

EACJ5007: Introduction to Engineering Education Research

Term: Fall 2022

Introduction

Engineering education research is a relatively new but growing discipline of research. Its focus is on the study and research of the learning around engineering, with particular focus (but not restricted to) the education of engineering student in universities. Areas of focus include: approaches to teaching and learning, course curricula, laboratories, educational objectives and challenges, such as equity diversity and inclusion. Besides engineering the field brings in research into learning, psychology and social sciences.

Instructor: Alan Steele

Contact: alan.steele@carleton.ca, Room ME4144

Delivery: In-person (see COVID-19 section below)

Website: Course Brightspace page

Meeting time: 4:05-5:25 TR, 7th Sept. 2022 - 9th Dec. 2022

Aims

The aim of this course is to introduce the current ideas and areas of study in engineering education research. This involves developing an understanding of the theoretical underpinnings to engineering education. As well as linking the theory to studies in different areas of engineering education.

Objectives

Students will be able to:

- Explain and discuss different aspects of the theoretical background to engineering education
- Apply the theoretical ideas and reflect on to their own engineering education experience.
- Conduct an examination of current engineering education research in an area of the student's interest. This includes:
 - Analyze current literature. Compare and discuss ideas of approaches.
 - Presenting their key findings of their own investigation.
 - Create a report with an evaluation and reflection on the findings.

Weekly Schedule

This is an approximate schedule, there may be slight adjustments in times or topic content.

| Week | Week Starting | Topic | Details |
|------|---------------|--|---|
| 0 | 5th Sept | Introduction to engineering education | Introduction to the course and the research area of engineering. Examples of recent studies (not detailed) |
| 1 | 12th Sept | Taxonomies | What is a taxonomy and why use one. Types of taxonomy. Bloom, Anderson, SOLO, Fink |
| 2 | 19th Sept | Learning models and learning styles | Kolb, Felder and Silverman, Schön. Learning approaches; surface, deep and strategic. |
| 3 | 26th Sept | Theoretical frameworks for learning | Frameworks include: Behaviourist, Cognitivist and Situated. Understanding the perspectives in reported studies. |
| 4 | 3rd Oct | Examples of engineering education. Preparation for case studies | A series of case studies will be investigated by students and presented in the class (in addition to their own mini-project). Reports can be from observation in the class, an analysis of a paper or a combination of those. |
| 5 | 10th Oct | Scholarship of Teaching and Learning (SOTL) and Engineering Education Research | What is SOTL and how does it fit with engineering education research? Human ethics for research. |
| 6 | 17th Oct | Case studies: Classrooms | Examples could be: looking at peer instruction; development of classroom instruction in the age of mobile devices; online 'classrooms'; problem analysis sessions. co-operative learning. |
| 7 | 24th Oct | No classes | |
| 7 | 31st Oct | Case Studies: Laboratories | Examples could be: Types of laboratory experience; benefits of individual to group laboratories; the laboratory environment; remote access and virtual laboratories. |
| 8 | 7th Nov | Case Studies: Project work | Examples could be: capstone projects; first year projects; mini-projects within a course; group project issues and concerns; evaluation. |
| 9 | 14th Nov | Case Studies: Social and professional aspects of engineering education | Ethical issues; Indigenous aspects; accreditation; diversity. |
| 10 | 21st Nov | Assessment | Consideration of the area of assessment. |
| 11 | 28th Nov | Student presentations and discussion | Mini-projects would have been decided by week 6. This is either oral or poster demonstration of the findings. |

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|----|---------|---|---|
| 12 | 5th Dec | Future areas of developments and summary. | Selection of some current and potential future direction in engineering education. Summary of the course. |
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Important Dates in the Term

These dates are included here for convenience and you should always check <https://calendar.carleton.ca/academicyear/> in case of any changes

- *5th September 2022*. Statutory holiday. University closed.
- *6th September 2022*. Academic orientation.
- *7th September 2022*. Fall term begins. Fall and fall/winter classes begin.
- *30th September 2022*. Last day to withdraw from fall term and fall/winter courses with a full fee adjustment. Withdrawals after this date will result in a permanent notation of WDN on the official transcript.
- *10th October 2022*. Statutory holiday. University closed.
- *24th-28th October 2022*. Fall break, no classes.
- *11th November 2022*. Last day to request Formal Examination Accommodation Forms for December examinations to the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfil accommodation requests received after the specified deadlines.
- *1st December 2022*. Last day for receipt of applications from potential winter (February) graduates. Last day for graduate students to submit their supervisor-approved thesis, in examinable form to the department.
- *9th December 2022*. Fall term ends. Last day of fall term classes. Classes follow a Monday schedule. Last day for take home examinations to be assigned, with the exception of those conforming to the examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar. Last day for academic withdrawal from fall term courses. Last day for handing in term work and the last day that can be specified by a course instructor as a due date for term work for fall term courses.
- *10th-22nd December 2022*. Final examinations in fall term courses and mid-term examinations in fall/winter courses may be held.
- *25th December 2022*. University closed.

Office Hours

I will be available for office hours at **noon on Tuesday and Wednesday** (room ME4144). This could be adjusted if we see it beneficial to adjust this. If you need to meet at an alternative time then please contact me for an appointment.

Texts and Learning Resources

There is no set text that you have to buy but there will be references made to various books and papers. Wherever possible I will try and select material that is available electronically through Carleton's Library website or has openly available. As this course looks at an active area of research and there is a project required then there will be a significant amount of

searching in the literature by you. Again, the University's Library website will allow access to many sources of information.

One resources that is worth noting though is:

"Cambridge Handbook of Engineering Education Research", A. Johri and B. Olds (eds.), Cambridge University Press, (2014).

This is available through the library.

Assessment

The set dates are approximate and may vary depending on factors like progress and workload.

1. Assignment 1: Value 10% [Set week 2]
2. Assignment 2: Theory 15% [Set week 4]
3. Participation in Discussions 15% [Due before week 12]
4. Project 60% (composed of the elements below)
 - Proposal (15%) [Set week 6]
 - Update reflection (15%) [Set week 8]
 - Peer review of colleague's draft (15%) [Set week 9]
 - Video presentation (15%) [Due week 11]
 - Final report (40%) [Due week 12]

Academic Accommodations

"Carleton University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals.

Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University."

From <https://students.carleton.ca/course-outline/>

Further details on accommodations can be found at <https://students.carleton.ca/course-outline/>

COVID-19

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's [symptom reporting protocols](#).

Masks: Carleton has paused the [COVID-19 Mask Policy](#), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in [cuScreen](#) as soon as

possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.