

Spring 2021

ME 430-002: Introduction to Computer Aided Design

Jaskirat Sodhi

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COURSE OUTLINE

Prerequisites

CIS 101, FED101 and Math 222

Instructor

Dr. Jaskirat Sodhi

Office: FENS267

Phone: 973-596-5220

E-mail: jaskirat.sodhi@njit.edu

Office Hours

Wednesday and Friday 12 – 1 pm or by appointment

Textbook

No Textbook. Must purchase Solid Professor Academic Student License: <https://www.solidprofessor.com/student-store/school>

Class Name: ME430-002 Sodhi. Class Code: SODHI

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 FEA modules 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

Lab Work – Assignments	25%
Solid Professor Exercises & Quizzes	15%
Final Project	20%
Mid-Term Exam	20%
Final Exam	20%
e-Portfolio	5% (Bonus)

Course Policies:

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. **The method of handling late or missed work is determined by the instructor.**
2. **Missing more than 4 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 – 3 pm**, leaving early will be marked as an absence.
4. There will be **mandatory** one-on-one 15 minute update meetings scheduled every four weeks or sooner on a need-to basis.
5. **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.

6. *“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/academicintegrity-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”*
7. 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.
8. Weekly assignments are to be turned in by the due date on Canvas.
9. 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 a loss of grade for the assignment.
10. Weekly assignments are due on the first meeting of the class for the week (Monday or the appropriate first day of class for the section) **BEFORE** the start of Lecture. Assignments turned in after the lecture starts are counted as late.
11. Taking the midterm and final exams are mandatory to receive a final grade in the course.
12. **Assignments that are more than 2 weeks late will not be accepted.**
13. Point deduction – Late Assignments: 1-Week-20%, 2-Weeks-30%
14. **At least 60% of the homework has to be submitted for a passing grade.**
15. Not submitting the final project will lead to an ‘F’ in the course.
16. Attendance, attitude, class participation and effort can and will be used to change borderline grades up or down.
17. Please note that NJIT policy requires that all exam be proctored. As such I will be using exam proctoring modes available at NJIT. Please review: <https://ist.njit.edu/online-course-exam-proctoring>. You must have access to a microphone and a camera to show your video during the exams. If you do not then please contact Dean of Students office ASAP. Method of proctoring will be discussed in class prior to any exam. Failure to comply will result in serious consequences on your exam and overall grade. Once again, any issues must be discussed with the instructor ahead of time.
18. For special allowances associated with disabilities student must approach the Disability Resource Center.
19. 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.

NJIT Makerspace: Students will get training in the following Makerspace courses:

Make 101 - Introduction to the Makerspace

Make 103 - Introduction to 3D Printing

Tentative Course Outline:

Week#	TOPICS	ASSIGNMENTS
1)	Course Introduction	Solid Professor – Assignment 1
2)		SolidWorks: Idler Arm, & Split Cotter Pin. Solid Professor – Assignment 2
3)		SolidWorks: Detailed Drawing of Housing Cover Support Bracket – Sheet Metal Solid Professor – Assignment 3
4)	Dimensioning & Tolerancing Techniques Multi-view Projections & Auxiliary View Type of Sectional Views	SolidWorks: Landing Gear Assembly, Assembly drawing of Landing Gear. Solid Professor – Assignment 4
5)	Geometric Dimensioning & Tolerancing	SolidWorks: Car Wheel Assembly. Solid Professor – Assignment 5
6)	CAD/CAM Software – Matrices of Coordinate Systems Transformation: Homogeneous Coordinate System, and Mathematical Development of Working, Model & Screen Coord. Systems Relationships.	SolidWorks: Predator Drone Creo Parametric: Base Support, Card Holder & Helical Extension Spring. Solid Professor – Assignment 6
7)	Assembly Design Modeling – Assembly Constraints	Creo Parametric: Cam, Razor Handle Solid Professor – Assignment 7 Make-101/Make-103 Training
8)	Mid-term Exam	Creo Parametric: Bottle, Pump Housing, Involute Gear. Solid Professor – Assignment 8
9)		Creo Parametric: Roller Chain Assembly, Roller Chain Assembly Detailed Drawing & Bicycle Chain Assembly. Solid Professor – Assignment 9
10)	Additive manufacturing and Prototyping	Creo Parametric: Pinion Gear Shaft Detailed Drawing, Brake Rotor

		Solid Professor – Assignment 10
11)	<p>Mechanism Design – Kinematics and Dynamics Analyses in CAD.</p> <p>Mechanism Design – Type of Joints and Degree of Freedom in Mechanism Design</p>	<p>Creo Mechanism: Slider Crank Mechanism, Valve Cam Mechanism.</p> <p>Solidworks Mechanism: Jansen Mechanism</p> <p>Solid Professor – Assignment 11</p>
12)	<p>FEA – 2-D and 3-D Analysis, Element Types, Singularities</p> <p>Finite Element Analysis (FEA) – P-Method and H-Method, Steps in FEA Modeling, Convergence Techniques</p> <p>Theory of Failures – von Mises Stress etc.</p>	<p>Creo Simulate: Structural Analysis of Guide Block</p> <p>SolidWorks Simulation: Static Structural Analysis of Pulley Support</p> <p>Solid Professor – Assignment 12</p>
13)	<p>Matrices of Geometric Transformation – Translation, Scaling, Reflection & Rotation</p>	<p>SolidWorks Simulation: Steady State Thermal Analysis of Heatsink.</p> <p>Start to create parts for Final Project.</p>
14)		Working on the Final Project.

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

The laboratory will have hands-on sessions to cover the basics and advanced features of Creo Parametric, Creo Simulate, SolidWorks & SolidWorks Simulate.



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, 2021

