EACJ5007: Introduction to Engineering Education Research

Term: Fall 2021

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 discipline bring in research into learning, psychology and social sciences.

Instructor: Alan Steele alan.steele@carleton.ca

Delivery: Online Synchronous

Website: Course Brightspace page

Meeting time: 8:35-9:55 MW, Sep 08, 2021 - Dec 10, 2021

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	Starting	Topic	Details
0	6th Sept	Introduction to engineering education	Introduction to the course and the research area of engineering. Examples of recent studies (not detailed)

1	13th Sept	Taxonomies	What is a taxonomy and why use one. Types of taxonomy. Bloom, Anderson, SOLO, Fink
2	20th Sept	Learning models and learning styles	Kolb, Felder and Silverman, Schön. Learning approaches; surface, deep and strategic.
3	27th Sept	Theoretical frameworks for learning	Frameworks include: Behaviourist, Cognitivist and Situated. Understanding the perspectives in reported studies.
4	4th 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	11th 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	18th 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	25th Oct	No classes	
7	1st Nov	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	8th 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	15th Nov	Case Studies: Social and professional aspects of engineering education	Ethical issues; Indigenous aspects; accreditation; diversity.
10	22nd Nov	Assessment	Examination of the area of assessment.
11	29th Nov	Student presentations and discussion	Mini-projects would have been decided by week 6. This is either oral or poster demonstration of the findings.
12	6th Dec	Future areas of developments and summary.	Selection of some current and potential future direction in engineering education. Summary of the course.

Important Dates in the Term

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

- *6th September 2021*. Statutory holiday. University closed.
- *8th September 2021.* Fall term begins. Fall and fall/winter classes begin.
- 30th September 2021. 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.
- *11th October 2021.* Statutory holiday. University closed.
- *25th-29th October 2021*. Fall break, no classes.
- *12th November 2021*. 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 2021*. 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.
- *10th December 2021.* 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.
- *11th-23rd December 2021*. Final examinations in fall term courses and mid-term examinations in fall/winter courses may be held.
- *25th December 2021*. University closed.

Office Hours

I will be available for office hours at **4pm (Ottawa Time) on Monday and Wednesday**. This could be adjusted if we see it beneficial to adjust this, for example due to people's time zones or TAing duties. 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%
    - ☐ 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]

Accommodation

"The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable)."

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