

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
- K.K. BIRLA GOA CAMPUS**

FIRST SEMESTER 2013-2014

Course Handout

Course Title: 3D modelling and Structural Analysis using Catia and Ansys

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Course Description:

CATIA is a robust application that enables you to create rich and complex designs. The goals of the CATIA course are to teach you how to build parts, surfaces and assemblies in CATIA, and how to make simple drawings of those parts and assemblies. This course will focus on the fundamental skills and concepts that will enable you to create a solid foundation for your designs.

ANSYS is an engineering simulation software. It is a general purpose finite element modelling package for numerically solving a wide variety of mechanical problems. These problems include: Static/dynamic structural analysis (linear and non-linear) heat transfer and fluid problems, as well as acoustic and electromagnetic problems. At the end of the course, students will be well versed with all the features of structural module and how to couple it with other modules like thermal, fluid dynamics etc.

Course Structure

Lect.
No.

Skillet

Introduction to Catia and Ansys

What is PLM/CATIA software?

In this section, you will learn about PLM and how it relates to CATIA. This section also introduces the key features of CATIA.

- 1
- CATIA's function in the product life cycle

V5 Fundamentals:

Upon completion you will be able to learn how to work on part designing module

- Introduction to Catia
- Profile Creation.
- Basic Features.

- 2
- Additional Features
 - Dress-up Features
 - Reusing Data
 - Finalizing Design Intent
 - Assembly Design
 - Designing in Context
 - Drafting
 - Master Project

Part Design Expert

Advanced stage of Part designing

- 3
- Use 3D Elements to create a part
 - Create advanced Sketch-Based Features

-Apply Advanced Dress-Up Features

-Design using Boolean operations

4 -Analyse Parts

-Annotate Parts for review

Drafting:

5 -Standards

-Sheet Styles

-Views

Surface Design:

Upon completion of this you will be able to:

-Introduction to surface design

- Identify and use the tools specific to the Generative Shape Design workbench

-Create Wireframe Geometry

- Create simple reference and Wireframe geometry

-Shape Design Common Tools

6,7,8,9 -Create Surfaces

- Use the reference wireframe elements to create simple surfaces

-Performing Operations on Geometry

-Completing the Geometry in Part Design

- Create clean topology from a set of surfaces and smooth sharp edges

-Modifying the Geometry

-Using Tools

- Detect and correct the discontinuities on curves and

-Master Exercise

surfaces

- Create solids from surfaces

Surface Design Expert:

Upon completion of this, you will be able to create and modify complex parts based on variable shapes and make sure the resulting surfaces fit to industrial quality criteria.

- 10,11, -Creating Advanced Wireframe Features
- 12,13 -Wireframe Analysis and Repair
- Creating Advanced Swept Surfaces
- Creating Advanced Blend Surfaces
- Surface Analysis and Repair
- Additional Surface Design Tools

Catalogue Editing:

Upon completion, you will be able to regenerate as many parts as you like from a single parameterized part using the design tables.

- Parameterizing the parts
- 14 -Design Table Usage

Rendering

Upon completion you will be able to render life-like models

Analysis and simulation Basics in Catia:

Upon completion you will know how to perform structural analysis of parts using Catia features

15

-Generative Structural Analysis

Introduction to ANSYS

- 16
- Need for ANSYS
 - Our Objectives in the course
 - FEA/FEM
 - ANSYS Basics
 -

Mechanical APDL

- 17
- Introduction
 - Basic Analysis
 1. Truss
 2. Cantilever Beam
 3. Simply supported beam
 4. Brackets

Upon completion, students will be able to solve basic structural problems in Mechanical APDL environment

Mechanical APDL

- 18
- Intermediate Analysis

Self-weight, Distributed loading, Thermal Problems, Buckling, Non-linear Analysis,

Exploiting the symmetry of the problem etc.

Upon completion, students will be able to solve basic structural and thermal problems.

Mechanical APDL

Upon Completion, students

19 - Advanced Analysis

should be well versed with all the features of Mechanical APDL

20 **Introduction to Workbench**

- Basic and Intermediate Analysis

21,22 **Advanced Analysis**

Upon completion, students must be able to solve advanced problems in ANSYS

Evaluation Components:

To be announced in the class.