COURSE CONTENT

ADVANCED CAD								
I Year I Semester: M.Tech CAD/CAM								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2414001	**Foundation**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: There are no prerequisites to take this course.								

Course Overview:

This course introduces CAD tools, software standards, and the fundamentals of 3D geometric modeling. It covers wireframe, surface, and solid modeling techniques along with curve and surface representations. Students learn CAD transformations, projections, visualization methods, and data exchange standards. The course also emphasizes evaluation of CAD systems, dimensioning, and tolerance principles for design application.

Course Objectives:

1. To study about the CAD process and concept of geometric modelling.
2. To study the concepts of wireframe modelling.
3. To study the concepts related to surface modelling.
4. To study the concepts of solid modelling.
5. To study about geometric transformations techniques, data exchange formats and mechanical tolerance.

Course Outcomes: After Completion of the Course, Students should be able to

CO1: Understand the CAD process and geometric modelling concepts.

CO2: Analyze the utility and application of wire frame modelling.

CO3: Understand the concepts of surface modelling.

CO4: Understand and apply the concepts of solid modelling techniques.

CO5: Understand graphics by using transformations and analyse the utility of data exchange formats with dimensioning and tolerances.

MODULE - I:

CAD Tools: Definition of CAD Tools, Graphics standards, Graphics software: requirements of graphics software, Functional areas of CAD, Efficient use of CAD software.

Basics of Geometric Modelling: Requirement of geometric 3D Modeling, Geometric models, Geometric construction methods, Modelling facilities desired.

MODULE – II:

Geometric Modeling: Classification of wireframe entities, Curve representation methods, Parametric representation of analytic curves: line, circle, arc, conics, Parametric representation of synthetic curves: Hermite cubic curve, Bezier curve, B-Spline curvewire, NURBS, Curve

manipulations.

MODULE - III:

Surface Modeling: Classification of surface entities, Surface representation methods, Parametric representation of analytic surfaces: plane surface, ruled surface, surface of revolution, tabulated cylinder, Parametric representation of synthetic curves: Hermite cubic surface, Bezier surface, B-Spline surface, Blending surface, Surface manipulations.

MODULE - IV:

Solid Modelling: Geometry and topology, Boundary representation, The Euler-Poincare formula, Euler operators, Constructiv e solid geometry: CSG primitives, Boolean operators, CSG expressions, Interior, Exterior, closure, Sweeping: linear and non-linear, Solid manipulations, feature modeling.

MODULE - V:

Transformations:2-D and 3-D transformations: translation, scaling, rotation, reflection, concatenation, homogeneous coordinates, Perspective projection, orthotropic projection, isometric projection, Hidden surface removal, shading, rendering.

Evaluation Criteria: Evaluation criteria of CAD software, Data exchange formats: GKS, IGES, PHIGS, CGM, STEP

Dimensioning and tolerances: Linear, angular, angular dimensions, maximum material condition (MMC), Least material condition (LMC), Regardless of feature size (RFS).

TEXT BOOKS:

1. CAD/CAM Concepts and Applications, Chennakesava R. Alavala, Prentice-Hall of Indi (PHI), 1st Edition, 2007.
2. Mastering CAD/CAM, Ibrahim Zeid, McGraw Hill International Edition, 1st Edition, 2004.

REFERENCE BOOKS:

1. CAD/CAM: Computer-Aided Design and Manufacturing, Mikell P. Groover, Pearson Education, 1st Edition, 2003.
2. CAD / CAM / CIM P. Radhakrishnan and S. Subramanian, New Age International Publishers, 3rd Edition, 2008.
3. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson Education, 1st Edition, 2004.
4. Computer Numerical Control Concepts and programming, Warren S. Seames, Thomson Delmar Learning, 1st Edition, 2002.
5. CAD/CAM Principles and Applications, P.N. Rao, TMH, 3rd Edition, 2010.

ELECTRONIC RESOURCES:

1. https://libguides.wits.ac.za/cad/cam
2. https://eng.libretexts.org
3. https://nptel.ac.in/courses/104118192
4. https://ftp.idu.ac.id/wpcontent/uploads/ebook/tdg/ADVANCED%20MECHANICS%20DESIGN/epdf.pub_advanced-functional-materials.pdf
5. https://eng.libretexts.org/Bookshelves/Design_Engineering_

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)