

ENGINEER 1C03 FALL 2017

ENGINEERING DESIGN & GRAPHICS

1. Course Instruction

INSTRUCTOR: Delivery of lecture material, supervise cornerstone project, address student issues & concerns

Name: Dr. Thomas E. Doyle, Ph.D., P.Eng.

Office: ETB/106

Email: doylet@mcmaster.ca

Drop-in Office Hours:

Mondays: 1:00pm – 3:00pm

INSTRUCTIONAL ASSISTANT INTERNS (IAIs): IAIs will lead tutorial and laboratory lessons, as well as assist with 3D printing in the EPIC lab. Please record your IAIs name and contact information when you first attend lab and tutorial.

Name:	Logan Orosz	Swaleh Owais	Liam Flannigan
Office:	ETB-127	ETB-127	ETB-127
Email:	oroszld@mcmaster.ca	owaism@mcmaster.ca	flannilg@mcmaster.ca
Office Hours:	Please see Avenue	Please see Avenue	Please see Avenue
Role:	Lab & Tutorial	Lab & Tutorial	EPIC

TEACHING ASSISTANTS (TA): TAs will assist the IAIs in lab, run the biweekly tests, and be responsible for grading of lab and tutorial tests. Please record your TAs name(s) and contact information when you first attend lab and tutorial.

2. Course Administration

COURSE COORDINATOR: Handles any administrative-related course issues (e.g., MSAF)

Name: Jessica Anderson

Office: ETB/110

Email: engic@mcmaster.ca

Office Hours: Drop-in or by appointment

3. Course Schedule

LECTURES: (1 hour/week.) C01: MONDAYS 10:30 – 11:20am (LRW B1007)
C02: MONDAYS 5:30 – 6:20pm (LRW B1007)

LECTURES DESCRIBED: Lectures are complemented by lab and tutorial lessons, with an emphasis on technical communication and design. Later in the term, concepts will be discussed in the context of the cornerstone design project.

TUTORIALS: (2 hours/week) Refer to your assigned tutorial section

TUTORIALS DESCRIBED: Topics include technical sketching, visualization, gear design, and mechanical dissection. Each week will involve either a lesson or a test. Refer to Avenue for a detailed schedule.

LABORATORIES: (3 hours/week) Refer to your assigned lab section

LABS DESCRIBED: Topics include solid modelling, assembly modelling, mechanisms, engineering drawings, and dynamic simulation. These topics are applied through Autodesk Inventor Professional. Each week will involve either a lesson or an assignment. Refer to Avenue for a detailed schedule.

4. Course Description

This course is about technical design and communication for engineers. Using solid modelling CAD, freehand sketching, and simulation, the course will explore the design of common mechanisms, visualization, the reading and creation of engineering drawings, and technical standards. The course ties these elements together in a group dissect and design project.

The course assumes no prior background in the content. Throughout the term, you will have marked and unmarked assignments to help prepare you for exams and the project. It is important to keep up with the work and to remember that each assignment will build upon the previous assignments.

Prerequisite: registration in any engineering programme

Antirequisite: ENGINEER 1C04

5. Course Topics

1. Technical sketching
2. Visualization
3. Projections
4. Solid modelling
5. Degrees of freedom and constraint
6. System modelling and simulation
7. Design of simple mechanisms
8. Design for 'X'
9. Engineering drawings
10. Reverse engineering

6. Objective

The primary goal of Engineering Design and Graphics is for you to be able to model your designs and effectively communicate in the language of engineering graphics. By the end of the term, you will be able to:

- Mentally visualize three-dimensional objects from arbitrary points of view given orthographic projections, isometric projections, or physical objects
- Hand sketch multiviews and isometric pictorials of engineering designs quickly and accurately
- Read engineering drawings conforming to standard practices
- Model parts and assemblies using computer-aided design (CAD) software

- Create engineering drawings conforming to standard practices using CAD software
- Analyze and validate the design of a mechanism through dynamic simulation
- 3D prototype a functioning mechanical system

7. Expectations

You can expect the following:

- That no prior knowledge of sketching, drawing, drafting, solid or system modelling is assumed
- Although very helpful, you do not require your own computer
- Grades will be posted periodically on the Course Management System (CMS)
- Graded assignments will be returned within 7 days. (Contact course coordinator if not received)
- IAs and TAs will be helpful and professional, and grade objectively per the marking scheme
- The instructor, coordinator, IAs, and TAs will endeavour to respond to email within 48 hours (sending your email to the right person helps reduce the response time)

Your instructor, IAs, and coordinator expect from you:

- All email communication with the instructor, IAs, and coordinator will be sent from a McMaster email
- You are expected to check your email and CMS for announcements pertaining to this course daily
- You are expected to be familiar with this document (the syllabus) as well as all referenced documents
- It is assumed you have a basic computer literacy (i.e. word processing, web browsing, etc.)
- It is expected that you have a firm grasp of the English language in conversation, reading and writing
- You are expected to be punctual and prepared for all lectures, tutorials, and labs
- You are expected to work on all lab and tutorial assignments on your own
- You are expected to properly submit and verify your submission as instructed during labs and tutorials
- If you require help with tutorial or lab materials, contact your IA first

8. Email Policy

Any emails directed to the instructor, IA's or course coordinator should include a subject prefix of "ENGINEER 1C03". Your email must be sent from your own McMaster University email account. Be sure to include the following in your email: student number, lab section, tutorial section and project group number (if a project-related question). Please include all past correspondence to make it easier to keep track of past discussions. You are expected to use the English language appropriately in all correspondence.

9. Course Materials

REQUIRED: All course materials are available through the Titles bookstore or online

1. Textbook: "Visualization, Modeling, and Graphics", by Lieu & Sorby, 2nd Edition
 - a. This textbook is available as a hard copy text or digital copy (MindTap)
 - b. For students electing to purchase MindTap:
 - i. The course key is: **MTPN-PP9P-MDFL**
Students can register at <https://login.nelsonbrain.com/course/MTPNPP9PMDFL>
2. Custom Coursepack: ENGINEER 1C03: ENGINEERING DESIGN AND GRAPHICS, compiled by Doyle and McDonald
3. Software: Autodesk Professional Inventor Suite 2017

OPTIONAL, BUT RECOMMENDED:

1. Sketching Instruments

- a. A 400 Series Strathmore sketchpad (9x12 inch, 100 sheets), or a McMaster red sketch book (any bound book with sketching paper is acceptable)
- b. A Staedtler drafting pencil (e.g. model MARS-780)
- c. A Staedtler drafting pencil HB lead refill
- d. A Staedtler eraser

ONLINE MANAGEMENT: The Course Management System (CMS) will be Avenue to Learn (avenue.mcmaster.ca). The student is required to check the system daily for assignment postings and submission, course-related material, and posted announcements.

10. Course Readings

The weekly outline of required course readings will be posted on the CMS (Content > Schedules > Course), and can also be found in the Custom Coursepack. Additional reading will be assigned through lab and tutorial sample problems.

11. Group Project

A group project will require you to apply topics covered in the course towards the design of a simplified mechanism. The project will be introduced in Week 5.

3D PROTOTYPING: One feature of the group project requires students, working in groups, to create a viable and functioning prototype of their design using the 3D printers available in the EPIC Lab

A functioning prototype requires booking printer time **outside of lecture, lab, and tutorial hours**. Booking availability for the project as well as project requirements will be outlined during Week 5. All groups must abide by the following when booking use of the 3D printers:

- Not all students in a group need be present to use the 3D printers
- Due to limited 3D printer availability, there will be strict restrictions placed on the number of bookings each group may make per week
- Expedient printing requires files to be in the proper file format
 - Failure to have the file in its proper format will result in the student(s) losing their printer booking
- It is the responsibility of the student to ensure a sufficient number of bookings have been made to print all project components by the appropriate deadline(s)

12. Evaluation

The final letter grade will be determined from the weighted sum shown in Table 1:

Table 1: Final Grade Weighting

Final Grade Component	Weight
Lab Assignments Assignments 1-4 → 4% each Assignment 5 → 9%	25%
Tutorial Tests Tests 1-4 → 4% each Test 5 → 9%	25%
Project Group Component: 20% Individual Component: 5%	25%
Final Exam	25%

LAB AND TUTORIAL ATTENDANCE:

The student has chosen or been assigned specific laboratory and tutorial sections. When attending labs and tutorials, the student must attend the assigned room and section. Any test written by a student in a different lab or tutorial section than the one they have been assigned will not be graded.

SUBMISSION OF LAB AND TUTORIAL TESTS AND ASSIGNMENTS:

It is the student's responsibility to ensure that assignments are correctly submitted to the correct location (e.g. correct drop box), on time, and in the specified format(s). **Failure to correctly submit an assignment will result in a mark deduction** (see below).

Grades for lab and tutorial tests will be posted to Avenue within 7 days after completing your test. **You will have 7 days from this date (i.e., up to 14 days from the day the test was taken) to address any concerns you may have to me or your IAI.**

- Any questions/concerns must be addressed electronically to either the instructor or your IAI
- Concerns with regards to grading will not be heard without appropriate electronic documentation (e.g., sending an email from your McMaster email account)
- Any concerns or appeals brought to the attention of the instructor or IAI after 14 days from the day the test was taken will not be heard

SUBMISSION PENALTIES:

Please be aware of the following penalties for lab and tutorial work:

- Failure to properly upload and submit your Lab assignment will result in a mark deduction
 - e.g., wrong file format, missing files, submitting files individually when a *.ZIP file is required
- Failure to submit a lab evaluation assignment by the specified deadline
 - 20% penalty up to two minutes late
 - 100% if more than two minutes
- Hand sketches that are too small will have deductions applied
 - Your sketch should use at least half of the available drawing area
- Any test deemed to be partially or fully copied will be considered an academic offence and be subject to the terms laid out under the Academic Integrity Policy

FINAL EXAM:

The final exam must be written else a final grade of **F** will be awarded with the notation DNW (Did Not Write). In a case where the component weight cannot be fulfilled as a result of unforeseen and/or uncontrollable circumstance(s) in the course operation or execution, the grades assigned to that component may be pro-rated. Final exam details are set by the Registrar. The instructor(s) reserves the right to choose the format (i.e. written or oral) of any deferred midterm or exam in this course.

TEST AND EXAMINATION AIDS:

Unless otherwise stated, the use of calculators, laptops, personal digital assistants, cell phones, and/or any programmable device is not permitted during any evaluation, test, or examination in this course. Unless otherwise stated, tests and examinations are closed-book. Failure to comply will result in severe penalty and will be treated as an offence under the Academic Integrity Policy

13. Learning Outcomes

Upon successful completion of the course, the student will be expected to have demonstrated the ability to:

1. Sketch and model objects in 2D
2. Sketch and model objects in 3D
3. Create and interpret isometric and multiview projections
4. Create solid models of parts using a 3D modelling software package
5. Create assemblies using a 3D modelling software package
6. Read and create a set of engineering drawings
7. Understand the engineering design process
8. Understand operating principles of simple mechanisms and calculate gear ratios
9. Understand solid modelling and system modelling
10. Effectively communicate technical design
11. Understand international standards
12. Design, model and prototype a functioning gear train mechanism
13. Integrate “design for X” (such as assembly and manufacturability) and creativity considerations during prototyping of a gear train mechanism
14. Effectively work in groups and evaluate the performance of one’s self and group members

14. Mapping to Graduate Attributes

This course provides the students the opportunity to develop the following measures of graduate attributes:

<i>Graduate Attribute</i>	<i>Learning Outcomes</i>
A01 Knowledge Base for Engineering	
1.04. Competence in specialized Engineering knowledge	1-3, 6, 8
A04 Design	
4.01. Recognizes and follows an engineering design process	7, 12
4.02. Recognizes and follows engineering design principles including appropriate consideration of environmental, social and economic aspects as well as health and safety issues	6, 9, 11, 12
4.03. Proposes solutions to open-ended problems	12, 13
A05 Use of Engineering Tools	
5.02. Demonstrates an ability to use modern state-of-the-art tools	4, 5, 9
A06 Individual and Team Work	
6.03. Able to work in a group, taking a leadership role and relinquishing role as appropriate	14
A07 Communication Skills	
7.01. Demonstrates an ability to respond to technical and non-technical instructions and questions	10
7.02. Presents instructions and information clearly and concisely as appropriate to the audience	7-10

15. Missed Work – MSAF

Should any work be missed with valid reason, a student may apply for special consideration using the Missed Work Form Self Reporting Tool (<http://www.mcmaster.ca/msaf>) (MSAF). For policies that govern the MSAF system, please refer to the MSAF website. If the MSAF Form is issued then the student must obtain an approval and a course of action from either the instructor or course coordinator.

- You must use the following email address for 1C03 MSAF: engic@mcmaster.ca
- Any MSAFs that are not sent to this email will be fail to be processed
- Please note that missed course components are not added to the final exam. Missed lab/tutorial tests are assigned the average of the remaining lab/tutorial tests, unless otherwise stated (see below)
 - Exceptions include **Lab 5 Cumulative Assessment** and **Tutorial 5 Cumulative Assessment**. In the event an MSAF is applied, they will be rescheduled

When stating the Work Missed, you must indicate the following:

- Correct assignment name (e.g., Lab 1 Assignment)
- Date of missed work
- Weight of missed assignment
 - For Lab 1-4 Assignments: 4% each
 - For Tutorial 1-4 Tests: 4% each
 - ***For Lab 5 Cumulative Assessment: 9%
 - ***For Tutorial 5 Cumulative Assessment: 9%
 - ***Project Interview: 5%

*** In the event an MSAF is applied for Lab 5 Cumulative Assessment, Tutorial 5 Cumulative Assessment and/or the Project Interview, the missed work **will be rescheduled**

RELIGIOUS OBLIGATIONS, KNOWN ABSENCES, AND VARSITY COMPETITION:

In accordance with University regulation, special examination arrangements may be made for conflict with religious obligations. Application may be made to the Office of the Associate Dean of Engineering. It is rare that special examination arrangements are granted for alternate reasons, however, cases are reviewed individually. Application may be made to the Office of the Associate Dean of Engineering.

If a known future absence will conflict with any scheduled portion of the course (e.g. tutorials, labs, exams, etc.), excluding examinations, an application for special consideration may be made to the course instructor. **All applications must be made at least 10 working days before the scheduled date of the course component and acceptable documentation must be supplied.** Failure to meet the stated deadline may result in the denial of special arrangements.

16. Appeals

If an appeal becomes necessary, it will be initiated by the student. The successive levels for an assignment or laboratory appeals are:

1. Instructional Assistant Intern
2. Instructor
3. Associate Dean, and
4. Senate Review Board Academic

For an appeal of an exam grade, the appeal process begins with the instructor. All levels of appeal shall be by the submission of written request that is signed and dated by the student (an email is not suitable). The appeal procedure should be commenced as soon as possible, but not later than ten calendar days from the date of the action or decision giving rise to the appeal.

Students who are repeating the course for any reason shall repeat it in its entirety, unless an exception is granted. Application for exception is to be submitted in writing to the course instructor within the first week of lecture.

17. Academic Integrity Policy

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

18. Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons involved, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.

19. Health and Safety

The Faculty of Engineering is committed to McMaster's University Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs".

It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at:

<http://www.workingatmcmaster.ca/eohss/>

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.

20. Pedagogical Study

For the study of engineering education you may be asked to provide information or feedback about course components. When possible, the instructor will share these results with participants.

21. Notes on Obtaining Autodesk Inventor

Autodesk Inventor Professional 2017 is a suite of industry standard software available to students at McMaster University. As a student, you are permitted free access to the academic versions of this suite of software through:

<http://www.autodesk.com/education/home>

To access the software, you must register in the Education Community with your McMaster University email address

Once registered you will have access to download all Autodesk academic software. Please note that you only require Inventor Professional 2017. Be aware that the download and install will take some time and disk space. Ensure you select the appropriate installation for your computer (i.e. 32-bit vs. 64-bit). For step by step installation instructions please see Avenue.