Fall 2019

ME 430-001: Introduction to Computer Aided Design

Swapnil Moon

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COURSE OUTLINE

Prerequisites: CIS 101, Math 222

Instructor: Dr. Swapnil Moon
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Office Hours: Wednesday 11:45 – 1:00 & Tuesday 12:15 - 3:00

Textbook
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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Work – Assignments</td>
<td>35%</td>
</tr>
<tr>
<td>Project</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-Term Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
<tr>
<td>E-Portfolio</td>
<td>5% (Bonus)</td>
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</tbody>
</table>

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 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. 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. NJIT honor code will be used for all situations that involve cheating, copying, misrepresentation of student work, and misrepresentation of
student information and any violations will be brought to the immediate
attention of the Dean of Students

6. Weekly assignments are to be turned in by the due date and must
include the statement “This assignment represents my work and is not
the result of copying or using any other persons work.” The statement
must be signed by the student submitting the work.

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 a loss of
grade for the assignment.

8. Weekly assignments are due on the first meeting of the class for the
week (Monday or the appropriate first day of class for the particular
section) BEFORE the start of Lecture. Assignments turned in after the
lecture starts are counted as late.

9. Assignments that are more than 2 weeks late will not be accepted.

10. Point deduction – Late Assignments: 1-Week-20%, 2-Weeks-30%

11. At least 60% of the homework has to be submitted for a passing grade.

12. Not submitting the final project will lead to an ‘F’ in the course.

13. For using your smart phone devices during the lecture you are
requested to please step out of the class, otherwise you would be
asked to leave for the day.

14. Attendance, attitude, class participation and effort can and will be used
to change borderline grades up or down.

15. For special allowances associated with disabilities student must
approach the Disability Resource Center.

16. 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:

<table>
<thead>
<tr>
<th>Week Number</th>
<th>TOPICS</th>
<th>ASSIGNMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Course Introduction, Product Life Cycle and Roles of CAD in Design Process (Synthesis and Analysis)</td>
<td><strong>Creo Parametric</strong>: Base Support, Card Holder &amp; Helical Extension Spring.</td>
</tr>
<tr>
<td></td>
<td>Structure of Software GUI and Basic &amp; Advanced Types of Protrusion</td>
<td></td>
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<tr>
<td>2)</td>
<td>CAD/CAM Hardware – CAD/CAM Systems – Hardware Configurations (Mainframe, Workstation and PC Configurations).</td>
<td><strong>Creo Parametric</strong>: Hammer Handle, Cam, Razor Handle &amp; Clip.</td>
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<td></td>
<td>Graphics Displays hardware in Computer Graphics</td>
<td></td>
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<tr>
<td>3)</td>
<td>CAD/CAM Hardware – Hardware Integration and Networking.</td>
<td><strong>Creo Parametric</strong>: Bottle, Pump Housing, Basket Ball Rim &amp; Involute Gear.</td>
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<tr>
<td>5)</td>
<td>Dimensioning &amp; Tolerancing Techniques Multi-view Projections &amp; Auxiliary View Type of Sectional Views Assembly Design Modeling – Assembly Constraints</td>
<td><strong>Creo Parametric</strong>: Roller Chain Assembly, Roller Chain Assembly Detailed Drawing &amp; Bicycle Chain Assembly.</td>
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<td>7)</td>
<td>Optimization Mechanism Design – Kinematics and Dynamics Analyses in CAD.</td>
<td><strong>SolidWorks</strong>: Landing Gear Assembly, Detailed Drawing of Housing Cover &amp; Assembly drawing of Landing Gear.</td>
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<td>8)</td>
<td>Mid-term Exam I Curves Representation – Analytical and Free Form Curves: Bezier, B-Spline &amp; NURBS</td>
<td><strong>SolidWorks</strong>: Support Bracket – Sheet Metal</td>
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<tr>
<td>9)</td>
<td>Mechanism Design – Type of Joints and Degree of Freedom in Mechanism Design</td>
<td><strong>SolidWork</strong>: Car Wheel Assembly. <strong>Creo Parametric</strong>: Crankshaft Balancing and Optimization &amp; Plastic Advisor Analysis of Card Holder.</td>
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<tr>
<td>10)</td>
<td>Introduction to Plastic Injection Machines.</td>
<td><strong>Creo Parametric</strong>: Slider Crank Mechanism, Eccentric Mechanism &amp; Valve Cam Mechanism.</td>
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</tbody>
</table>
|  | Theory of Failures – von Mises Stress etc.  
| Finite Element Analysis (FEA) – P-Method and H-Method, Steps in FEA Modeling, Convergence Techniques |  |
|  |  |
**SolidWorks Simulation**: Static Structural Analysis Of Pulley Support  |
|  | 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 |

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.