

Fall 2019

ME 430-005: Introduction to Computer Aided Design

Jaskirat Sodhi

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Sodhi, Jaskirat, "ME 430-005: Introduction to Computer Aided Design" (2019). *Mechanical and Industrial Engineering Syllabi*. 115.
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COURSE OUTLINE

Prerequisites

CS 101, FED101 and MATH 222

Instructor

Dr. Jaskirat Sodhi

Office: FENS267

Phone: 973-596-5220

E-mail: jaskirat.sodhi@njit.edu

Office Hours

TF 1 pm -2:30 pm & R 12-1 pm

Textbook

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.

Grading Scheme & Policies:

Lab Work – Assignments	30%
Project	20%
Mid-Term Exam	20%
Final Exam	30%
E-Portfolio	5% (Bonus)

Ground Rules:

1. Attending class, completing assignments on time, and keeping up with the class material is important for success in this course and in college. Generally, late or missed assignments **will not** be accepted except for legitimate (**pre-approved when possible**) reasons as determined by the instructor. Examples of legitimate reasons are: illness, death in family, etc. **The method of handling late or missed work is determined by the instructor.**
2. **Missing more than 2 classes will lead to an 'F' grade in the course.** Exceptions will only be made for cases of excused absences supported by relevant documentation submitted to and verified by the office of Dean of Students.
3. The class time is **1:00 to 3:05 pm**, leaving early will be marked as an absence, if due to any issues you are not able to attend the listed class duration please register for a different section.
4. **ANY FORM OF CHEATING ON ASSIGNMENTS OR EXAMS WILL RESULT IN AN 'F' FOR THE COURSE.** This includes looking at another person's exam or copying another person's work for exams or assignments.
5. ***"Academic Integrity is the cornerstone of higher education and is***

central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found

at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*

6. The part file for the assignment is required to be submitted to get credit for the assignment. Non submission of the part file will lead to zero grade for the assignment.
7. Weekly assignments are due **BEFORE** the start of Lecture. Assignments turned in after the lecture starts are counted as late.
8. **Assignments that are more than 2 weeks late will not be accepted.**
9. Point deduction – Late Assignments: 1 week late-20%, 2 weeks late-30%
10. **At least 60% of the homework has to be submitted for a passing grade.**
11. Not submitting the final project will lead to an 'F' in the course.
12. Attendance, attitude, class participation and effort can and will be used to change borderline grades up or down.
13. For special allowances associated with disabilities student must approach the Disability Resource Center.
14. 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.

Tentative Course Outline:

Week Number:	TOPICS	ASSIGNMENTS
1	Course Introduction	Creo Parametric: Base Support, Card Holder & Helical Extension Spring.
2		Creo Parametric: Hammer Handle, Cam, Razor Handle & Clip.
3	CAD/CAM Software – Database Coordinate Systems and Sketch Planes (Working Coordinate System, Model Coordinate System, and Screen Coordinate System - Projections).	Creo Parametric: Bottle, Pump Housing, Basket Ball Rim & Involute Gear.
4	Model Representation Schemes – Wireframe Modeling, Surface Modeling, and Solid Model Creation Techniques (Constructive Solid Geometry, Boolean Operations, and Parametric Modeling)	Creo Parametric: Pinion Gear Shaft Detailed Drawing, Aux. View of Control Bracket Detailed Drawing & Brake Rotor.
5	Dimensioning & Tolerancing Techniques Multi-view Projections & Auxiliary View Type of Sectional Views Assembly Design Modeling – Assembly Constraints	Creo Parametric: Roller Chain Assembly, Roller Chain Assembly Detailed Drawing & Bicycle Chain Assembly.
6	CAD/CAM Software – Matrices of Coordinate Systems Transformation: Homogeneous Coordinate System, and Mathematical Development of Working, Model & Screen Coord. Systems Relationships.	SolidWorks: Idler Arm, Shaft Hanger, Drill Press Bracket & Split Cotter Pin.
7	Mid-term Exam I Curves Representation – Analytical and Free Form Curves: Bezier, B-Spline & NURBS	SolidWorks: Support Bracket – Sheet Metal.
8	Optimization Mechanism Design – Kinematics and Dynamics Analyses in CAD.	SolidWorks: Landing Gear Assembly, Detailed Drawing of Housing Cover & Assembly drawing of Landing Gear.
9	Mechanism Design – Type of Joints and Degree of Freedom in Mechanism Design	SolidWorks: Car Wheel Assembly. Creo Parametric: Crankshaft Balancing and Optimization
10	Theory of Failures – von Mises Stress etc. Finite Element Analysis (FEA) – P-Method and H-Method, Steps in FEA Modeling, Convergence Techniques	Creo Parametric: Slider Crank Mechanism, Eccentric Mechanism & Valve Cam Mechanism.
11	FEA – 2-D and 3-D Analysis, Element Types, Singularities	Creo Parametric & Simulate: Structural Analysis of Guide Block & Thermal Analysis of Computer Chip Assembly. SolidWorks Simulation: Static Structural Analysis Of Pulley Support
12	Matrices of Geometric Transformation – Translation, Scaling, Reflection & Rotation	Creo Parametric & Simulate: Static Structural Analysis of Spider Assembly.

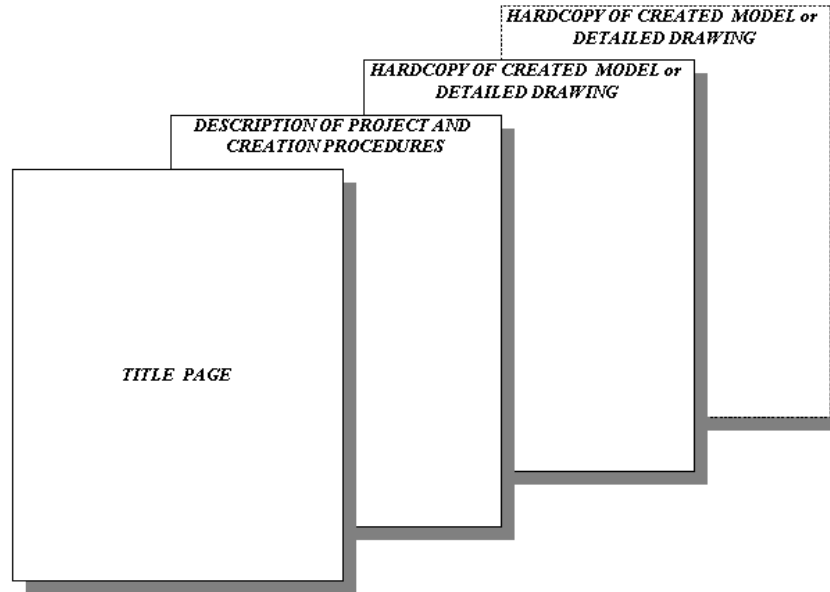
		SolidWorks Simulation: Steady State Thermal Analysis Of Heatsink. Creo MANUFACTURE: Plate Milling and Drilling Using Expert Machinist. Start to create parts for Final Project
13	Standards Exchange Between CAD Systems – Direct method and Neutral files (IGES, DXF, and STEP)	Working on Final Project.
14	Review	Finishing Final Project.

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 Creo Parametric, Simulate & SolidWorks.

Final Project submission FORMAT:

Final Project should be submitted according to the following format:





New Jersey's Science & Technology University

ME-430 Introduction to Computer Aided Design

Mechanical and Industrial Engineering Department

AT NEW JERSEY INSTITUTE OF TECHNOLOGY

Name of Assignment/Project

By

Instructor: Dr. Jaskirat Sodhi

Month Date, 2019