

Course Syllabus

Simulation and Modeling (CSCI 3010U)

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Computer Science, Faculty of Science
University of Ontario Institute of Technology

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Instructor

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Lectures

Tuesday, 2:10-5 pm, UA2120
First day of lectures, Tuesday, September 12, 2017.

Labs

The course has three lab sections. Each student will be assigned to one of these lab sections. All labs cover the same material. Each lab section is limited to 24 students, and these are filled on a first-come bases.

- Friday, 3:40-5 pm, UA2460
- Friday, 8:10-9:30 am, UA2460
- Monday, 3:40-5 pm, UA2460

Office hours

Tuesday, 1-2 pm in UA4032, or by appointment.

Important dates

UOIT academic calendar that lists important dates (and deadlines) is available at [here](#).

Course Description

This is a survey course on simulation methodologies, techniques, and applications. The main emphasis of the course is on the use of simulation in physical sciences, in particular its applications in Physics. In this course we will learn to build simulations and to use these simulations to solve real world problems.

Topics (in no particular order)

- Simulation methodologies
- Continuous systems
- Particle-based simulations
- Rigid body dynamics
- Random processes
- Many particle systems
- Discrete event simulation
- Scientific computing
- Validation and verification

Tentative schedule

- Week 1 - Introduction and building simulations
- Week 2, 3 - Continuous systems
- Week 4, 5 - Rigid body dynamics
- Week 6 - Collision detection
- Week 7 - *Midterm*
- Week 8, 9 - Random processes
- Week 10, 11 - Discrete event systems, many particle systems, validation & verification
- Week 12 - Project presentations

Course material

No single textbook covers all the material that we will discuss in this course. Still the following two books are useful for a deeper study of most of the topics that we will cover in this course.

- Harvey Gould, Jan Tobochnik, and Wolfgang Christian, “An Introduction to Computer Simulation Methods: Applications to Physical Systems,” Third Edition, Addison Wesley, 2007.
- Wolfgang Christian, “Open Source Physics: A User’s Guide with Examples,” Addison Wesley, 2007.

Students are strongly encouraged to take their own notes during lectures.

Grading

- Class participation, 8%
- Labs, 12%
- Midterm, 30%
October 24, in class, 75 minutes, no aids allowed
- 2 assignments, 30%
 - A1, *September 26 to October 10*
 - A2, *October 24 to November 7*
- Project, 20%
 - Project topics selection, by the week of November 7
 - Project presentations, during the last week of lectures
 - Project reports due on December 8, midnight
- **This course has no final exam.**

We will make every effort to stick to the above schedule.

Class participation

Class attendance is strongly encouraged. This course covers a lot of ground, ranging from calculus to particle systems to random number generation and probability. Consequently, it is rather easy to fall behind. Regular class attendance dramatically increase your chances of success. We will discuss topics in class that are not presented in the class room.

In order to assign class participation marks, I will provide in-class exercises during the last 20 to 30 minutes during most lectures. These exercises will require programming and will cover the topic currently under discussion. These exercises are due before the end of the lecture. When grading these exercises, I will focus more on the attempt rather than the correct solution. Paying attention during lectures and taking your own notes is one way to successfully complete these exercises.

Course project

The students will work in teams of up to 2 and work on a course project. The topic of the project will be decided in consultation with the instructor. Students teams and course projects will be finalized during the week of November 7. Each team will give a 5 to 10 minutes presentation on their project during the last week of lectures. The project report is due back on December 8, midnight.

Below, you will find a list of projects that students have done in the previous iterations of this course:

- Angry birds;
- Flappy birds;
- Balancing an inverted pendulum on a moving platform;
- Billiard;
- Rocket simulation;
- Stock market simulation;
- High-performance collision detection;
- Simulating a waving flag;
- The attack of zombies;
- Rigibu puzzle;
- Modeling storms;
- Fireworks;
- An analysis of customer service in call centres;
- Crowd simulation;
- A vehicle rental network;
- Golf;
- A leaf blowing in the wind; and
- Simulating waves.

Course work submission

Unless otherwise instructed, all course work should be submitted using Blackboard.

Partial marks

Assignments will primarily be evaluated based on the correctness of solutions; however, partial credit may be assigned for documentation, discussion, etc.

Remarking

It is extremely important that all work is fairly graded. Please submit a remark request by email within 5 days of receiving the grade. The email must contain the reasons for which you think the work should be remarked. *Please note that a remark may result in a lower grade.*

Late submission policy

The penalty for a late submission is 10% per day. An assignment or project will get a **zero** if submitted more than 72 hours after the submission deadline.

Email traffic

The instructor and the TA will make every effort to respond to emails in a timely manner; however, it may take up to two working days to respond to an email. It simply means that emails sent right before a deadline may not be answered in time. Urgent emails may be sent to “faisal.queshi@uoit.net” with the subject line “csci 3010 - fall 2017”.

Discussions

Appropriate use of discussion groups include clarification of lecture material and assignments and other concerns and comments about the course that might of general interest to course participants. Please do not post assignment solutions to the discussion groups.

Collaboration

I encourage you to work together when discussing assignments/projects; however, it doesn't mean that you should share your written solutions or that you submit someone else's work as your own.

Course evaluation

It is important that every student participates in course evaluations. Course evaluations, which are completely anonymous, provide extremely useful feedback to the instructor and the TA, helping improve the course.

Academic integrity

Assignments and tests must be strictly individual work. UOIT takes academic dishonesty very seriously. Please read and understand UOIT's policy on academic integrity available [here](#)

Accessibility

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations. More information about Student Accessibility Services (SAS) is available [here](#).

Freedom of Information and Protection of Privacy Act

UOIT is governed by the Freedom of Information and Protection of Privacy Act (“FIPPA”). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that UOIT not disclose the personal information of its students without their consent. FIPPA's definition of “personal information” includes, among other things, documents that contain both your name and your Banner ID. To ensure that your rights to privacy are protected, I encourage you to use only your Banner ID on assignments or test papers being submitted for grading (the exception to this rule are midterm and final exams, since these are returned individually). This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that UOIT will interpret this as an implied consent to the disclosure of your

personal information in the normal course of returning graded materials to students. Please contact the UOIT Chief Privacy Officer at accessandprivacy@uoit.ca for more information.

Sexual Violence Policy

UOIT is committed to the prevention of sexual violence in all its forms. For any UOIT student who has experienced Sexual Violence, **UOIT can help**. UOIT will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, who are specially trained individuals authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolutions options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email supportworker@uoit.ca
- Learn more about your options at: www.uoit.ca/sexualviolence