ME-430 INTRODUCTION TO COMPUTER AIDED DESIGN

Textbooks and Notes:

- Instructor's Lecture Notes

Reference:

Mastering CAD/CAM by I. Zeid, McGraw-Hill, New York, 2005
ISBN 0-07-286845-7

Course Description:

This is a course introducing basic concepts of CAD (Computer Aided Design) and structural and thermal as applied to Mechanical Engineering design problems. Topics include geometric modeling, computer graphics, projections, database, mechanism design, structure and thermal FEA (Finite Element Analysis), optimization for design models. The laboratory component involves use of current CAD software packages for mechanical design.

Prerequisites: CIS 101, Math 222

Miscellaneous:

- NJIT Academic Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students – visit http://www.njit.edu/academics/honorcode.php.
- For any modifications or deviations from the syllabus throughout the course of the semester, instructor will consult with students and the students must agree to.

Course Outline1[1] : Lectures

Session Number:	TOPICS	ASSIGNMENTS
1	Course Introduction, Product Life Cycle and Roles of CAD in Design Process (Synthesis and Analysis) Structure of Software GUI and Basic & Advanced Types of Protrusion	Shaft, Base Support & Helical Extension Spring
2	CAD/CAM Hardware – CAD/CAM Systems – Hardware Configurations (Mainframe, Workstation and PC Configurations). Graphics Displays hardware in Computer Graphics	Hammer Handle, Tray & Cam
3	CAD/CAM Hardware – Hardware Integration and Networking. CAD/CAM Software – Database Coordinate Systems and Sketch Planes (Working Coordinate System, Model Coordinate System, and Screen Coordinate System - Projections).	Windmill, Razor Handle & Ball Bearing
4	Model Representation Schemes – Wireframe Modeling, Surface	Clip, Bottle &



	Modeling, and Solid Model Creation Techniques (Constructive Solid Geometry, Boolean Operations, and Parametric Modeling)	Pump Housing
5	Dimensioning & Tolerancing Techniques Multi-view Projections & Auxiliary View Type of Sectional Views	Involute Spur Gear, Detailed Drawing of Shaft & Cotter Pin Using Family Table
6	CAD/CAM Software – Matrices of Coordinate Systems Transformation: Homogeneous Coordinate System, and Mathematical Development of Working, Model & Screen Coord. Systems Relationships.	Brake Rotor, Roller Chain Assembly & Roller Chain Assembly Drawing
7	Curves Representation – Analytical and Free Form Curves: Bezier, B-Spline & NURBS Assembly Design Modeling – Assembly Constraints Optimization Mechanism Design – Kinematics and Dynamics Analyses in CAD.	Bicycle Chain Assembly, Crankshaft Balancing and Optimization & Eccentric Mechanism
8	**Mid-term Exam I**	Oscillating Cam Mechanism & Exercise Machine
9	Mechanism Design – Type of Joints and Degree of Freedom in Mechanism Design Theory of Failures – von Mises Stress etc. Introduction to Plastic Injection Machines	Car Wheel, Plastic Advisor Analysis of Tray & Bike Wrench Structural Analysis Start to create parts for Project 1
10	Finite Element Analysis (FEA) – P-Method and H-Method, Steps in FEA Modeling, Convergence Techniques	Torsional Analysis & Transient and Steady State Thermal Analysis Start to create parts for Project 1
11	FEA – 2-D and 3-D Analysis, Element Types, Singularities	Project I – Belt Tightener
12	Matrices of Geometric Transformation – Translation, Scaling, Reflection & Rotation	Project I – Belt Tightener
13	Standards Exchange Between CAD Systems – Direct method and Neutral files (IGES, DXF, and STEP)	Project II – Welder Arm
14	Review	Project II – Welder Arm

Homework related to the lectures will be assigned, collected and graded.

The laboratory will be in MEC-219, and will have hands-on sessions to cover the basics and advanced features of Pro/ENGINEER.

SUBMITTED ASSIGNMENT FORMAT:

Projects / assignments should be submitted according to the following format:
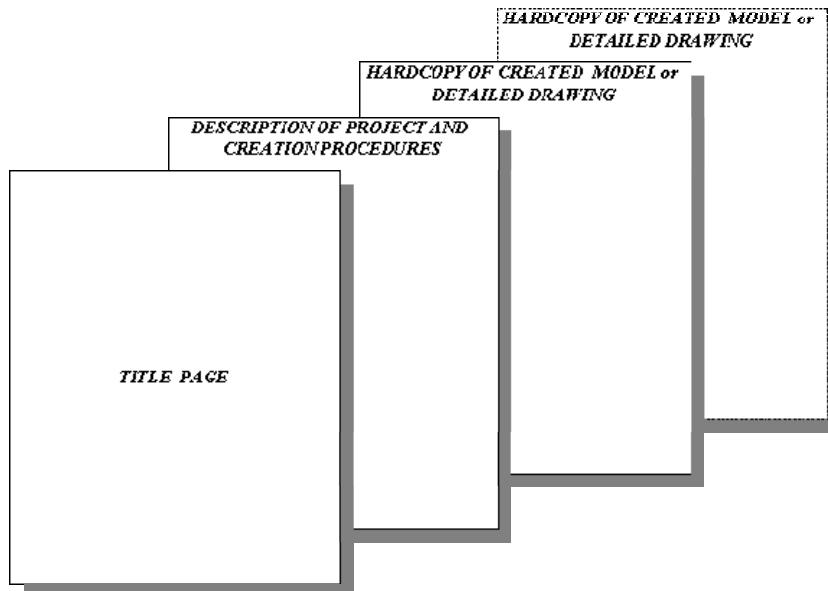
Grading Scheme:

The grade will be based on the following:

Lab Works - Assignments	30%
Project I & II	20%
Mid-term Exam	20%
Final Exam	30%
Total	100%

<mark>*Note: Assignments may vary as determined by your instructor.*</mark>

Sample of Title Page:

ME-430 Introduction to Computer Aided Design

AT NEW JERSEY INSTITUTE OF TECHNOLOGY

Name of Assignment/Project

by

Instructor: Dr. Herli Surjanhata

May 22, 2006