Mechanical Engineering 4M06: Senior Project

Coordinator: Dr. M. K. Jain Course Web Site: (http:/avenue.mcmaster.ca)

Lectures: See the last page on Lectures from the Department faculty and external speakers for details**.** First introductory class by Dr. Jain will be held virtually on Wednesday, September 9th at 5:30 PM. The lectures will end in Term I. There will be no lectures in Term II.

Design Build: Due to laboratory use restriction placed at McMaster due to COVID-19 pandemic, there will be very limited opportunities this year in 4M06 to do design fabrication in the Department Project Laboratories. Some project supervisors may allow students to access their labs for design build.

Lecture Days	Time period	Term	Location
Mondays, Wednesdays and Thursdays	05:30 PM - 06:20 PM	I	Virtual Classroom

Important Dates:

Dates	Events
Wednesday, September 9	Introductory session; Project List is posted on the course web site
Thursday, September 10	Introduction to some projects by interested 4M06 faculty members
Monday, September 14	Avenue submission of completed Project Selection Sheet (last day for submission) – submission in Avenue drop box of Dr. Jain
Thursday, September 17	List of project teams and their project allocations as well as list of two faculty evaluators for each project to be posted on Avenue
Thursday, September 17	Start of 4M06 online (live) lectures (as per the above class time table) (see the list of lectures at the end of this document)
Thursday, October 29	Multiple choice test based on 4M06 Lectures, to be conducted on Avenue
Monday, November 2	Avenue drop box submission of Scope of Work (SW) document by teams to assigned evaluator and Dr. Jain
Monday, November 2	Term 1 presentation abstracts to be submitted on Avenue drop boxes of team's two Presentation Evaluators
Period: Nov. 9 – Nov. 23	Term 1 online oral presentations (presentation date/time and specific virtual meeting platform to be set by the project supervisors in consultation with their project teams and faculty presentation evaluators)
Monday, January 18	Avenue drop box submission of Design Concept (DC) document by teams to assigned evaluator and Dr. Jain
Friday, February 19	Avenue drop box submission of Final Design Review (FDR) document by teams to Senior Technician John Colenbrander and Dr. Jain
Thursday, March 25	Term 2 presentation abstracts to be submitted on Avenue drop box of team's two Presentation Evaluators
Period: April 1 – April 16	Term 2 online oral presentations (presentation date/time and virtual meeting platform to be set by the project supervisors in consultation with their project teams and faculty presentation evaluators)
Friday, April 9	Avenue drop box submission of Final Design – Development, Analysis and Optimization (FD-DAO) document to your project Supervisor and Dr. Jain

Evaluation:

- Evaluation will be based on the following scheme:

Term	Component	Group mark (max)	Individual mark (max)	Evaluation by
1	Multiple choice test (based on in-class lectures)	Not applicable	5%	Dr. Jain
	Technical writing	Not applicable	1% (bonus)	Dr. Wohl
	Scope of Work (SW) document[1]	20%	Group mark* IE factor[2]	Designated (team-specific) Project Evaluator
	Group Presentation 1	10%	Group mark* IE factor[2]	Two designated (team-specific) Project Evaluators
2	Design Concept (DC) Document[1]	15%	Group mark* IE factor[2]	Project Supervisor[1]
	Final Design Review (FDR) document[1]	N/A (Design Pass/Revise)	N/A	Department Technical Staff (John Colenbrander)
	Group Presentation 2	20%	Group mark* IE factor[2]	Two designated (team-specific) Project Evaluators
	Final Design – Development, Analysis and Optimization (FD-DAO) document[1]	30%	Group mark* IE factor[2]	Project Supervisor

Note: Rubrics will be provided to the students on the course web site (Avenue) ahead of time for all requested documents and presentations (with the exception of Multiple Choice Test).

- **Multiple Choice Test** (on October 29th, 5:30 PM)

There will be one hour long written multiple-choice test based on in-class lectures during the period Sept. 17 – Oct. 29 (with the exception of Dr. Jain's lecture on September 30th). The scope of the test will involve all lecture material covered by participating faculty and invited speakers. The test will be worth 5% of the course grade. All lecture slides will be posted on course web site in advance of the test. Effort will be made to also post videos of many of the lectures given by the participating lecturers.

[1] Avenue drop box submissions.

[2] Group mark will be multiplied by initiative & effort, IE, factor for each students in the group, taking values between 0.0 for no participation in group project effort and 1.0 for full initiative and effort. The IE factor for individual contribution to the group effort will be determined by peer review by students themselves and /or by the supervisor.

- **Scope of Work document** (due Monday, November 2nd, 11.59 PM)

A comprehensive Scope of Work (SW) document with well-defined and quantifiable objectives and deliverables is to be prepared by the team in consultation with the Project Supervisor as per the template to be provided on the course web site. SW should include, (i) project-specific background research, (ii) project problem analysis used to quantifying project related objectives and deliverables, (iii) identification of numerical tools for design analysis and optimization, (iv) available and applicable lab infrastructure (if applicable), (v) objectives and deliverables of project in clear and quantitative terms (suitable for engineering action) by reassessment of the project's original broader objectives as stated on Project List, and (vi) detailed timelines for achieving the objectives and deliverables of the project. Challenges based on new research and knowledge should also be presented in this document. SW should include names of all team numbers including the Project Supervisor, McMaster e-mail addresses, and e-signatures of all team members and Project Supervisor. SW will constitute 20% of the final course grade.

A template for the SW document will be made available on Avenue ahead of time. Also, a sample SW document will be posted on Avenue for guidance. SW document evaluation will be carried out by an assigned 4M06 faculty member (so-called Project Evaluator) other than the Supervisor of the project, and based on a rubric. A copy of the rubric for SW document will be made available on the course web-site (Avenue) ahead of the due date. SW document must be submitted to Avenue drop boxes of the assigned 4M06 evaluator and Dr. Jain.

- **Term 1 Presentation** (Period: Nov. 9th – 23rd)

Term 1 Presentation will be a 20-minute online presentation (plus 10 minutes for questions and discussion). The presentation should include content similar to the SW document and any additional progress since the submission of SW document. The online presentation will be evaluated by 2 participating Project Evaluators (i.e., other participating faculty members and not by the team's Project Supervisor). A list of Presentation Evaluators for projects will be made available on the course web site in early September. This will likely remain unchanged for Terms 1 and 2 presentations unless special circumstances arise. A rubric for Term 1 presentation will be made available to the students on the course web site well ahead of the presentation period. Term 1 presentation will constitute 10% of the final course grade.

A one-page presentation **abstract** must be submitted in Avenue drop boxes of your team's two Presentation Evaluators by November 2nd.

- **Design Concept document** (due Monday, January 18th, 11.59 PM)

Design Concept (DC) document will include a well-defined and justified concept selection criterion, concept sketches of various feasible and valid designs, and selection of the final design concept based on the concept selection criterion and rankings of the individual design concepts. This document should also provide an update of the project status with reference to the objectives, deliverables and timelines. DC will constitute 15% of the final course grade.

A template for the DC document will be made available on Avenue ahead of time. Also, a sample SW document will be posted on Avenue for guidance. Similar to the SW document, DC evaluation will be carried out by the assigned 4M06 faculty member other than the Supervisor of the project, based on a rubric. A copy of the rubric for SW will be made available on the course

web-site ahead of due date. DC document must be submitted directly on Avenue to the drop box of the assigned 4M06 evaluator and also to Avenue drop box of Dr. Jain.

- **Final Design Review document** (due Feb. 19th, 11.59 PM)

  Final Design Review (FDR) document should include as much details of the final design as possible prior to quantitative design analysis and optimization phases of the design. The CAD drawing of the final design should be included to whatever extent possible. This document will be reviewed by the members of the Department technical staff. The design review effort will be coordinated by John Colenbrander. The review will result in a pass or revise decision by the technical staff based on design quality, and fabrication and cost perspectives. If the decision is to revise the design, online meetings will be setup by the reviewer with the student team to discuss the design and suggest alternatives. No marks will be assigned for this submission. In fact, it would be mandatory to receive a pass from a design review team member. Teams will be asked to revise their final design until a pass is received from a design review team member.

  A template for the FDR document will be made available on Avenue ahead of time. Also, a sample FDR document will be posted on Avenue for guidance. FDR must be submitted directly on Avenue drop box of John Colenbrander, co-ordinator of the design review process, and also to Avenue drop box of Dr. Jain.

- **Final Design – Development, Analysis and Optimization document** (due April 9th, 11.59 PM)

  Final Design – Development, Analysis and Optimization (FD-DAO) document will include presentation and detailed discussion of the final design including the details of applicable design theory utilized to carry out analysis and optimization of the final design. This document should also discuss how the final design meets the project objectives and deliverables. For projects that involve design build, all fabrication details and costs should be included as well as how the design build meets the fabrication objectives and deliverables. FD-DAO document will constitute 30% of the final course grade.

  A template for the FD-DAO document will be made available on Avenue ahead of time. Also, a sample FD-DAO document will be posted on Avenue for guidance. This document will be evaluated by the Project Supervisor based on a rubric. A copy of the rubric for FD-DAO document will be made available on the course web-site ahead of time. FD-DAO document must be submitted directly on Avenue to the drop box of your Project Supervisor and also to the Avenue drop box of Dr. Jain.

- **Term 2 Presentation** (Period: April 1st -16th)

  Term 2 Presentation will be a 20-minute online presentation (plus 10 minutes for questions and discussion). The presentation should include content similar to the FD-DAO document. As in Term 1, this online presentation will be evaluated by your team's two Presentation Evaluators (and not by your project supervisor). A rubric for Term 2 presentation would be made available on Avenue well ahead of the presentation. Term 2 presentation will constitute 20% of the final course grade.

  A one-page presentation **abstract** must be submitted in Avenue drop boxes of your team's Presentation Evaluators by March 25th.

Submission of Reports and Presentation Abstracts (summary Table):

Item	Evaluator(s)	Document/Abstract submission location (Online)	Test and document submission dates & times
Multiple Choice Test	Automatic Evaluation on Avenue	Avenue Drop box	October 29, 2020, 5:30 PM – 6:30 PM
Scope of Work document	One assigned Project Evaluator	Avenue Drop boxes of your team's designated Evaluator and Dr. Jain	November 2, 2020, 11:59 PM
Term 1 Presentation Abstract	Two Assigned Project Evaluators	Avenue Drop box of your team's two designated Evaluators and Dr. Jain's box	November 2, 2020, 11:59 PM
Term 1 Presentation (online) or Presentation Video	Two Assigned Project Evaluators	Avenue Drop box of your team's two designated Evaluators	Period: Nov. 9th – 22nd
Design Concept document	One assigned Project Evaluator	Avenue Drop boxes of your team's designated Evaluator and Dr. Jain	January 18, 2021, 11:59 PM
Final Design Review document	Department technical staff	Avenue Drop boxes of John Colenbrander and Dr. Jain	February 19, 2021, 11:59 PM
Term 2 Presentation Abstract	Two Assigned Project Evaluators	Avenue Drop box of your team's two designated Evaluators and Dr. Jain's box	March 25, 2021, 11:59 PM
Term 2 Presentation (online) or Presentation Video	Two Assigned Project Evaluators	Avenue Drop box of your team's two designated Evaluators	Period: April 1st -16th
Final Design – Development, Analysis & Optimization document	Project Supervisor	Avenue Drop box of your Project Supervisor and Dr. Jain	April 9, 2021, 11:59 PM

Additional Information:

- Average project effort per person must be 6 hrs/week in Term 1 & 12 hrs/week in Term 2.
- All written documents must be prepared using the standardized template/form while adhering to the maximum space requirements for each of the boxes on the form.
- **Documents** are to be formal engineering reports, and need to be done to a professional standard. A logical, concise and well-organized report is far better than a voluminous, rambling, one. The Project Evaluators and Supervisors are expected to timely read and provide feedback to the students, and submit completed rubrics to Avenue drop box of Dr. Jain.
- **Presentations** are to be prepared to professional standards by each group. The students should directly approach the Presentation Evaluators for any feedback soon after the marks have been posted on Avenue.
- Good **Communication** with your supervisor is critical for the success of the project. Schedule regular online meetings, at least once a week, and all group members must attend them. Your supervisor may assign you demerit marks for poor project meeting attendance.
- When the Project List becomes available on September 9th, it is advisable that you setup online meetings with supervisors of projects you are interested in, to make sure you have a good and shared understanding of what the project entails.

- If your project leads to the creation of new **Intellectual Property** (IP), you have certain rights regarding the ownership of that IP. See McMaster's policies on IP located at the following address:

http://www.mcmaster.ca/mufa/handbook/ippolicyJoint.html

ACCREDITATION LEARNING OUTCOMES

The Learning Outcomes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's grade in the course.

Outcomes	Indicators
Problem Analysis, Design, Use of Engineering Tools, Individual and Team Work,	2.01, 2.02, 4.01-4.06, 5.01,5.02, 6.01-6.03
Communication skills, Professionalism, Impact on Society & Environment,	7.01-7.02, 8.01, 9.01
Economics and lifelong learning	11.02, 12.01

For more information on Accreditation, please visit: https://www.engineerscanada.ca

EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Mechanical Engineering is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the Equity and Inclusion Office.

PHYSICAL AND MENTAL HEALTH

For a list of McMaster University's resources, please refer to the Student Wellness Centre.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/

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.

COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, MS Teams,WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

It is the students' responsibility to regularly check the course webpage (ex. Avenue to Learn) for updates and announcements.

SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

1. Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:

   - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
   - Students may submit requests for relief using the MSAF once per term.
   - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
   - The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
   - The MSAF cannot be used for academic work that has already been completed attempted.
   - An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
   - The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.

2. For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:

   - Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate supporting documentation.
   - If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office *normally within 10 working days* of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

ME4M06 Project Selection Sheet – Individual Submission

Student Name: _____ Student ID: _____

List (in decreasing order of preference) five different supervisors and the project codes on which you would like to work. It is mandatory to list all 5 choices. Each choice must be with a different project supervisor. When you submit this form, it is understood that you do not have a group and will not be part of any group project selection sheet submission. Submit your completed form to the Avenue drop box of Dr. Jain by September 14th, 11.59 PM.

Last Name of Supervisor[1]	Project codes (from Project List)	Met with the supervisor (yes/no)?	Brief Comments
1.			
2.			
3.			
4.			
5.			

[1] Each of the five project choices must be with a different supervisor

ME4M06 Project Selection Sheet – Group Submission

Note: This Project Selection Sheet is to be filled by those students who have already formed a group (i.e., have already agreed to work together on a 4M06 project). Maximum group size is four students. Submit your completed Project Selection Sheet (one sheet per group) to the Avenue drop box of Dr. Jain by September 14th, 11.59 PM. When a group submit this form, it is understood that the group members will not be making an individual Project Selection Sheet submission.

Student Names	Student ID:	Student e-signatures (required)
1.		
2.		
3.		
4.		

List (in decreasing order of preference) five different supervisors and five project codes (one from each supervisor) on which you would like to work. It is mandatory to list all 5 choices. Each choice must be with a different project supervisor. Your group size must be consistent with the group size required for each of the chosen projects in the Project List provided on Avenue.

Last Name of Supervisor[1]	Project code (from Project List)	Met with the supervisor (yes/no)?	Brief Comments
1.			
2.			
3.			
4.			
5.			

[1] Each of the five project choices must be with a different supervisor

4M06 Lectures

(Online, Mondays, Wednesdays and Thursdays at 5:30 PM in Term 1 only)

A multiple choice test based on the lectures noted below (worth 5% of the mark towards the course grade) will be conducted online via Avenue on October 29th. Tentative lecture dates, names of speakers and lecture topics are given in the table below.

Date	Speaker	Topic
Sept. 17	Dr. Jim Cotton	Sustainability
Sept. 21	Katie Harding	Library Instruction
Sept. 23	Dr. Mohamed Hamed	Effective presentations
Sept. 24	Dr. Greg Wohl	Technical Writing I
Sept. 28	Dr. Greg Wohl	Technical Writing II
Sept. 30	Dr. Mukesh Jain	Scope of Work document preparation (material is not included on the multiple choice test)
Oct, 1	Kathryn Leistner	Never apply to a job posting again
Oct. 5	Dr. John MacKinnon	Success in the workplace, time management and professionalism
Oct. 7	Dr. Don Metzger	Design consulting in the Canadian nuclear industry
Oct 8	Dr. Phil Koshy	Machining for Manufacturing
Oct 19	Baninder Grewal	Soft Skills
Oct. 21	Dr. Stuart Fraser	Human Factors in Design in Nuclear Industry
Oct. 22	Tracey Caruana/Adeilton Reberio (PEO)	Professionalism
Oct. 26	Dr. Wajih Hamouda	Engineers in the real world
Oct. 28	Kavin Tanaka	(Topic not yet available)
Oct. 29	Multiple Choice Test	Online test on Avenue

Note: The order of lectures may change depending upon any changes in schedules of some of the speakers. The list will be updated with new information and reposted on Avenue in such cases. Please check the course web site regularly for any changes/updates. There will be no lectures in Term 2.