ME E2160: Fall 2015 Syllabus

Class location and time

Section II: Tuesdays and Thursdays 11:00-12:15 at FGH 203 computer lab.

Instructors

Lecturer: Dr. Nabil Simaan sections II Office hours: Tuesdays 16:00-17:00 email: nabil.simaan@vanderbilt.edu office: Olin Hall 405	**Teaching Assistant** Zhangshi Liu Office hours: TBA email: zhangshi.liu@vanderbilt.edu

Course Mission

- This course is designed to provide you with the necessary skills in Computer Graphics and Design. The focus of the course will be technical drawing for Mechanical Engineers while covering freehand sketching, 3D modeling of parts, managing assemblies, dimensioning, generating multi-view and production drawings, including basic considerations for manufacturing and specifications of dimensional tolerances, generating flexible (re-usable) and robust 3D designs that are compatible for re-design and current design methodologies in industry, generating assembly animations.

Textbooks

Required textbooks used for this class are available from the Vanderbilt bookstore:

1. *Creo Parametric 2.0 for Designers*, by Sham Tickoo, CADCIM Technologies, USA. ISBN **978-1-936646-38-8** (Also check PTC web page for free tutorials: http://www.ptc.com/products/tutorials/index.htm)

I will provide you also with handouts and homework assignments that will be available through OAK.

Auxiliary textbook (Copies of these textbooks are available in the Engineering Library as reserved items. At this point I do not require you to buy this book, however it will be a valuable recourse for you in the future if you buy it) :

1. *Fundamentals of Graphics Communication* by Gary R. Bertoline and Eric N. Wiebe, 5th edition♣, McGraw-Hill.

Recommended Textbooks (If you are considering other alternatives for text books):

1. Technical Drawing, by Frederick Giesecke, et al., Twelfth edition, Prentice Hall.

The course will cover additional material beyond the scope of these textbooks (see course schedule). Such material will be conveyed in class and circulated as hand-out material.

Course Website

- We will use "Blackboard/OAK" as the main web page for the course. You will be able to download miscellaneous material (tutorials, homework assignments and solutions) from this web page.
- The course also provides video tutorials available at the following link: http://arma.vuse.vanderbilt.edu/index.php?option=com_content&view=article&id=162&Itemid=57

Course Policies

Homework: there will be 8 homework assignments out of which the last 2 homework assignments (pr1, pr2) are mandatory. These 2 homework assignments are required to help you create your final project report. Homework assignments are due in class on the date specified on the homework sheet. Submission should be on hard copy and online using the FTP server set for the class required for your design sketches). All electronic submissions should adhere to the submission requirements that will be posted on OAK course web page and attached in the first homework set that will be handed out.

♣ The editions listed here are few years older than what is sold now. You can save quite a bit of money if you buy a used version. It is not required but if you are spending money then the new editions offer diminished returns over the older editions.

During the course you will be graded based on how well you master the following:

1. **Basic freehand sketching:** You will be required to **submit all sketches on white Letter size and unlined paper**. Submit all sketch attempts including the initial ones that you think went wrong. You will receive your grading partly based on general quality and effort.
2. **Using Creo/Pro-Engineer:** you will be required to use this software during class tutorials, to prepare homework, to submit a final project, and for your exams.
3. **Learn how to plan your design and to generate 3D design models:** You will be required to submit with each exercise that requires 3D modeling a sketch or a series of sketches that explain how you plan to create your 3D model from basic features, how you define datum planes, and coordinate systems, and whether you implement relations between the dimensions of the part. **Exercises that are submitted without these sketches will not be graded.**
4. **Quality of technical drawings:** You will be evaluated on your ability to follow the technical standards for producing a technical drawing portfolio for your final project and in some of your homework assignments.
5. Understanding the concepts of design process management, basic machine component repertoire available for you as a designer.

Final project assignment: You will be asked to submit final projects in pairs. Although submissions by single students are possible we encourage working in teams of 2 students since this allows a broader project scope while maintaining a more reasonable level of workload. Note that to complete your final project report you must first complete two required homework assignments (Pr1 and Pr2) that help you in achieving particular milestones for your project.

Honor Code & Course Ethics: Vanderbilt's Honor Code governs all work in this course (e.g., tests, papers, and homework assignments). By remaining enrolled in this class you pledge to follow the Vanderbilt University Honor Code as presented in this web page: http://www.vanderbilt.edu/student_handbook/the-honor-system/ .

Note that discussions among students on software usage are encouraged. However, using electronic versions of the homework from other students will not help you prepare for your exams and will not be tolerated and will be forwarded to the Honor Council.

Open door policy: The teaching staff would like the course to be as enjoyable and as beneficial to you as possible. Your constructive criticism (both positive and negative) will be welcomed as a necessary tool that will help us improve the course. You are encouraged to submit your comments via email to the course instructors or to directly speak to the course instructors to voice your concerns and suggestions.

Grading

All homework assignments will be graded and returned 2 weeks after their submission date. Some of the homework assignments will be graded such that random subset of questions out of the homework will be graded and used to calculate your homework grade.

Project and Homework	Midterm exam	Final Exam	Total
• 20% will be given for **best 7 homework assignments (counting assignments Pr1 and Pr2 which are mandatory)**. • Additional 20% will be allocated for final project report.	30% optional	30% if mid term grade is used. Otherwise, 60%	100%

Bonus points: The best three final projects will be chosen by the course instructors at the end of the semester. These students will get 5 points of bonus on their final grade.

Satisfactory attendance and participation: up to 10 points of the final grade will be deducted if a student exhibits irregular attendance during the class lectures and tutorials.

Grievance procedures: If you disagree with your homework grading you can submit your grievance in writing to the Teaching Assistant while documenting and supporting your case. If you are still unsatisfied you can appeal to the course instructor in a similar manner.

Planned Course Schedule♠ [1]

Date	Subjects covered	Tutorial/ Lecture	Chapters	Home-work
Thursday 8/27	Course overview. Lecture 1 Intro to CAD and Design: Importance of CAD, traditional and concurrent design methodologies, Introduction to the course & account creation.	L1	B 1, 11	
Tuesday 9/1	Lecture 1 continued. Lecture 2: Introduction to Pro/Engineer: 3-D solid modeling: Parametric modeling, feature analysis, capturing design intent, identifying 3D primitives, extrude, sweep, blend, revolve. Demonstration of Creo: Creo environment view, orient, extrude and revolve and orientation references. Create a simple part using extrude.	L2 + intro to Creo	S 1, 2 , B 4	
Thursday 9/3	Tutorial 1: Using sketcher & sketcher constraints. Extruding a sketch, setting units, setting material, calculating weight.	T1	S 1, 2	H1
Tuesday 9/8	Lecture 3: Projections, multiview drawings, line standards, creating multi-view drawings from a 3D part, creating an isometric pictorial view from given multi-views drawings.	L3	B 5, 7	
Thursday 9/10	Tutorial 2: extrusions, sketcher contraints, datum planes	T2	S 1, 2, 4, 3	H2
Tuesday 9/15	Lecture 3 continued. Lecture 4: Multi-view drawings-continued, auxiliary views, line types, Sections: aligned, revolved, partial.	L4	B 5, 6, 7, 8	Draft of final project
Thursday 9/17	HW overview: creating inclined datum planes. Tutorial 3: Creating parts using revolved features, chamfers, mirrored features, using arrays. Copy, paste, shell commands.	T3	S 5, 6	H3 **Pr1 hand out**
Tuesday 9/22	Tutorial 4: Modifying existing parts, Revolved parts, ribs, datum axes Lecture 4 example 1	T4 L5	S 4, 5 B 9	
Thursday 9/24	Tutorial 5: Introduction to view manager in Pro/E, creating section views of parts, work region sections, creating multiview drawings from a part file, adding drawing sheets, using formats.	L5 T5 demo	B 9 S 6, 9, 11	H4
Tuesday 9/29	Lecture 5: Dimensioning multi-view drawings & standard regulations for layout. Functional dimensions & manufacturing considerations.	T5	S 11, 12	
Thursday 10/1	T5-continued: Creating & detailing multiview drawings and placing dimensions, centerlines, sections. Cleaning up dimensions, using the drawing properties file to set up units, draft scale, and how to add pitch circles and dimension their diameters when needed. Rules of dimensioning using reference planes.	L6	B 9, 12	**PR1due** **Pr2 hand out** **Final project hand out**
Tuesday 10/6	Tutorial 6: Introduction to assembly in Pro/E, top down approach, assembly constraints, exploded views, simplified representations, view manager (pin/block tutorial)	T6	S 10	
Thursday 10/8	Lecture 6: Dimensional tolerances & Geometric tolerances, surface finish designations.	T7	S 10 ♣	H5

♠ L indicates "lecture", T indicates a tutorial. S1 indicates chapter 1 in Sham Tickoo text book, B1 indicates chapter 1 in Bertoline book, ♣ indicates material beyond the scope of the course textbooks.

[1] Section I will lag 1 class behind sections II and III. This table provides planned progress for section II and III

Tuesday 10/13	Tutorial 7: Assembling using mechanism connections, mechanism application, animating mechanisms, defining cams, generating movies, dragging components. Creating 3D sections of parts and assemblies, using the view manager and x-sec option. Changing section representations/hatching.	T8	S11, 12	
Fall break 10/15/2015-10/16/2015				
Tuesday 10/20	Tutorial 8: modifying existing assemblies, Top down approach, creating sections of assemblies, exploded views of assemblies Demo: Printing Drawings in Creo	T9	S 11, 12, 13	H6
Th 10/22	**Mid-Term exam**			
Tuesday 10/27	Lecture 7: Work, power, efficiency of machines. Basics of lead screw geometry and statics with solution of design examples. Basic definitions of efficiency and power requirements for machinery.	L7	♣	
Thursday 10/29	Tutorial 9: Multi-view drawings, balloons, bill of materials, creating forms and inserting sheets, generating work drawings portfolio. Demo: Gear connections in Creo.	L8	♣	**Pr2 due**
Tuesday 11/3	Tutorial 10: advanced mechanism connection and analysis using mechanism application. User defined measures. Exporting results into graphs and excel and Matlab.	T10	♣	
Thursday 11/5	Tutorial 10: continued	T11	S7, 8, 9	H7
Tuesday 11/10	Tutorial 11 Advanced modeling: sweep command	T12	S 8, 9	
Thursday 11/12	Tutorial 12: Blends and rotational blends	T13	♣	H8 **Final project design review update**
Tuesday 11/17	Tutorial 13: part 1: (Advanced modeling methods 1). Creating flexible components in Pro/E. Creating compression springs and inserting them in assembly. Using relations to drive the geometry of the spring. Review final project requirements & questions of students (last 15 minutes).	T13	♣	
Thursday 11/19	Tutorial 13 part 2: (Advanced modeling methods 2). Defining springs under the mechanism application, using spring icons, creating an animation of an assembly with a spring, defining joint and motor limits	T14	♣	**Final project design review update**
Thanks giving holiday break 11/21 until 11/29				
Tu 12/1	Tutorial 14: (Advanced modeling tools 3) creating swept blends. Creating a flexible model of a compression spring with hooks. Using relations to drive the geometry of the spring body and the hooks. Cosmetic threads.	L9	♣	
Th 12/3	Final project reviews and work in class	T 14		**Final project design review update**
Tu 12/8	Project reviews (time permitting)			
Th 12/10	Project reviews **Final project deadline 12/10 at 5:00 PM**			

Final Exam: According to the Registrar's office Section 02 final exam is planned for Thursday 12/17 at 2:00 pm. **If possible, we will try to move the exam of section 02 to 12/15 2:00 pm. Watch out for announcement later.**