



Faculty of Engineering
Department of Mechanical Engineering
COURSE OUTLINE

MECH 580 A05 – Modeling and Simulation of Dynamic Systems

Term – Summer 2022 (202205)

Instructor	Office Hours
Dr. Flavio Firmani	Days: TBA
Phone: 250-721-7890	Time: TBA
E-mail: ffirmanic@uvic.ca	Location: TBA

LECTURE DATE(S)

Section: A05 CRN31586	Days: TF	Time: 1:00 – 2:20 PM	Location: ECS 124
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TA Name	E-mail	Office
Spencer Funk	spencerfunk@uvic.ca	By appointment

Optional Text
Title: Modeling and Control of Engineering Systems
Author: Clarence de Silva
Publisher/Year: Published by CRC Press, 2009

COURSE OBJECTIVES:

Introduction to modeling and simulation of dynamic systems, including mechanical, electrical, thermal, and fluid systems. This course covers fundamental concepts of modelling and analogies among systems of different domains based on state-space representation and linear graphs. The course introduces simulation software tools that allow students to analyze the response of linear, linearized, and nonlinear models.

LEARNING OUTCOMES: At the end of this course, students will be able to:

1. Recognize the different methods for modeling a dynamic system.
2. Model basic elements and recognize the analogies among the different domains.
3. Develop constitutive, compatibility, and continuity relations.
4. Develop state-space models of electrical, mechanical, fluid, thermal, and hybrid systems.
5. Simulate with software tools the response of a dynamic system.
6. Implement linear graphs to model a dynamic system
7. Analyze the response of non-linear models through linearization and non-linear simulation tools
8. Relate frequency domain and time domain models.

Weight & Date(s) of Assessments:	Weight	Date
Assignments	10% (4 assignments, 2.5% each)	TBD
Module Exams	50% (two exams, 25% each)	TBD
Project	40%	TBD

ASSIGNMENTS

Graduate students must complete the assignments **individually**. Assignment submissions are to be made using Brightspace's Digital Submission. Submit copy of the assignment through Brightspace

NOTE: Do not plagiarise digital work! If we find evidence of plagiarism, we will take immediate action as per the UVic policy on Academic Integrity.

Assignment #	Due (5:30pm)
No. 1	TBA
No. 2	TBA
No. 3	TBA
No. 4	TBA

PROJECT

Graduate students are expected to work on the project **individually** and, if possible, incorporate a research topic within the project. Students must consult the instructor about the feasibility of the research project.

NOTES:

NOTES

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

COURSE LECTURE NOTES

Unless otherwise noted, all course materials supplied to students in this course are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

Course Schedule

(May be subject to change)

Module	Topics	Week
1	Course Introduction, Dynamic Systems and Models	1
2	State-Space Representation: Mathematical and Physical perspectives	2
3	Modeling of Dynamic Systems and Analogies	3-5
4	Hybrid Systems	6
5	Introduction to Simulation	7
6	Modelling with Linear Graphs	8-9
7	Modelling Non-Linear Systems (Linearization and Non-Linear)	10-11
8	Transfer Functions	12-13

Grading System

The University of Victoria follows a percentage grading system in which the instructor will submit grades in percentages. The University will use the following Senate approved standardized grading scale to assign letter grades. Both the percentage mark and the letter grade will be recorded on the academic record and transcripts.

F	D	C	C+	B-	B	B+	A-	A	A+
0-49	50-59	60-64	65-69	70-72	73-76	77-79	80-84	85-89	90-100
Grades	GPA	Description							
A+, A, A-	9, 8, 7	Exceptional, outstanding or excellent performance. Normally achieved by a minority of students. These grades indicate a student who is <i>self-initiating</i> , <i>exceeds expectation</i> and has an <i>insightful</i> grasp of the subject matter.							
B+, B, B-	6, 5, 4	Very good, good or solid performance. Normally achieved by the largest number of students. These grades indicate a <i>good</i> grasp of the subject matter or <i>excellent grasp in one area balanced with satisfactory grasp in the other areas</i> .							
C+, C	3, 2	Satisfactory, or minimally satisfactory. These grades indicate a <i>satisfactory performance and knowledge</i> of the subject matter.							
D	1	Marginal Performance. A student receiving this grade demonstrated a <i>superficial grasp</i> of the subject matter.							
F	0	Unsatisfactory performance. Wrote final examination and completed course requirements;							

Course Experience Survey (CES)

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to the [CES site](#)

You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. I will remind you closer to the time, but please be thinking about this important activity, especially the following three questions, during the course.

- What strengths did your instructor demonstrate that helped you learn in this course?
- Please provide specific suggestions as to how the instructor could have helped you learn more effectively.
- Please provide specific suggestions as to how this course could be improved.

General Information

Note to Students: Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Assistant to the Chair to set up an appointment.

Centre for Accessible Learning (CAL) <https://www.uvic.ca/services/cal/>

Accommodation of Religious Observance (AC1210) Read it [here](#)

Discrimination and Harassment Policy (GV0205) Read it [here](#)

Sexualized Violence Prevention and Response at UVic:

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting <https://www.uvic.ca/sexualizedviolence/>. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

Where: Sexualized violence resource office in EQHR; Sedgewick C119

Phone: 250.721.8021

Email: svpcoordinator@uvic.ca

Web: <https://www.uvic.ca/sexualizedviolence/>

Office of the Ombudsperson:

The Office of the Ombudsperson is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations.

Phone: 250-721-8357

Email: ombuddy@uvic.ca

Web: <https://uvicombudsperson.ca/>

Electronic devices in labs and lectures: No unauthorized audio or video recording of lectures is permitted.

Electronic devices in midterms and exams: Calculators are only permitted for examinations and tests if explicitly authorized and the type of calculator permitted may be restricted. No other electronic devices (e.g. cell phones, pagers, PDA, etc.) may be used during examinations or tests unless explicitly authorized.

Faculty of Engineering, University of Victoria Standards for Professional Behavior

It is the responsibility of all members of the Faculty of Engineering, students, staff, and faculty, to adhere to and promote standards of professional behavior that support an effective learning environment that prepares graduates for careers as professionals...

You are advised to read the Faculty of Engineering document [Standards for Professional Behavior](#) which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Graduate Students' Society

The Graduate Students' Society (GSS) serves all students registered in a Graduate degree program. For information on GSS activities, events and services navigate to <https://gss.uvic.ca/>

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Attendance

Students are expected to attend all classes in which they are enrolled. An academic unit may require a student to withdraw from a course if the student is registered in another course that occurs at the same time...

An Instructor may refuse a student admission to a lecture, laboratory, online course discussion or learning activity, tutorial or other learning activity set out in the course outline because of lateness, misconduct, inattention or failure to meet the responsibilities of the course set out in the course outline. Students who neglect their academic work may be assigned a final grade of N or debarred from final examinations.

Students who do not attend classes must not assume that they have been dropped from the course by an academic unit or an instructor. Courses that are not formally dropped will be given a failing grade, students may be required to withdraw and will be required to pay the tuition fee for the course. Read the policy [here](#).

Academic Integrity

Academic integrity is intellectual honesty and responsibility for academic work that you submit individual or group work. It involves commitment to the values of honesty, trust, and responsibility. It is expected that students will respect these ethical values in all activities related to learning, teaching, research, and service. Therefore, plagiarism and other acts against academic integrity are serious academic offences.

The responsibility of the institution Instructors and academic units have the responsibility to ensure that standards of academic honesty are met. By doing so, the institution recognizes students for their hard work and assures them that other students do not have an unfair advantage through cheating on essays, exams, and projects.

The responsibility of the student Plagiarism sometimes occurs due to a misunderstanding regarding the rules of academic integrity, but it is the responsibility of the student to know them. If you are unsure about the standards for citations or for referencing your sources, ask your instructor. Depending on the severity of the case, penalties include a warning, a failing grade, a record on the student's transcript, or a suspension.

It is your responsibility to understand the University's policy on [Academic Integrity](#)

Equality

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning (formerly the Resource Centre for Students with a Disability) located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.