

Carleton University
Department of Mechanical and Aerospace Engineering

MAAE 2001A/B: Engineering Graphical Design

Winter 2017 Course Outline – FINAL Version

Instructors: Section A: Prof. M.J.D. Hayes, 2184 ME
Section B: Prof. A.V. Artemev, 3230B ME
Office Hours: TBA

Goals: To teach the fundamentals of Descriptive Geometry (DG) and graphical solution techniques for standard problems in 3D Euclidean space; development of spatial visualization skills; fundamental principles and practices of Engineering Drawing; development of CAD skills using *Creo Parametric*; dimension measurement of machined features; introduction to rapid prototyping/3D printing technology; to apply these skills to the Engineering Design Process.

Topics:

- The Design Process (CEAB Graduate Attribute 4: Design).
- Dimension measurement using Vernier scale (CEAB Graduate Attribute 5: Use of Engineering Tools).
- Basic manual drafting skills using instruments, sketching (CEAB Graduate Attribute 2: Problem Analysis).
- Introduction to Descriptive Geometry (DG) (CEAB Graduate Attribute 2: Problem Analysis):
 - principal projection planes and coordinates;
 - 1st and 3rd angle projections;
 - points, lines and planes;
 - problem solving using auxiliary views (*line* methods);
 - problem solving using cutting planes (*plane*, or *direct* methods);
 - graphical mechanics;
 - intersections and developments.
- Engineering Drawing (CEAB Graduate Attribute 4: Design):
 - drawings;
 - dimensioning conventions;
 - fits and tolerances;
 - threads and fasteners, welding;
 - gears and cams;
 - materials and manufacturing processes.

Texts (required):

1. *Graphics Technology, 2nd Ed.*, James H. Earle, Pearson Prentice Hall, 2005.
2. *Creo Parametric 3.0 Tutorial*, Roger Toogood, SDC publications, 2015.

Both books are available at the University Bookstore (any edition of Earle will suffice, including any edition of *Engineering Design Graphics*).

Drafting Instruments (required):

You require the following instruments for manual drawing assignment and exam problems. These items can be purchased at the bookstore or at any stationary supply store:

1. 30°-60° and 45°-90° triangles
2. Protractor
3. Compass
4. Straight edge scale
5. White vinyl eraser
6. Pencils

8-Inch Caliper with a Vernier Scale (required):

You require an 8-inch caliper with a Vernier scale, available for sale at the **CMAS office, ME 3348**. Alternately, any 8-inch caliper with a Vernier scale with a resolution of 0.001 in. (0.02 mm).

Course Management: cuLearn – course information, lectures, assignments, and grades will be posted on the MAAE 2001 cuLearn site.

Structure: There are two 1-hour lectures per week in which the topics listed above will be reviewed, according to the “Lecture and Lab Schedule”. There are two 2-hour lab periods per week. One of the weekly lab periods is devoted to DG using freehand sketching, and manual drafting using instruments. The second is devoted to Engineering Drawing and Design using Creo Parametric. Both labs support the development of your design skills.

All assignments are assigned according to the “Lecture and Lab Schedule”. Due dates are specified in “Project, DG, and Pro/E Assignment Due Dates”. All assignments (Measurement Projects, DG, Creo, and the design project) must be submitted. Failure to do so will result in a grade of “*FND*” for the course. All assignments are posted on cuLearn.

There will be three Measurement Projects. Consult the **Project, DG, and Creo Assignment Due Dates** document on cuLearn for the actual schedule. For each measurement project, you will work in your Project Group, formed in the first Creo Lab. Using a Vernier Caliper with a Vernier Scale, you will measure all relevant dimensions with of a stock channel component with some machined features, then provide a properly dimensioned, hand drawn orthographic sketch of the channel and all features. The sketch must be submitted by the end of the lab period.

All DG Laboratory assignments are to be solved in two ways: 1) freehand sketching on 8.5 x 11 inch paper 2) manually using drafting instruments on 8.5 x 11 inch paper. You must include the following information in the title block of your instrument drafted drawing: your name, student ID number, and lab section; title, and number of the assignment; the name of your TA; the date of submission. All completed assignments will therefore consist of two pages. Make the manual draft using instruments **page one**, and the freehand sketch **page two**. Completed assignments are to be **stapled** and handed in to the appropriate TA for grading. They are typically due within the first 30 minutes of the DG laboratory period one week after the DG period in which it was assigned. Consult the **Project, DG, and Creo Assignment Due Dates** document on cuLearn for the actual schedule. Late submissions will automatically receive a grade of 0, but, they **must** be submitted.

Weekly Creo exercises will be assigned from the text *Parametric Modeling with Creo Parametric*, as detailed in “Creo Assignment Details”. You must include an appropriate title page that contains the same information as in the DG assignment title block. All Creo assignment solutions will consist of a freehand sketches on a single piece of 8.5 x 11 inch paper, as well as wireframe and rendered hardcopies generated from the corresponding lesson assignment. Completed assignments (**hardcopy only**) are to be stapled and handed in to the appropriate TA for grading. They are typically due within the first 30 minutes of the Creo laboratory period one week after the Creo period in which it was assigned. Consult the **Project, DG, and Creo Assignment Due Dates** document in cuLearn for the actual schedule. Late submissions will automatically receive a grade of 0, but, they **must** be submitted.

Additionally, a design-oriented project will be assigned, consisting of five major deliverables: 1) Project Proposal; 2) Concept Sketches; 3) Proof-of-Concept Working Model; 4) ABS Working Prototype; 5) Design Drawings and Report.

The Design Report must be submitted as a formal engineering report. Consult the **Design Project Description and Deliverables** document on cuLearn for a full description.

Examinations:

1. A 50-minute closed-book mid-term examination tentatively scheduled for **Monday and Tuesday, March 6-7, 2017** in class. There will be a number of multiple-choice questions, and several DG constructions, some with more than one component.
2. A 3-hour closed-book final examination during the examination period at the end of term. It covers all lecture material and assigned readings. There will be a number of multiple-choice questions, and several DG constructions, some with more than one component.

Absolutely no test scheduling accommodations will be made for other than certified health reasons.

Grading:

6 DG Lab Assignments:	5%	
7 Pro\ E exercises:	5%	
3 Measurement exercises (projects):	10%	
1 Design Project:	20% in total	
		– Project Selection Proposal: 0%
		– Concept Sketches: 2%;
		– Proof-of-Concept Working Model: 3%;
		– ABS Working Prototype: 5%;
		– Design Drawings and Report: 10%
1 Mid-Term (closed-book):	10%	
1 Final Exam (closed-book):	50%	

Notes:

1. Missing even one class is very bad practice. If you do miss a class and special instructions or requirements for the course are given during that period, you are fully responsible and will have to get the information from others who attended the class. The instructors will not repeat the information privately.
2. No instructional offences (cheating on tests, plagiarism, disrupting lectures, etc.) will be tolerated. Please turn your cell phone off before entering the lecture hall.
3. All laboratory and project components of the course are mandatory. **Failure to submit any deliverable will result in a grade of “FND” for the course.**
4. You may not remain registered in MAAE 2001 if the lab or lectures have a timetable conflict with another course.
5. The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). **Requests made within two weeks will be reviewed on a case-by-case basis.** After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (*if applicable*).

M.J.D. Hayes and A.V. Artemev, December 28, 2016