

HIST 1971
Engineering and Society: Historical and Philosophical Perspectives

Dalhousie University, Department of History
Winter 2022

Course description:

This course uses historical case studies to examine the connections between engineers, technology, and society. Topics will include the emergence of engineering as a profession; the societal impact of the Industrial Revolution; the rise of environmentalism and green technology; the relation of engineers to governments and militaries; and ethical responsibility for engineering disasters. In addition to developing written and oral communication skills, students will learn various ethical theories and apply them to key cases in engineering history.

Course objectives:

Upon completing this course, students should be able to:

- explain the emergence and development of the engineering profession
- analyze the impact of technological developments on society
- understand prominent theories of ethics and apply them to case studies
- identify intellectual and social factors that cause science and technology to change
- write a cogent analysis of a text discussing engineering and its history
- engage in analysis and debate about the history of engineering in a tutorial setting

Location and time: online, asynchronous; all times below are in the Atlantic Time Zone

Instructor: Adam Richter, PhD
richtera@dal.ca

Virtual office hours: by appointment

Course structure:

The course is divided into weekly modules that can be accessed through Brightspace. Each module will contain multiple short video lectures followed by brief quizzes to ensure comprehension of the material. Modules will also include assigned readings which will be the subject of students' weekly response papers. Finally, each week students will take part in a virtual tutorial on a Brightspace discussion board.

Course texts:

There is no textbook for this course. All readings will be made available through Brightspace.

Prerequisites: None

Grade breakdown

- Writing practice exercise: 5%
- Response papers: 50% (5 x 10% – one regraded)
- Ethical case study assignment: 15%
- Short video presentation (in tutorial): 5%
- Take-home final exam: 15%
- Tutorial participation: 10%

Schedule

<p>Week 1: Introduction to the course – January 5-9 (short week)</p> <p><i>Lecture</i> 1a) Introduction</p> <p><i>Assignment</i> Academic Integrity Module</p>
<p>Week 2: Technology and society: the advent of printing – January 10-16</p> <p><i>Lectures</i> 2a) The printing press 2b) How printing reshaped European society 2c) Response paper writing techniques (posted in tutorial)</p> <p><i>Reading</i> -Timothy P.J. Perry, “Early Depictions of the Printing Press: A Model Source,” <i>Printing History</i> 18 (2015): 27-53 ***WRITING PRACTICE EXERCISE DUE***</p>
<p>Week 3: The effects of industrialization – January 17-23</p> <p><i>Lectures</i> 3a) The Industrial Revolution 3b) Steam power 3c) Industry, society, and empire</p> <p><i>Readings</i> -Mark Hendrickson, “Advance Agent of Expanding Empires: George F. Becker and Mineral Exploration in South Africa and the Philippines,” <i>History and Technology</i> 35 (2019): 237-265 -Zef Segal, “The Naturalisation of Nineteenth-Century German Railways as Depicted in Visual Discourse,” <i>The Journal of Transport History</i>, DOI: 10.1177/00225266211031177 (2021) ***RESPONSE PAPER 1 DUE***</p>

Week 4: Premodern engineers – January 24-30

Lectures

- 4a) Engineers in antiquity
- 4b) Engineers in the Middle Ages
- 4c) Engineers in the Renaissance

Readings

- Amir Bani-Masoud, “Vitruvius and the Education of the Architect,” *Journal of Architectural Engineering* 22 (2016): 02516001 (6 pages)
- Bert S. Hall, “Giovanni de’ Dondi and Guido da Vigevano: Notes toward a Typology of Medieval Technological Writings,” *Annals of the New York Academy of Sciences* 314 (1978): 127-144

*****SHORT VIDEO PRESENTATION DUE*****

Week 5: Scientist-engineers in the 17th century – January 31-February 6

Lectures

- 5a) Galileo as instrument maker and military engineer
- 5b) Galileo as astronomer and physicist
- 5c) Robert Hooke as instrument maker and civil engineer

Readings

- Albert van Helden, “The Telescope in the Seventeenth Century,” *Isis* 65 (1974): 38-58
- Lisa Jardine, “Monuments and Microscopes: Scientific Thinking on a Grand Scale in the Early Royal Society,” *Notes and Records of the Royal Society of London* 55 (2001): 289-308

*****RESPONSE PAPER 2 DUE*****

Week 6: The modern engineering profession – February 7-13

Lectures

- 6a) John Smeaton and the civil engineering profession
- 6b) Engineers, the U.S. military, and the founding of NASA
- 6c) NASA engineers and Cold War politics during the “Space Race”

Readings

- Fraser MacDonald, “Space and the Atom: On the Popular Geopolitics of Cold War Rocketry,” *Geopolitics* 13 (2008): 611-634
- Andrew M.A. Morris, “English Engineer John Smeaton’s Experimental Method(s): Optimisation, Hypothesis Testing and Exploratory Experimentation,” *Studies in History and Philosophy of Science* 89 (2021): 283-294

*****RESPONSE PAPER 3 DUE*****

Week 7: Environmental issues – February 14-20

Lectures

- 7a) The prehistory of environmentalism
- 7b) Modern environmentalism
- 7c) *****Guest Lecture***** Melania Zurba – Indigenous Protected and Conserved Areas

Readings

-Karl Jacoby, "Class and Environmental History: Lessons from 'The War in the Adirondacks'," *Environmental History* 2 (1997): 324-342

-Michael B. Smith, "'Silence, Miss Carson!' Science, Gender, and the Reception of *Silent Spring*," *Feminist Studies* 27 (2001): 733-752

*****RESPONSE PAPER 4 DUE*****

FEBRUARY 21-27 – WINTER STUDY BREAK – NO CLASS

Week 8: Ethical Theories – February 28-March 6

Lectures

8a) Utilitarianism and Consequentialism

8b) Deontology and Kantian ethics

8c) Virtue ethics

Readings

-Charles E. Harris Jr., "The Good Engineer: Giving Virtue Its Due in Engineering Ethics," *Science and Engineering Ethics* 14 (2008): 153-164

-Ayhan Sol and Halil Turan, "The Ethics of Earthquake Prediction," *Science and Engineering Ethics* 10 (2004): 655-666

Week 9: Urban planning in Halifax – March 7-13

MARCH 7 – LAST DAY TO DROP WINTER-TERM CLASSES

9a) *****Guest Lecture***** Jeffers Lennox – Defending Chebucto: Mi'kmaq Resilience and Resistance, 1749-1755

9b) The Halifax explosion

9c) Africville documentary

Readings

-Jeffers Lennox, "An Empire on Paper: The Founding of Halifax and Conceptions of Imperial Space, 1744-55," *The Canadian Historical Review* 88 (2007): 373-412

-Tina Loo, "Africville and the Dynamics of State Power in Postwar Canada," *Acadiensis* 39 (2010): 23-47

*****ETHICAL CASE STUDY DUE*****

Week 10: Ethics of engineering disasters – March 14-20

Lectures

10a) The History of the NASA Space Shuttle Program: The Background to Disaster

10b) The *Challenger* and *Columbia* disasters

10c) *****Guest Lecture***** Holly Hanes – Railway Bridge Disaster in South Maitland, Nova Scotia

Readings

- Richard O. Mason, “Lessons in Organizational Ethics from the *Columbia* Disaster: Can a Culture Be Lethal?”, *Organizational Dynamics* 33 (2004): 128-142
- George E. Thomas, “Piers of Midland Railway Bridge, Shubenacadie River, South Maitland, Nova Scotia,” *Journal of the Western Society of Engineers* 6 (1901) 158-173

*****RESPONSE PAPER 5 DUE*****

Week 11: New technological frontiers – March 21-27

*****Guest Lectures*****

- 11a) Tiffany Nichols – Big Physics During the Waning Years of the Cold War from the Perspective of the Laser Interferometer Gravitational-Wave Observatory (LIGO) and Its Precursors
- 11b) Ian Stewart – The Case of Solar Geoengineering
- 11c) Stephen Snobelen – Megastructures

Readings

- Allan Franklin, “Gravity Waves and Neutrinos: The Later Work of Joseph Weber,” *Perspectives on Science* 18 (2010): 119-151
- Pak-Hang Wong, “Confucian Environmental Ethics, Climate Engineering, and the ‘Playing God’ Argument,” *Zygon* 50 (2015): 28-41

*****RESPONSE REWRITE DUE*****

Week 12: Engineering and ethics today – March 28-April 6 (long week)

Lectures

- 12a) Autonomous technology
- 12b) Exam review

Readings

- Andreas Wolkenstein, “What Has the Trolley Dilemma Ever Done for Us (And What Will It Do in the Future)? On Some Recent Debates about the Ethics of Self-Driving Cars,” *Ethics and Information Technology* 20 (2018): 163-173

*****FINAL EXAM DUE*****

Please also consult Dalhousie’s “Important Dates” page for information about the university’s calendar, including add/drop dates: https://www.dal.ca/academics/important_dates.html.

Assignments

Academic Integrity Module: Before you begin any writing assignments for this course, it is strongly recommended that you complete Dalhousie’s Academic Integrity Module. The Academic Integrity Module will offer guidance about how to ensure the integrity of your work (including, but not limited to, the avoidance of plagiarism). It will take approximately 35-45 minutes to complete. You should complete the workshop prior to submitting your first response paper. Accordingly, the deadline for completing it is January 16 at 11:59 p.m. (the end of Week 2). If you complete the module by then, you will earn a **bonus of 3% to your final grade**. The

module is available from the beginning of the course, so you can complete it right away. You should be automatically enrolled in the module; it should appear on your Brightspace homepage. If you don't see it, or if you want more information about the module, please visit this page: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills/academic-integrity-module/academicintegritymodule0.html

Writing practice exercise: To get you more comfortable with the sorts of writing and analysis you'll do during the course, you'll complete a writing practice exercise as part of Week 2. Your TA will post a video on your tutorial message board to provide guidance on this exercise and to communicate their expectations regarding your written work in general. After you watch the video, you'll complete a series of questions about the assigned reading for Week 2. These questions will encourage you to summarize the text, to state the author's main argument, to identify the kinds of evidence used, and so on. The questions will be posted on Brightspace. This assignment will be due **at 11:59 pm on Sunday at the end of Week 2**. This assignment will be worth 5% of your final grade.

Response papers: Five times during the term, you'll write a short critical response paper on one of the assigned readings for the week. These papers should be around **500-600 words long** and they will be due during **Weeks 3, 5, 6, 7, and 10** at 11:59 pm on Sunday. **Late response papers will not be accepted.** Before you write your first response paper, please look over rubric on Brightspace to see how it will be graded. There's also a link to a website with tips on response paper. Please note that **you must write the response paper itself entirely on your own, without collaborating.** Each response paper will be worth 10% of your final grade.

During Week 11, you will have the opportunity to revise **one** response paper and submit it for regrading. You can choose to rewrite any of the response papers that you will have submitted by that point in the course.

Each response paper should consist a brief summary followed by a critical analysis of the author's argument. The paper should identify the main argument of the text, explain how the author supports it, and discuss whether you agree or disagree with it, and why. These papers must be written in complete sentences and paragraphs. Your TA will provide guidance and feedback on these papers; please pay close attention to their advice!

Tutorial participation: The class will be divided into small tutorial groups led by TAs. Tutorials will be asynchronous and will take place on a Brightspace discussion board accessible only to your tutorial group. During Week 2, you'll have a chance to meet your TA and fellow tutorial members (virtually), and you'll be able to ask your TA any questions you might have about the course, expectations for writing assignments, that week's readings, and so on. Beginning in **Week 3**, your TA will post several questions on the discussion board and moderate the subsequent discussion. Your grade will be based on regular participation in a meaningful and respectful discussion with your fellow tutorial members. The discussion questions for a given week will be open from **12:00 p.m. on Monday to 11:59 p.m. on Sunday**. Beginning in Week 3, you are expected to post **at least three** responses each week, either to the questions themselves or to other students' responses. These responses should be about **40-50 words long** on average. Your responses must be posted during the week when we're covering the topic in

question, which means between the time the questions are posted on Monday and **11:59 p.m. on Sunday**. Late posts will not be counted toward your participation grade. It is strongly advised that you complete the week's lectures and readings before participating in the tutorial. If your responses are not clearly related to the lecture or reading that is referred to in the discussion question, they won't count toward your participation grade. **Note: Weeks 1, 2, and 12 will not count toward your tutorial participation grade.** Tutorial participation will be worth 10% of your final grade.

Short video presentation: During Week 4, you will submit to a short video presentation to your tutorial group. Your video presentation can be up to **3 minutes** long and will provide a critical analysis of the readings for that week, which address the modern engineering profession. After a video has been posted, the other tutorial members can respond to the video with follow-up questions and comments.

These activities will be graded separately from your tutorial participation in other weeks, and they will be worth 5% of your grade. To get full marks, you need to submit a video **and** engage in a written discussion about other students' videos.

Ethical case study assignment: During Weeks 8 and 9, you will work on your ethical case study assignment. At the start of Week 8, you'll be given a short list of historical or hypothetical cases of engineers facing an ethical dilemma. After you pick one of these cases, you will analyze it in terms of one or more of the ethical theories that will be addressed during Week 8. Your case study assignment should be approximately **1000 words** long and should explain how you would apply the ethical theory that you consider most appropriate in this situation. Your TA will provide additional guidance. This assignment will be due by 11:59 p.m. on Sunday at the end of Week 9. **Before you submit the case study assignment, please look over rubric on Brightspace to see how it will be graded.** Late case study assignments will have their grades reduced by 3% per calendar day, up to a maximum of five days, after which they will not be accepted at all. This assignment will be worth 15% of your final grade.

Take-home exam: The final exam will be posted as part of the Week 12 module. On the exam, you will be required to write **two** essays based lecture material. You will have a range of questions from which to choose.

Your essays, which should be written in complete sentences and paragraphs, will ask you to synthesize material from various lectures. The main goals will be to demonstrate knowledge of lecture material and to formulate an argument about a trend or historical development that we will have traced throughout the course. You will have three days to write the exam; it will be due at the end of Week 12 (April 6 at 11:59 p.m.). **Late exams will not be accepted.** The exam will be worth 15% of your final grade.

Missed assignments: In the event that you cannot complete an assignment on time for medical reasons, please complete a Student Absence Declaration, described here, and submit it by email to your TA: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html. Accommodations can generally be made for medical issues, but you must notify your TA **prior to the deadline**.

Grading: Your work will be evaluated in accordance with the Dalhousie’s grading practices (https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html). Grades will follow the Dalhousie’s 4.30 grade scale (https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html).

Urkund: Please note that your assignments will be checked for originality via Urkund, the plagiarism detection tool build into Brightspace. This tool checks students’ submissions against a database of previously submitted assignments, alerting instructors and TAs in cases of excessive similarity. Students can choose, without penalty, to opt out of having their assignments checked by Urkund. (In that case, assignments will still be checked for excessive similarity, but without the use of software designed for this purpose.) If you want to opt out and have your work checked for originality via other methods, please notify your TA prior to the submission of your first assignment—i.e., Response Paper 1, which is due on January 23 at 11:59 p.m. For more information about academic integrity in relation to this course, see the statement on academic integrity under “University Policies and Statements”.

Technical issues: To get support for course or university technologies (Brightspace, Collaborate Ultra, email, Microsoft products), contact Information Technology Services (ITS) at support@dal.ca.

Learning and Support Resources: Please take note of the following services that are available to you as Dalhousie students:

General Academic Support – Advising

https://www.dal.ca/campus_life/academic-support/advising.html (Halifax)

<https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html> (Truro)

Student Health & Wellness Centre (including information on counselling):

https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre:

https://www.dal.ca/campus_life/communities/indigenous.html

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803):

<https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

Black Student Advising Centre:

https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre:

https://www.dal.ca/campus_life/international-centre.html

South House Sexual and Gender Resource Centre:

<https://southhousehalifax.ca/about/>

LGBTQ2SIA+ Collaborative:

<https://www.dal.ca/dept/hres/education-campaigns/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries:

<http://libraries.dal.ca>

Copyright Office:

<https://libraries.dal.ca/services/copyright-office.html>

eLearning website:

<https://www.dal.ca/dept/clt/e-learning.html>

Dalhousie Student Advocacy Services:

<https://www.dsu.ca/student-advocacy-service>

Dalhousie Ombudsperson:

https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services:

<https://www.dal.ca/dept/hres.html>

Writing Centre:

https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Academic Support – Study Skills / Tutoring:

https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

University Policies and Statements

Dalhousie courses are governed by the academic rules and regulations set forth in the University Calendar and the Senate. (<https://academiccalendar.dal.ca/catalog/viewcatalog.aspx>)

Academic integrity:

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Please note that the university takes breaches of academic honesty very seriously, and that offences can have lasting academic consequences far worse than failing an assignment. Academic dishonesty includes, but is not limited to, plagiarism. All work that you submit must be entirely your own. **Unacknowledged borrowing from any source, published or unpublished, will not be tolerated. Nor will any effort to portray someone else's work as your own. All work that you submit should have been complete entirely by you and no one else.** If you have any concerns about academic dishonesty, feel free to contact me or your TA. You can also consult the Academic Integrity page on the Dalhousie website: https://www.dal.ca/dept/university_secretariat/academic-integrity.html Finally, please remember that in the age of the Internet, it is very easy to detect plagiarism, so it is simply not worthwhile.

Accessibility:

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation.

If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion please contact:

- the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro.
- the Student Success Centre in Truro for courses offered by the Faculty of Agriculture (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

Your classrooms may contain accessible furniture and equipment. It is important that these items remain in place, undisturbed, so that students who require their use will be able to fully participate.

Conduct in the Classroom – Culture of Respect:

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Student Code of Conduct:

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. (Read more: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). (Read more: <http://www.dal.ca/cultureofrespect.html>)

Fair Dealing Policy:

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. (Read more: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

Originality Checking Software:

The course instructor may use Dalhousie’s approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work, and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. (Read more: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

Student Use of Course Materials:

These course materials are designed for use as part of the HIST 1971 course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g., uploading to a commercial third-party website) may lead to a violation of Copyright law.

Internationalization:

At Dalhousie, “thinking and acting globally” enhances the quality and impact of education, supporting learning that is “interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders.” <https://www.dal.ca/about-dal/internationalization.html>

University Policies and Programs:

Important Dates in the Academic Year (including add/drop dates)
http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol

https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policy

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process

https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy

https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program

<https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Territorial acknowledgement:

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

For more information about the purpose of territorial acknowledgements, or information about alternative territorial acknowledgements if your class is offered outside of Nova Scotia, please visit <https://native-land.ca/>.