University of Toronto
MIE-540 Product Design

Instructor: D.Nacson
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Office Hours: 1 hour before class or by appointment

Course Description: Over the next 13 weeks, students will gain an understanding of the steps involved and the tools utilized in developing new products. The course will seamlessly integrate both business and engineering concepts through examples, case studies and a final project. Identifying customer needs, project management and the economics of product design are among the business concepts that will be covered.

Some of the product design engineering tools to be examined include: developing product specifications, concept generation, concept selection, Product Functional Decomposition (PFD) diagrams, Design of Experiments, noises, interactions, tolerance analysis and latitude studies. Specific emphasis will be placed on product optimization.

Throughout the course, students will be exposed to a number of industry case studies, examples and assignments to illustrate the tools and methodologies in practice.

Additional Notes:
Tutorial**:** The tutorial is designed to help clarify concepts, answer any questions regarding the group project, and practise solving old exam questions. The tutorial time slot will be used if additional lecture time is required.

Lab**:** You will be required to attend a lab session.
The lab session will be conducted during one lecture time towards the end of the course.
Lab date and location to be determined.

Taking notes:
You must actively take notes during lectures. The lectures have many examples and points which are not always captured by the reading material referenced below.

Required Reading Material:
Product Design MIE540 Notes. D.Nacson (available online)

Suggested Reference Materials:
1. Product Design and Development
   Karl Ulrich & Steven Eppinger 5th, 6th or 7th Edn. (all recent editions are fine)

Course Objectives

At the end of this course you will be able to:

- Describe and apply tools of the product design process in order to define, design and optimize a simple mechanical system.
- Demonstrate an ability to apply business tools such as risk analysis, project management and financial modeling to the topic of product design.
- Develop control factors and specifications from Voice of Customer requirements.
- Demonstrate appropriate levels of independent and group thought, creativity, and capability in real-world problem solving.
- Design, build, and optimize a product by implementing Design of Experiment and Robust Design techniques.
- Communicate effectively both orally and in writing.
- Work effectively in teams, including structuring individual and joint accountability; assigning roles, responsibilities, and tasks; monitoring progress; meeting deadlines; and integrating individual contributions into a final group deliverable.
- Develop and improve leadership characteristics.

Evaluations:

The evaluation criteria is designed to measure the student's accomplishment of the course objectives

Assignments (4-5)	15%
Term Test 1 (1 hour)	15%
Term Test 2 (2 hours)	25%
Lab	5%
Group Project	40%
Total	**100%**

Ground rules for the course:

- Each student will attend class on time and with no disruptions.
- Students will be prepared for each lecture by reading the lecture notes for the week in advance and preparing questions.
- All tutorial problems should be attempted before the tutorial.
- All deliverables will be hand delivered and on time. The assignments, lab and project will not be accepted through email or fax.
- Pay full attention and take active notes at all times.
- Turn your phones off.
- Students demonstrating their final projects must consider safety first. If in doubt validate your design concept with the TAs before beginning

Term tests:

The dates and locations for the term tests will be confirmed in the first few weeks of class once rooms are booked.

Welcome to Product Design…

You are entering a new world of engineering practice that will give you a disciplined *process approach* to help you apply the individual engineering course knowledge you have built over your academic career. This course will provide a structured way for you to apply your academic knowledge to the process of developing & designing products. Part of this course, Product Optimization, is a step-by-step approach to improving the performance of products, subsystems, assemblies and components.
Unlike a "specialty" course, product design is a broad topic. This course will expose you to the many areas of product design in a relatively short time. **This course will not make you an expert in any one area of product design, but rather expose you to the topics, vocabulary and the product design & development process.**

Companies involved in product design look for individuals who understand topics such as: Robust Design, Parameter Management and Tolerance Analysis. These skills will help you to competitively participate in your upcoming job interviews and to further your existing engineering academic career. Many students "seal the deal" on getting a job by bringing these product design skills to the table during their interviews. I hope you will find this course to be enjoyable, rewarding, and a strong asset for your future careers.

D. Nacson

Policies & Statements

University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Learn more about Canada's relationship with Indigenous Peoples here.

Indigenous Students' Supports

If you are an Indigenous engineering student, you are invited to join a private Discord channel to meet other Indigenous students, professors, and staff, chat about scholarships, awards, work opportunities, Indigenous-related events, and receive mentorship. Email Professor Bazylak or Darlee Gerrard if you are interested.

Indigenous students at U of T are also invited to visit First Nations House's (FNH) Indigenous Student Services for culturally relevant programs and services. If you want more information on how to apply for Indigenous specific funding opportunities, cultural programs, traditional medicines, academic support, monthly social events or receive the weekly newsletter, go to the FNH website, email or follow FNH on social media: Facebook, Instagram, or TikTok. A full event calendar is on the CLNX platform. Check CLNX often to see what new events are added!

Wellness and Mental Health Support

As a university student, you may experience a range of health and/or mental health challenges that could result in significant barriers to achieving your personal and academic goals. The University of Toronto and the Faculty of Applied Science & Engineering offer a wide range of free and confidential services that could assist you during these times.

As a U of T Engineering student, you have a Departmental Undergraduate Advisor or a Departmental Graduate Administrator who can support you by advising on personal matters that impact your academics. Other resources that you may find helpful are listed on the U of T Engineering Mental Health & Wellness webpage, and a small selection are also included here:

- U of T Engineering's Mental Health Programs Officer
- Accessibility Services & the On-Location Advisor
- Health & Wellness and the On-Location Health & Wellness Engineering Counsellor
- Graduate Engineering Council of Students' Mental Wellness Commission
- SKULE Mental Wellness
- U of T Engineering's Learning Strategist and Academic Success
- Registrar's Office and Scholarships & Financial Aid Office & Advisor

We encourage you to access these resources as soon as you feel you need support; no issue is too small.

If you find yourself feeling distressed and in need of more immediate support, consider reaching

out to the counsellors at U of T Telus Health Student Support or visiting U of T Engineering's Urgent Support – Talk to Someone Right Now.

Accommodations

The University of Toronto supports accommodations for students with diverse learning needs, which may be associated with mental health conditions, learning disabilities, autism spectrum, ADHD, mobility impairments, functional/fine motor impairments, concussion or head injury, visual impairments, chronic health conditions, addictions, D/deaf, deafened or hard of hearing, communication disorders and/or temporary disabilities, such as fractures and severe sprains, or recovery from an operation.

If you have a learning need requiring an accommodation the University of Toronto recommends that students register with Accessibility Services as soon as possible.

We know that many students may be hesitant to reach out to Accessibility Services for accommodations. The purpose of academic accommodations is to support students in accessing their academics by helping to remove unfair disadvantages. We can assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. The process of accommodation is private; we will not share details of your needs or condition with any instructor.

If you feel hesitant to register with us, we encourage you to reach out for further information and resources on how we can support. It may feel difficult to ask for help, but it can make all the difference during your time here.

Phone: 416-978-8060
Email: accessibility.services@utoronto.ca

Equity, Diversity and Inclusion

Looking for community? Feeling isolated? Not being understood or heard?

You are not alone. You can talk to anyone in the Faculty that you feel comfortable approaching, anytime – professors, instructors, teaching assistants, first-year or upper years academic advisors, student leaders or the Assistant Dean of Diversity, Inclusion and Professionalism.

You belong here. In this class, the participation and perspectives of everyone is invited and encouraged. The broad range of identities and the intersections of those identities are valued and create an inclusive team environment that will help you achieve academic success. You can read the evidence for this approach here.

You have rights. The University Code of Student Conduct and the Ontario Human Rights Code protect you against all forms of harassment or discrimination, including but not limited to acts of racism, sexism, Islamophobia, antisemitism, homophobia, transphobia, ableism, classism and ageism. Engineering denounces unprofessionalism or intolerance in language, actions or interactions, in person or online, on- or off-campus. Engineering takes these concerns extremely seriously and you can confidentially disclose directly to the Assistant Dean for help here.

Resource List:

- Engineering Equity, Diversity & Inclusion Groups, Initiatives & Student Resources
- Engineering Positive Space Resources
- Request a religious-based accommodation here
- Email Marisa Sterling, P.Eng, the Assistant Dean, Diversity, Inclusion & Professionalism here
- Make a confidential disclosure of harassment, discrimination or unprofessionalism here or email engineering@utoronto.ca or call 416.946.3986
- Email the Engineering Society Equity & Inclusivity Director here
- U of T Equity Offices & First Nations House Resources

Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

Academic Integrity

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarismâ€"representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or programâ€"is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see the U of T Academic Integrity website.

Quercus Information

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at https://q.utoronto.ca. Once you have logged in to Quercus using your UTORid and password, you should see the link or "card" for this course. You may need to scroll through other cards to find this. Click on this link to open our course area, view the latest announcements and access your course resources.There are Quercus help guides for students that you can access by clicking on the "?" icon in the left side column.

SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted

are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.