FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Automobile Engineering)**

Semester: **V**

Course Code: **202010506**

Course Title: **Computer Aided Design and Manufacturing**

Course Group: **Professional Elective Course-I**

Course Objectives: To impart knowledge to the students regarding applications of CAD/CAM in a field of automobile engineering. Students will also learn about recent advancement in computer aided design & manufacturing and will get solid foundation in solving analytical problems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	50 / 18	25 /9	50 / 17	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Fundamentals of CAD & Computer Graphics:** Automotive applications, Introduction to CAD and Design process, Application of computer for design, Product Cycle and CAD-CAM, integration, CAD work station: Hardware & Software , Benefits of CAD for industries, Introduction to Computer graphics, Scan conversions and Algorithm for generation of line and circle, 2D and 3D Transformations and Composite Transformations	5

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2	**Geometric Modeling** Representation of curves and surfaces, Parametric representation of lines: Locating a point on a line, parallel lines, perpendicular lines, distance of a point, Intersection of lines, Synthetic Curves: Concept of continuity, Cubic Spline: equation, properties and blending. Bezier Curve: equations, properties; Properties and advantages of B-Splines and NURBS. Geometric modeling techniques, Wireframe modeling, Surface Modeling and Solid Modeling, Feature based Parametric modeling, applications of modeling in vehicle body design.	**12**
3	**Geometric Transformations** Homogeneous representation; Translation, Scaling, Reflection, Rotation, Shearing in 2D and 3D; Orthographic and perspective projections. Window to View-port transformation.	**7**
4	**Finite Elements Techniques** Procedure , methods, element , types, modeling, single dimensional analysis on beam element, shape function, stress matrix, connectivity table, thermal stresses, horizontal and vertical element structure, global load matrix, global deflection matrix, stiffness matrix, elimination approach and penalty approach, heat transfer analysis , fluid flow analysis, programming , mesh generation, analysis of Trusses and Beams.	**13**
5	**Computer Aided Manufacturing** Application of CAM in Automobile, Introduction of CAM, Objectives & scope, Nature & Type of manufacturing system, Evolution, Benefits of CAM, Role of management in CAM, Concepts of Computer Integrated Manufacturing, NC and CNC Technology: Types, Classification, Specification and components, Construction Details, Controllers, Sensors and Actuators, CNC hardware: Re Circulating ball screw, anti friction slides, step/servo motors. Axis designation, NC/CNC tooling. Fundamentals of Part programming, Types of format, introduction for part programming for drilling, lathe and milling machine operations,	**8**
		45

List of Practicals / Tutorials:

1	Introductory exercise for 3-D modelling software
2	Exercise for basics of 3-D editing commands
3	Exercise for advanced of 3-D editing commands
4	Exercise for basics of Drawing module

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5	Exercise for basics of Assembly module
6	Introductory exercise for Finite Element Analysis.
7	Exercise on 1-D structural problems using FEA
8	Exercise on Finite Element Analysis of Trusses.
9	Exercise on analysis of beam elements using FEA
10	Demonstration of automotive component manufacturing using CNC

Reference Books:

1	Ibrahim Zied, CAD / CAM: Theory and Practice, McGraw-Hill
2	Hearn E J and Baker M P, Computer Graphics, Pearson.
3	Logan D, A First Course in the Finite Element Method, Cengage
4	Chandrupatla T A and Belegundu A D, Introduction to Finite Elements in Engineering, PHI.
5	David F. Rogers, James Alan Adams "Mathematical elements for computer graphics" second edition, Tata McGraw-Hill edition
6	Farazdak Haideri, CAD / CAM and Automation, Nirali Prakashan.
7	M. Groover, CAD/CAM, Pearson Education.
9	J. Srinivas, CAD/CAM: Principles and Application , Oxford University Press

Supplementary learning Material:	
1	**N**PTEL resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

Internal Evaluation :

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The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
25	**25**	**25**	**15**	**5**	**5**	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Realize and appreciate use of CAD tools in product development through computer aided design & graphics.	15
CO-2	To understand the mathematical aspects of geometrical modeling and various curves applications in automotive car body style design.	**25**
CO-3	To understand different geometric transformations and application in modelling.	15
CO-4	To understand various finite element methods for analysis of simple automotive components.	**25**
CO-5	To understand concepts and scope of computer aided manufacturing.	20

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027

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