ME 421 Advanced CAD

Meeting Times:
Sect I Tue 2:00 pm-3:15 pm               GJ115 IdeaWorks
Sect II Tues 5:00 pm-6:15 pm               GJ115 IdeaWorks
Sect III Tues 12:30 pm – 1:45 pm               GJ115 IdeaWorks
Lab Hours (per sign-up sheet)               GJ 115 Idea Works

Instructional Team:
Steven Beyerlein (sbeyer@uidaho.edu)        GJ 234
Edwin Odom (eodom@uidaho.edu)               GJ 234
TAs: Zach Maryon (Sect 1), Amanda White (Sect 2), Matt Kologi (Sect 3)

Course Website: www.webs1.uidaho.edu/mindworks/catia.htm

Course Materials:
Catia Course Folder on Senior Design Drive Portfolio, under the following subfolders
- Problem Sets
- Final Project
- Returned Homework

Course Rationale:
This course introduces you to concepts and tools for producing solid models and engineering drawing packages using CATIA. The knowledge, skills, and perspectives you develop will greatly enhance your senior design experience and will be highly marketable in the engineering workplace, including summer internships. The first half of the course will help you transition from Solidworks to CATIA. The second half of the class examines special features of CATIA that are useful in the modern manufacturing workplace. There are no hourly exams in this class, and hence problem sets and projects will constitute the majority of your grade. Class preparation is important for getting the most out of your lab time. As such, a portion of your grade is based on quizzes that review contents of a set of student-authored instructional videos that have been created for this course. Many assignments are individual, but there will be a number of group projects, including a major synthesis project at the end of the course. Outcomes of synthesis projects along with ongoing senior design projects will be shown publicly at the Dec 6th Design Snapshot. By organizing your course work throughout the term in a folder on the Catia Course drive, you will develop an electronic resource that can be a valuable reference in future design activities as well as in job interviews.

Course Prerequisites: ME 301 or instructor permission
Grading

50% Daily Quizzes & Assignments
- Quizzes (closed book/open course binder; no make-ups)
- In-class Tutorials
- Homework Exercises
- Mini-Projects
- Participation in Class Activities
- Maintenance of Personal Course Binder

50% Final Project
- Up-to-date Timeline
- Deliverables
- Lessons Learned
- Peer Review

Rubric for Scoring Quizzes/Assignments/Project Elements:

<table>
<thead>
<tr>
<th>Score</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Exemplary, insightful, worthy of sharing with entire class</td>
</tr>
<tr>
<td>3</td>
<td>Complete, correct, long-term reference value to self</td>
</tr>
<tr>
<td>2</td>
<td>Complete, minor errors, limited reference value to self</td>
</tr>
<tr>
<td>1</td>
<td>Incomplete, major errors, no supporting documentation</td>
</tr>
<tr>
<td>0</td>
<td>Submitted late, must complete</td>
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</tbody>
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Grade of ‘A’ corresponds to average on semester work above 3.2
Grade of ‘B’ corresponds to average on semester work between 2.6 and 3.19
Grade of ‘C’ corresponds to average on semester work between 2.0 and 2.59
Grade of ‘F’ corresponds to average on semester work less than 2.0
Design-Related Learning Outcomes:

**ME 301 (Computer Aided Design)**

1) Define roles & expectations of design engineers, draftsmen, manufacturing engineers, and machinists in a typical engineering organization. Discuss how these have changed over the last generation and forecast why/how they are likely to change in the future.

2) Recognize when a hand sketch is an effective way to communicate a design idea and make a sketch that follows conventional engineering practices. Recognize proper time in a project to create a drawing package (part drawings, assembly drawings, detail drawings, and bill of materials).

3) Describe drawing intent based on details shown in an existing drawing and interpretations based on drawing standards/conventions.

4) Make a detail drawing that follows standard practices for features such as dimensions, through holes, threaded connections, and radii. Produce drawing package that can be used to guide manufacturing of components in a machine shop.

5) Create and maintain an electronic drawing package following departmental standards and conventions (including file management guidelines, mating conventions, and templates).

6) Identify key tolerances associated with a part assembly and explain how to inspect parts to determine the degree to which the part matches the drawing.

7) Explode, animate, and render assemblies to illustrate design features.

**ME 424/426 (Senior Design)**

1) Estimate weight and cost (materials and labor) required to manufacture a part from a detail drawing.

2) Use standard references and on-line catalogs to locate and size components that are usually purchased rather than custom-made. Add call outs for electronic components, circuit boards, and connectors to a detail drawing.

3) Prepare for and conduct a formal drawing review to receive constructive feedback on design for manufacturability.

4) Develop a plan for part fabrication based on its intended use and manufacturing equipment available, estimating time and budget needed for machining and assembly.

5) Gain hands-on experience creating first articles for a simple assembly in a machine shop (selecting machine type, tooling, fixtures, and order of operations).

6) Generate tool paths, create fixtures, and calibrate CNC equipment for making precise parts.
ME 421 (Advanced CAD)

1) Gain familiarity through structured use of the following CATIA workbenches: part design, assembly design, generative surface design, sheetmetal design, generative drafting, DMU, photo studio, and advanced machining.

2) Navigate CATIA’s on-line help system to learn about new workbenches, cultivating transferable software learning skills.

3) Use ‘save management’ to successfully copy, update, and organize solid modeling documents. Follow some best practices in file organization and PLM.

4) Employ relational features, such as functions and parameters, in part design and assembly modeling for easier product development, maintenance, and reuse.

5) Create 2D drawing documents and 3D model based definitions as guides for manufacturing.

6) Create a catalog of parts based on a design table, facilitating part family design.

7) Within the CAD environment, generate instructions for common CNC operations.

8) Implement environments, materials, light sources, and camera techniques for impactful visualization of design products.

9) Based on introductory experience with generative surface design, explain the advantage of using surfaces as the starting point for solid model construction.

10) Create accurate Finite Element models and test the analysis software’s capabilities.

11) Create/update electronic learning objects (videos, quick references, tutorials, and exemplars) for future use by yourself and other students in acquiring and sustaining best practices associated with engineering graphics, manufacturing, and product lifecycle management.

12) Advance organizational knowledge in one of the following areas surrounding a locally meaningful synthesis project: kinematic modeling, large-scale relational design, surface metrology, direct generation of CNC code, design visualization, and production process modeling.