DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA

CSC376H5F LEC0101
Fundamentals of Robot Design
Course Outline - Fall 2019

Class Location & Time	Wed, 12:00 PM - 01:00 PM MN 3120 Thu, 12:00 PM - 01:00 PM MN 3120
Instructor	Jessica Burgner-Kahrs
Office Location	DH-3064
Office Hours	Friday 10am-12pm
E-mail Address	jessica.burgnerkahrs@utoronto.ca
Course Web Site	https://q.utoronto.ca
Teaching Assistant	Reinhard Grassmann
Office Location	DH-3050
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Teaching Assistant	Sven Lilge
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Office Hours	Friday 10am-12pm
E-mail Address	sven.lilge@utoronto.ca

Course Description

An introduction to designing robot systems. Topics include sensors, actuators, and manipulators; kinematics and dynamics; motion planning; modeling; and intelligent control. Topics covered in lecture will be implemented and explored in a practical environment using robots from different application domains. [24L, 24P]

Prerequisite: CSC209H5; CSC258H5; CSC338H5 Recommended Preparation: CSC375H5 (SCI)
Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from here.

Detailed Course Description

Students will learn basic methodologies, tools and concepts to build a foundation for advanced topics in robotics (CSC476, CSC477, CSC2621). Concepts covered in the course are robot components and designs; rigid body motions; forward, velocity and inverse kinematics; trajectory generation; and motion planning.

Learning Outcomes

By the end of this course, students will be able to:

- Identify a robot's design and analyze its kinematic structure
- Understand and compute performance parameters of robots
- Use mathematical representations of rigid body motion
- Establish and implement the forward, velocity and inverse kinematic model for serial robot arms
- Implement concepts of robot motion
- Utilize robot simulation software

Textbooks and Other Materials

Lynch & Park: Modern Robotics - Mechanics, Planning, and Control. Cambridge University Press 2017

Assessment and Deadlines

Type	Description	Due Date	Weight
Assignment	Assignment 1 - Rigid Body Motions	2019-10-04	15%
Assignment	Assignment 2 - Kinematics	2019-11-08	15%
Assignment	Assignment 3 - Motion Generation	2019-11-29	20%
Quiz	Online Quizzes	On-going	5%
Final Exam	Final Exam	TBA	45%
		Total	100%

More Details for Assessment and Deadlines

Online quizzes will be worth 5% in total. The quizzes will be made available on Quercus after each module and can be answered until 10 PM 5 days later.

Assignment 1 - Rigid Body Motions
Pen and paper based assignment. Submitted electronically through Quercus as a single pdf file.
Due: Oct 4, 2019; Available from Sep 13, 2019

Assignment 2 - Kinematics
Pen and paper based assignment using V-REP (group work). Submitted electronically through MarkUs as a zipped file containing source code and a short report (pdf).
Due: Nov 8, 2019; Available from Oct 2, 2019

Assignment 3 - Motion Generation
Coding assignment using V-REP (group work). Submitted electronically through MarkUs as a zipped file containing source code and a short report (pdf).
Due: Nov 29, 2019; Available from Nov 11, 2019

Penalties for Lateness

1 free late day for *Assignment 1*.

3 free late days as a sum across *Assignment 2 and 3* for each group.

0 points for every late assignment after using up the free days.

Procedures and Rules

Missed Term Work

To request special consideration, bring supporting documentation to the instructor in person during office hours at least one week in advance.

In case of illness, bring a U of T medical certificate to the instructor within one week of the missed work. The certificate must specify the exact period during which you were unable to carry out your academic work.

Missed Final Exam

Students who cannot write a final examination due to illness or other serious causes must file anonline petition **within 72 hours of the missed examination**. Original supporting documentation must also be submitted to the Office of the Registrar **within 72 hours of the missed exam**. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T Verification of Student Illness or Injury Form must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of $70 is required for each examination approved.

Academic Integrity

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone elses work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under

the link Codes and policies.

Final Exam Information

Duration:	2 hours
Aids Permitted:	1 page(s) of double-sided Letter (8-1/2 x 11) sheet

Additional Information

If you have questions regarding the course material, please post it on the Quercus Discussion Board first. If your question does not get answered on the Quercus Discussion Board within 48 hours, you are welcome to send an email from your UToronto account to csc376@cs.toronto.edu. I am committed to respond to your email within 48 hours. Please note, that I do not answer emails on the weekend.

You are also welcome to attend the office hours. Please schedule your attendance with us ahead of time by sending an email with the nature of your question to csc376@cs.toronto.edu and use "[Office Hour] ..." in the subject line (at least 24 hours before the office hours). You will receive a response with a time slot for your attendance as well as whom you will meet (TA or instructor depending on the nature of your request).

For any inquiry regarding this course email to csc376@cs.toronto.edu

Emails from non-UofT accounts will be ignored.

Last Date to drop course from Academic Record and GPA is November 7, 2019.