



**Faculty of Engineering**  
**Department of Mechanical Engineering**  
**COURSE OUTLINE**

**MECH 580 A03 – Energy Conversion and Storage**

**Term – Fall 2022 (202209)**

| <b>Instructor</b>     | <b>Office Hours</b> |
|-----------------------|---------------------|
| Dr. Andrew Rowe       | Days: TBD           |
| Phone: 250-721-8920   | Time: TBD           |
| E-mail: arowe@uvic.ca | Location: EOW 527   |

**LECTURE DATE(S)**

|                               |                    |                             |                              |
|-------------------------------|--------------------|-----------------------------|------------------------------|
| Section:<br>A03/ <b>12286</b> | Days:<br><b>MR</b> | Time:<br><b>14:30-15:50</b> | Location:<br><b>COR A225</b> |
|-------------------------------|--------------------|-----------------------------|------------------------------|

**ONLINE LEARNING, TEACHING, AND TOOLS**

**This course will be taught in person and using BrightSpaces (and maybe other tools).**

**Tools required:**

- This course will be taught in person while also making use of Brightspace.
- Scheduled class sessions will be maintained as per the timetable. Class time may be used for viewing recorded lectures, live tutorials, quizzes, and meetings with the instructors and/or teaching assistants.
- Office hours will be set with the instructor and teaching assistants once the course is underway.
- The following tools will be required: laptop/desktop, microphone/speakers/camera, web browser, Excel, Word. Specialised software (e.g. Matlab, Solidworks can be accessed through UVic's licence and set up details will be provided.)

| <b>TA Name</b>     | <b>E-mail</b>    |
|--------------------|------------------|
| Chiradeep Majumdar | cmajumda@uvic.ca |

**COURSE OBJECTIVES:**

In this course, students will:

- \* Develop an understanding of energy conversion systems
- \* Develop skills to assess feasibility of technology chain
- \* Utilize the concept of exergy to assess technological components and processes
- \* Quantify performance of electrochemical conversion and storage technologies
- \* Examine performance of thermal storage
- \* Engage in a project that develops a deeper understanding of options for delivery of decarbonized energy services
- \* Practice technical writing (report).

## LEARNING OUTCOMES:

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

- Explain exergetic value of energy
- Quantify minimum and maximum work inputs and outputs
- Quantify chemical exergy
- Explain differences between component and system losses and efficiencies
- Quantify entropy generation and impacts
- Identify ways to increase performance
- Calculate reduction-oxidation cell potentials
- Determine thermal behavior of redox cells
- Quantify storage dynamics

## COURSE STRUCTURE:

The overarching objective of the course is to develop skills and knowledge to assess the performance of energy systems, technologies, conversion processes, and storage. The course is comprised of three themes:

### Exergy Analysis

- Students will use the combined 1st and 2nd law to define exergy and the exergetic value of energy.
- Understand the role of exergy in society

### Performance Metrics

- Determine exergetic efficiencies
- Analyse components and systems
- Determine how system performance can be improved

### Storage Systems

- identify methods for energy storage
- determine performance of electrochemical storage systems

Analytical skills will be applied to modern energy conversion concepts so as to assess potential to provide sustainable and reliable energy services.

## Project

The course project will be posted on the Brightspace site and discussed online.

| Weight & Date(s) of Assessments: | Weight | Date                  |
|----------------------------------|--------|-----------------------|
| Assignments: 7                   | 10     | TBD                   |
| Quizzes: 3                       | 55     | Oct 18, Nov 15, Dec 5 |
| Project: 1                       | 20     | TBD                   |
| Oral Exam:                       | 15     | TBD                   |

*Note: Further details on deliverables will be provided during the term. Some adjustments may be made.*

## NOTES:

## NOTES ON WORK COMPELETION

Failure to complete exam requirements will result in a grade of N being awarded for the course.

## 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 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.

## 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](mailto: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](mailto: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 an Graduate degree program. For information on GSS activities, events and services navigate to <https://gss.uvic.ca/>

### **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. Read the policy [here](#)

### **Course Experience Survey (CES)**

We 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 <http://ces.uvic.ca>

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.

### **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.