



ENGR 498 (3) Special Topics: Corrosion and Corrosion Prevention Methods

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Format: This course is a Global Seminar and will take place from May 12- June 06, 2025, in Xian, China.

Academic Calendar Entry

ENGR 498 (3) Special Topics in Engineering: Corrosion and Corrosion Prevention Methods

This course is designed for 3rd and 4th year engineering students seeking to develop a comprehensive understanding of corrosion and corrosion control principles. It covers the fundamental mechanisms of corrosion, the different forms of corrosion, the various methods of corrosion prevention including but not limited to coatings, inhibitors, cathodic and anodic protections, and their practical application in the selection of construction materials and the protection of engineering systems. By the end of the course, students will gain valuable insights into the challenges posed by corrosion in different industries and the strategies employed to mitigate its effects, ensuring the longevity and reliability of engineering infrastructures such as pipelines, bridges, offshore facilities, etc.

Course Format

- One 4-hour workshop session pre-departure (in-person or virtual). Workshop attendance is mandatory.
- Weekly six hours of lectures (Mon. and Wed.)
- Weekly 3 hours of research/industry workshop/field trips
- Group Presentation on Fri. May 30th (3 hours)
- Final Exam on June 4th, Tentatively (2.5 hours, in-person)
- In-person attendance at all the above activities is mandatory
- Students will maintain a reflective journal throughout the course
- Submissions and grades are managed using Canvas

Course Overview, Content, and Objectives

In this seminar course, students will gain firsthand exposure to the critical role corrosion engineering plays in shaping the modern world. As part of the course, students will embark on an educational journey to Xi'an, China, a city steeped in historical significance as the former capital of the Zhou, Qin, Han, and Tang dynasties. Xi'an is also home to Northwestern Polytechnical University (NPU), China's leading institution in the field of Materials Science. This experience will provide students an unparalleled opportunity to immerse themselves in a globally recognized research and industrial environment at the forefront of technological advancement, innovation, and adoption.

Throughout the seminar, students will engage with cutting-edge research in corrosion engineering, exploring how this discipline influences various industries, from infrastructure and manufacturing to energy and transportation. They will interact with leading experts and gain insight into the latest



techniques in corrosion control, materials selection, and protection of engineering systems, all while observing how these innovations are applied in real-world scenarios.

The course also emphasizes the importance of sustainability and ethics in engineering practice. Students will critically reflect on the societal impact of corrosion and corrosion control methods, considering both the positive contributions—such as prolonging the lifespan of critical infrastructure—and the potential negative consequences, including environmental degradation and resource consumption. Through these reflections, students will be encouraged to evaluate their roles as future engineers, equipped with the knowledge and responsibility to drive positive societal change. They will explore how ethical considerations can shape engineering decisions, particularly in the context of sustainable development, ensuring that their future work contributes to a more sustainable and equitable world.

Learning Outcomes

After completing this course, students should be able to:

- Understand the fundamentals of corrosion engineering and recognize different types of corrosion;
- Understand the cultural aspects of the corrosion prevention methods and technology;
- Appreciate the impact corrosion engineering and prevention methods will have in the future of protecting our infrastructures and the role engineers will play;
- Research and report on key enabling technologies related to corrosion prevention/control industries.

Engineering Accreditation

The Canadian Engineering Accreditation Board requires students to have achieved competency in a twelve main areas by graduation. To ensure that our program provides sufficient instruction in these 12 graduate attributes, course learning outcomes have been mapped to the graduate attributes for each course. The relevant graduate attributes for this course are identified below.

Course Learning Outcomes	Graduate Attributes (as defined below)											
	1	2	3	4	5	6	7	8	9	10	11	12
Demonstrate the Understanding of the Fundamentals of Corrosion Engineering	D								D			
Demonstrate the Understanding of the cultural aspects of the evolution of technology in Corrosion Engineering and Prevention methods							D		D			
Appreciate the impact engineering will have in the future of corrosion Prevention methods in various industries and community infrastructures							D		D	D	D	
Research and report on key enabling technologies related to Corrosion and Corrosion Prevention/Control Industries							D					



CEAB Graduate Attributes

1. **A knowledge base for engineering:** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. **Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.
3. **Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.
4. **Design:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **Use of engineering tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. **Individual and team work:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **Communication skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. **Impact of engineering on society and the environment:** An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. **Ethics and equity:** An ability to apply professional ethics, accountability, and equity.
11. **Economics and project management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. **Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Required Materials - Students must bring a laptop on the trip.

Evaluation Criteria and Grading

- Grading scheme:

Pre-departure workshop	7.5%
Final Project Presentation/Report	35%
Final Exam	35%
Participation/Professionalism	15%
Reflective Personal Journal	7.5%
- Students will maintain a reflective journal, which will be updated within 24 hours after each learning activity (field trip or workshop). Journal entries will be submitted through Canvas.
- Students will be evaluated on their engaged participation during each day of learning activities.

Suggested Textbooks/Readings

[1] M. G. Fontana, "Corrosion Engineering", 3rd edition, McGraw-Hill Book Company, 1987.

[2] J. R. Davis, "Corrosion-Understanding the Basics", ASM International, 2000.

[3] Winston Revie, "Uhlig's Corrosion Handbook", 3rd edition, John Wiley and Sons, 2011.

[4] P. R. Roberge, "Corrosion Engineering Principles and Practice", McGraw-Hill Company, 2008.



[5] Z. Ahmad, "Principles of Corrosion Engineering and Corrosion Control", Butterworth-Heinemann, 2006.

[6] K. Elayaperumal and V. S. Raja, "Corrosion Failures-Theory, Case Studies, and Solutions", John Wiley & Sons, Inc., 2015.

[7] Organic Coatings, Wicks Jr. Z. W., et al., Society of Plastics Engineers Monographs 1995, ISBN10: 0471245070

Course Schedule

The following table is a schedule of the course learning activities.

Week	Topics covered	Comments
Week One	Fundamentals of Corrosion	Research Lab.
Week Two	Types of Corrosions	Industry Visit/invited guest
Week Three	Corrosion Prevention methods	Research Lab.
Week Four	Corrosion Prevention Methods Cont.	Final Project Presentations

Academic Integrity at UBC and the School of Engineering

Academic and professional integrity are of the utmost importance at the School of Engineering. Please read your syllabus carefully to understand the expectations surrounding academic integrity in this course. In addition, please familiarize yourself with the University of British Columbia's academic calendar language surrounding academic integrity for students:

"The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences."

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at <https://www.calendar.ubc.ca/okanagan/?tree=3,54,111,0>

In addition, all course material including lecture notes, assignments, and examination materials is the intellectual property of the instructor and as such must not be uploaded to third party, non-UBC sites for file sharing or for soliciting answers online. Doing so is considered academic misconduct under UBC's policies (see <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,959>) including the following:

"Use of or participation in unauthorized collaborative work; use or possession in an examination of any materials (including devices) other than those permitted by the examiner; use, possession, or facilitation of unauthorized means to complete an examination (e.g., receiving unauthorized assistance from another person, or providing that assistance); and dishonest practices that breach rules governing examinations or submissions for academic evaluation see Student Conduct during Examinations)."



Violating this is considered academic misconduct by the University and will be treated as such. Be wary of sites that market themselves to be "study aids" as they may fall under the definition of contract cheating (<https://academicintegrity.ubc.ca/academic-integrity-in-teaching-and-learning/contract-cheating/>). In addition, there have been instances where these sites have blackmailed students even after graduation.

Assignments

This course assesses student understanding of course material based on completed assignments. It is important to note that according to the UBC Okanagan Academic Calendar cheating includes the following:

"Falsification of any material subject to academic evaluation, including research data;"

For example, in this course, this includes, but is not limited to, copying another student's work or allowing another student to copy your assignment. Students are expected to submit original work for their assignments in this course.

"Use of or participation in unauthorized collaborative work;"

While collaboration is encouraged in some circumstances, not all collaboration is authorized. For example, in this course, unauthorized collaboration includes, but is not limited to, working in teams to complete projects that are intended as individual assessment.

Exams

This course assesses student understanding of course material based on midterm and final examinations. It is important to note that according to the UBC Okanagan Academic Calendar cheating includes the following:

"Use or possession in an examination of any materials (including devices) other than those permitted by the examiner;"

This includes, but is not limited to, possession during an exam of a cell phone, programmable calculator, or watch that is capable of storing unauthorized materials, unless specifically allowed.

"Use, possession, or facilitation of unauthorized means to complete an examination (e.g., receiving unauthorized assistance from another person, or providing that assistance);"

This includes, but is not limited to, looking at another student's exam paper during the examination time and accessing third-party online resources during exams unless explicitly permitted by your instructor.

Plagiarism

This course assesses student understanding of course material based on written reports. It is important to note that the UBC Okanagan Academic Calendar includes the following comprehensive description of plagiarism:

"Plagiarism, which is intellectual theft, occurs when an individual submits or presents the oral or written work of another person as his or her own. Scholarship quite properly rests upon examining and referring to the thoughts and writings of others. However, when another person's words (i.e., phrases, sentences, or paragraphs), ideas, or entire works are used, the author must be acknowledged in the text, in footnotes, in endnotes, or in another accepted form of academic citation. Where direct quotations are made, they must be clearly delineated (e.g., within quotation marks or separately indented). Failure to provide proper attribution is plagiarism because it



represents someone else's work as one's own. Plagiarism should not occur in submitted drafts or final works. A student who seeks assistance from a tutor or other scholastic aids must ensure that the work submitted is the student's own. Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments."

Students are responsible for ensuring all work is original and source use is properly documented.

For additional language specific to online education, please consult the Academic Integrity Working Group's website at <https://provost.ok.ubc.ca/initiatives/online-transition/faculty-resources/faculty-resources-for-academic-integrity>

SoE Academic Integrity Procedures

The following steps will be followed in cases of suspected academic misconduct:

- The instructor will notify the student of the alleged misconduct and the assigned penalty and the student will be given an opportunity to respond.
- The instructor will report the incident to the School of Engineering Academic Misconduct Review Committee and will include the student's response.
- The Academic Misconduct Review Committee will review the case and either issue a warning letter to the student or recommend further review by the Dean's Designate.
- The Dean's Designate will meet with the student and either issue a warning letter or refer the matter to the President's Advisory Committee on Student Discipline (if applicable).
- The case will be heard by the President's Advisory Committee on Student Discipline (if applicable).

UBC Okanagan Student Service Resources

UBC Okanagan Disability Resource Centre

The Disability Resource Centre (DRC) facilitates disability-related accommodations and programming initiatives that ameliorate barriers for students with disabilities and/or ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:

UNC 215 (250-807-8053)

Email: drc.questions@ubc.ca

Web: www.students.ok.ubc.ca/drc

UBC Okanagan Equity and Inclusion Office

Through leadership, vision, and collaborative action, the Equity & Inclusion Office (EIO) develops action strategies in support of efforts to embed equity and inclusion in the daily operations across the campus. The EIO provides education and training from cultivating respectful, inclusive spaces and communities to understanding unconscious/implicit bias and its operation within in campus environments. UBC Policy 3 prohibits discrimination and harassment on the basis of BC's Human Rights Code. If you require assistance related to an issue of equity, educational programs, discrimination or harassment please contact the EIO.

UNC 216 (250.807.9291)

email: equity.ubco@ubc.ca

Web: www.equity.ok.ubc.ca

Indigenous Programs and Services



Indigenous Programs and Services offers services from the time of application to graduation for First Nation, Métis and Inuit students. Services include academic advising, along with peer mentoring and peer tutoring. Programming includes orientation and transition as well as opportunities for experiential learning and social and cultural events.

UNC 210

Email: indigenous.programs@ubc.ca

Web: www.students.ok.ubc.ca/indigenous-students

Office of the Ombudsperson for Students

The Office of the Ombudsperson for Students is an independent, confidential and impartial resource to ensure students are treated fairly. The Ombuds Office helps students navigate campus-related fairness concerns. They work with UBC community members individually and at the systemic level to ensure students are treated fairly and can learn, work and live in a fair, equitable and respectful environment. Ombuds helps students gain clarity on UBC policies and procedures, explore options, identify next steps, recommend resources, plan strategies and receive objective feedback to promote constructive problem solving. If you require assistance, please feel free to reach out for more information or to arrange an appointment.

UNC 328 (250.807.9818)

Email: ombuds.office.ok@ubc.ca

Web: www.ombudsoffice.ubc.ca

Student Learning Hub

The Student Learning Hub is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with academic integrity, study skills and learning strategies**. Students are encouraged to visit often and early to build the skills, strategies and behaviours that are essential to being a confident and independent learner. For more information, please visit the Hub's website.

LIB 237 (250.807.8491)

Email: learning.hub@ubc.ca

Web: students.ok.ubc.ca/slh

Student Wellness

At UBC Okanagan health services to students are provided by Student Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Student Wellness for more information or to book an appointment.

UNC 337 (250.807.9270)

Email: healthwellness.okanagan@ubc.ca

Web: www.students.ok.ubc.ca/health-wellness

Resource Links

UBC Okanagan Academic Calendar: <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,959>

UBC Okanagan Senate Forms: <https://senate.ubc.ca/okanagan/forms/>



UBC Okanagan Provost Learning Services Faculty Resources for Academic Integrity

<https://provost.ok.ubc.ca/initiatives/online-transition/faculty-resources/faculty-resources-for-academic-integrity/>

Academic Integrity at UBC <https://academicintegrity.ubc.ca/>

SAFEWALK

*Don't want to walk alone at night? Not too sure how to get somewhere on campus?
Call Safewalk at 250-807-9236*

School of Engineering Calculator Policy for Exams

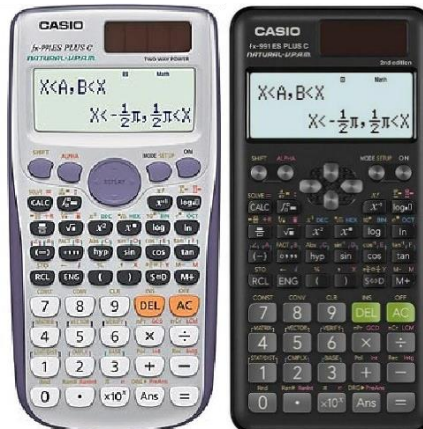
The School of Engineering has a calculator policy whereby only the two models shown below are permitted in midterm and final exams.

Two Permitted Makes / Models

Texas Instruments
TI-36X Pro



CASIO
fx-991ES PLUS C*



*2nd edition (right) released 2021

Both calculators will be available through the bookstore. Both calculators have the following functionalities:

- solar + battery powered
- "natural" 4-line display
- standard scientific operations (trig, hyp, exp, log, etc.)
- complex numbers
- numerical solver
- roots of quadratic and cubic polynomials
- simultaneous linear equations (up to 3 unknowns)
- vector and matrix operations (real valued, up to 3x3)
- numerical integrals and derivatives
- statistics, regressions, and distributions
- base 2, 8, 10, 16



- stored variables and operations
- constants and conversions
- NOT programmable
- NOT graphing capable
- NO wireless functions
- NO file storage



Academic Honesty and Integrity Pledge
School of Engineering | Faculty of Applied Science
UBC Okanagan

Academic honesty and integrity are essential principles of the University of British Columbia and engineering as a profession. All UBC students are expected to behave as honest and responsible members of an academic community. Engineering students have an even greater responsibility to maintain the highest level of academic honesty and integrity as they prepare to enter a profession with those principles as a cornerstone.

Cheating on exams or projects, plagiarizing or any other form of academic dishonesty are clear violations of these principles

As a student of the School of Engineering at UBC Okanagan, I solemnly pledge to follow the policies, principles, rules, and guidelines of the University with respect to academic honesty. In particular, I commit to upholding the academic integrity and the professionalism as an engineering student.

By signing this pledge, I promise to adhere to exam requirements and maintain the highest level of ethical principles during the exam period.

Signature

Name

Student Number

Date



Why are we doing the integrity pledge?

Dr. Laura Patterson

On behalf of the School of Engineering Ethics and Academic Integrity Committee

An engineering student asked me why the School of Engineering requires students to sign the Integrity Pledge, and what is so wrong with collaborating on an exam when everyone else is doing it. Those questions are important and this was the email that was sent in return.

The integrity pledge is a form of an honour code to ensure students acknowledge that the exam is intended to be a solo exercise testing your individual skills and not a group effort. In an exam situation, consulting with colleagues for answers on an exam intended to test individual abilities is not "collaborating," it is cheating and academic misconduct under UBC policies. Even though we are in a situation in which faculty may not be able to enforce this or enact consequences all the time, if a student chooses to continue this behaviour when expressly asked not to, they need to be aware that they are making a clear choice to act unethically, which is not entirely without consequences. These consequences are to one's identity.

There are many situations where no one is watching, or there are no immediate consequences, where professionals must choose to do either the ethical thing or the unethical thing. We do what we practice, and we become what we do. Research into ethics in engineering education found that those students who operate unethically during their education have a higher likelihood of operating unethically in their professional careers, because they have not exercised the skill of operating ethically in the easier and lower stakes setting of education. When these bad habits catch up with us, they can lead to lawsuits, public disgrace, and death. Examples of such cases in the media include the SNC Lavalin fraud case, cases of individual engineering university professors caught plagiarizing out of Waterloo and Regina, or the Hyatt Regency walkway collapse that killed 114 and injured 216. Few people wake up and decide to be unethical or think themselves to be, but the daily habit of cutting corners in the short term and rationalizing that behavior builds to larger exceptions that become harder to resist.

The "if everyone is doing it, I should too" argument is a common logical fallacy known as the bandwagon argument used to rationalize behaviour because it is popular. The common retort is "if everyone jumped off of a bridge, should you too?" A better quotation to respond to this argument would be "The only thing necessary for the triumph of evil is for good men to do nothing." It is true that it will seem that others are getting away with it; however, choosing to participate in it, not only makes the situation worse, it also comes at a significant cost to one's perceptions of oneself.

This integrity pledge then becomes a question of "Who do you want to be?" Choosing to do the ethical thing, even when the other option seems easier, is a long-term choice to build the habits of ethical behaviour and the skill set of handling the hard things necessary to be an ethical professional. It can also influence other students to act with integrity and help shift the culture if more students expected their colleagues to act ethically. So, when you choose what you are going to do in these difficult situations, you are choosing your identity and influencing the culture of your educational program.