notes:

a. It is compulsory to prepare log book of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by teacher.
b. Term work report must not include any photocopy/ies, printed manual/pages, litho, etc. It must be hand written / hand drawn by student only. Printouts of actually modelled parts/assemblies are to be permitted.
c. Term work report content of each experience should include following.
    i. Sketches of parts/assemblies.
    ii. Steps followed with commands, its options with numeric values, position of UCS (in case of AutoCAD), planes selected, etc.
    iii. Printouts of modelled parts/assemblies.
d. Mini project and presentation topic/area has to be assigned to the student in the beginning of the term by batch teacher. This may be assigned individually or in the group of maximum 2 to 3 students.
e. For 80 marks ESE, students are to be assessed for competencies achieved. They should be given following tasks:
    i. Prepare solid models and assembly using AutoCAD and any one software (Creo, Unigraphics, CATIA, Solid Edge, Inventor etc).

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Sr. No.	Activity
1	Bring Actual mechanical assembly from industry/real life/scrap shop/garage/etc. (made up of at least 4 to 5 mechanical components), dismantle the same, measure dimensions and sketch it to use the same for exercise no.6).
2	Visit design section of different industry and observe various hardware and software, procedure, standards they are following for designing a product.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

Sr. No.	Unit	Strategies
1	I & II	a. Explain various configurations for CAD workstation and different peripherals. b. Demonstrate various Input/output devices and its connections and how to use it. c. Demonstrate the procedure of loading the CAD software on a computer system.
2	III	Bring actual industrial production drawings from nearby industry and distribute them among group of students for self study and interpretation. Ask students to practice these drawings using CAD software.
3	IV & V	a. Bring small real components/assemblies like nuts, bolts, washers, cotter-knuckle joints, couplings, pulleys, shafts, gears, tool post, tool holders, etc. in the class. b. Demonstrate various features of such components. c. Show the steps to create solid models and assemblies of such parts/assembly using CAD softwares. d. Take the students for industrial visit.

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

Sr. No.	Title of Books	Author	Publication
1.	Creo 2.0 for designer and engineers	Sham Tickoo	Dreamtech press
2.	Designing with Creo Parametric 2.0	Dr. Michel J Rider	SDC Publications
3.	Pro/Engineer wildfire 5.0 instructor	David S. Kelley	McGraw-hill
4.	Unigraphics for designer & engineers	Sham Tickoo	Dreamtech press
5.	AutoCAD for engineers and Designers	Sham Tickoo	Dreamtech press
6.	Machine design	K.C.Jhon	PHI
7.	Production drawing	K.L.Narayan	New age publication
8.	Fundamental of Geometric dimensioning & tolerancing	Alex kruleski	Cengage publication
9.	CAD/CAM & Automation	Farzak haidaree	Nirali
10.	Machine drawing including AutoCAD	Ajeet singh	McGraw-hill

B. List of Major Equipment/ Instrument with Broad Specifications:

i. CAD Workstations.
ii. Laser printer-A3 size.
iii. AutoCad.

iv. Latest educational network version of Creo, Unigraphics, CATIA, Solid Edge, Inventor, software (Any one).

C. List of Software/Learning Websites:

i. https://www.youtube.com/watch?v=WY0YuCkJWdw
ii. https://www.youtube.com/watch?v=OIYrkF_FId8
iii. https://www.youtube.com/watch?v=zoMW_usjaJo
iv. https://www.youtube.com/watch?v=fx6kt9djIpc
v. https://www.youtube.com/watcAh?v=8wdOIHxICxw
vi. https://www.youtube.com/watch?v=srnm--IKtl4
vii. https://www.youtube.com/watch?v=rtjDfZXscrI

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics:

- **Prof. K. H. Patel**, Head of Mechanical Engineering, Dr.S.S.& S. Gandhi College of Engineering and Technology, Surat.
- **Prof. A. A. Lohia**, Lecturer in Mechanical Engineering, Government Polytechnic, Rajkot.
- **Prof. S. H. Sundrani**, Lecturer in Mechanical Engineering, Government Polytechnic Ahmedabad.
- **Prof. Hitesh J. Yadav**, Lecturer in Mechanical Engineering, RCTI, Ahmedabad.
- **Prof. B.D. Parmar**, Lecturer in Mechanical Engineering, Government Polytechnic, Porbandar.
- **Prof. J. B. Patel,** Lecturer in Mechanical Engineering, Sir BPI, Bhavnagar.
- **Prof. Jignesh M. Patel,** Lecturer in Mechanical Engineering, BSP Polytechnic, Kherva.

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. Sharad K. Pradhan**, Head, Department of Mechanical Engineering
- **Dr. K.K. Jain,** Professor and Dean, Department of Mechanical Engineering