



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

GEOMETRIC MODELLING LABORATORY											
IV Semester: AE											
Course Code	Category	Hours / Week			Credits				Maximum Marks		
		L	T	P	C	CIA	SEE	Total			
AEEE16	Core	0	0	2	1	40	60	100			
Contact Classes: Nil		Tutorial Classes: Nil		Practical Classes: 36			Total Classes: 36				
Prerequisite: Computer Aided Engineering Graphics											

I. COURSE OVERVIEW

This course will also provide the computer aided design laboratory provides a strong foundation of computer aided designing tool and students will learn the implementation of solid modelling using CATIA. It enables students to master the fundamentals of advanced modelling techniques, sketcher tools, base features, drafting, sheet metal and surface design workbenches. This course focuses on giving the foundations of engineering design and making it very useful for getting the student ready for product manufacturing industry

II. COURSE OBJECTIVES

The students will try to learn:

- I. The principles of isometric and orthographic projections to create accurate CAD models using CATIA V5 software.
- II. To create 2D profiles and convert them into 3D models, gaining practical skills in part creation and modification.
- III. The fundamentals of geometric dimensioning and tolerancing (GD&T) and how to represent them correctly in CAD models.
- IV. To design and model various aircraft components by selecting and using the appropriate CATIA workbenches and tools effectively.

III. COURSE OUTLINE

After successful completion of the course, students should be able to:

- CO1 Choose appropriate tools and profiles for developing the required sketch using the Sketcher workbench.
- CO2 Make use of wireframe elements, surfaces, trim elements and power copies for constructing the complex surfaces
- CO3 Utilize different geometric and dimensioning symbols and industry standards for the preparation of technical mechanical drawings
- CO4 Select appropriate tools available in assembly workbench for creating three-dimensional assemblies incorporating multiple solid models
- CO5 Build components using sketch Based features, perform sheet metal operations and correctly organize the tree for having maximum compatibility for editing or modifying the model
- CO6 Develop a model from drawing provided and draw conclusions for designing various aircraft components by utilizing different workbenches.

IV. COURSE CONTENT

EXERCISE -1: INTRODUCTION TO CATIA V5

Introduction to CATIA V5 software, its workbenches, toolbars, menus, and user interface.

EXERCISE -2: SKETCHER

Interface, Sketch Tools, View Tool bar, Profile Tool bar, Operation Tool bar, Tools, Constrain tool bar, Transformation Tool bar, User Selection Filter, Standards, Visualizations.

EXERCISE -3: PART DESIGN

Sketch Based Features Dress up Features, Transformation Features, Reference Elements, Measure, and Thickness.

EXERCISE -4: BOOLEAN OPERATIONS

Practice Boolean operations such as union, subtraction, and intersection to combine or modify multiple solid bodies and create complex parts.

EXERCISE -5: SHEET METAL DESIGN

Create walls, cutouts, stamping features, bends, and rolled walls, learning to design sheet metal components used in aircraft structures.

EXERCISE -6: SURFACE DESIGN

Perform surface creation, wireframe modeling, replication of surfaces, and learn techniques for complex aerodynamic shapes

EXERCISE -7: ASSEMBLY

Study of Assembly Design workbench, focusing on product structure, assembly constraints and hierarchical assembly design

EXERCISE -8: GEOMETRIC DIMENSIONING & TOLERANCING (GD&T)

Introduction to Geometric Dimensioning and Tolerance, Weld Symbols, GD and T Symbols, Types of Tolerances, Types of views, Roughness Symbols.

EXERCISE -9: DRAFTING

Generate 2D engineering drawings from 3D models, including orthographic, isometric views, annotations, and sheet formatting.

EXERCISE -10: DESIGN OF AIRCRAFT WING

Design and model two wing structures, creating airfoil profiles, ribs, spars, and other structural elements.

EXERCISE -11: DESIGN OF FUSELAGE

Design of aircraft fuselage with internal structural components, such as frames, longerons, and skin panels.

EXERCISE -12: DESIGN OF NOSE CONE

Design of nose cone structures, including surface modeling, lofting, and aerodynamic shaping integrated with the fuselage.

EXERCISE -13: DESIGN OF LANDING GEAR

Design of main and nose landing gear assemblies, including struts, shock absorbers, wheels, and mounting assemblies.

EXERCISE -14: DESIGN OF AIRCRAFT

Comprehensive design of any two aircraft structures, integrating wings, fuselage, nose cone, and landing gear

V. TEXTBOOKS

1. Sham Tickoo, “CATIA V5 for Designers”, CADCIM Technologies, 9th Edition, 2020.
2. Tutorial Books / Dassault Systèmes, “CATIA V5 Workbook – Mechanical Design”, 21st Release, 2021.
3. Raymer, “Aircraft Design: A Conceptual Approach”, American Institute of Aeronautics and Astronautics, 6th Edition, 2018.

VI. REFERENCE BOOKS

1. T. H. G. Megson, “Aircraft Structures for Engineering Students”, Elsevier, 6th Edition, 2017.
2. Tutorial Books / CADCIM Technologies, “CATIA V5 Design Fundamentals”, 1st Edition, 2018.
3. Alex Krulikowski, “Geometric Dimensioning and Tolerancing”, McGraw Hill, 3rd Edition, 2011.

VII. ELECTRONIC REFERENCES

1. <https://www.scribd.com/document/765393963/CATIA-Design-Manual>
2. https://akanksha.iare.ac.in/index?route=course/details&course_id=2388
3. <https://static.sdcpublications.com/pdfsamples/1-58503-314-6-2.pdf>

VIII. MATERIALS ONLINE

1. Course Outline Description
2. Lab Manual