



Carleton
UNIVERSITY

Department of
**Systems and
Computer Engineering**

SYSC 4201

Ethics, Research Methods and Standards for Biomedical Engineering

Calendar description

Ethical theories, ethical decision-making, biomedical research ethics: informed consent, confidentiality, privacy, research ethics boards; research methods: hypothesis formulation, data collection, sampling bias, experimental design, statistical literacy; regulations for design, manufacture, certification of medical devices; impact of technology and research (social, political, financial).

Includes: Experiential Learning Activity.

Lectures three hours a week, problem analysis one and a half hours per week.

<http://calendar.carleton.ca/undergrad/courses/SYSC/>

Prerequisites

ELEC 3605 or SYSC 3203.

Prior knowledge

Students should have knowledge of:

- Foundation in mathematics including calculus, algebra, and probability.
- Foundation in written and oral communication skills.

Course objectives

The objectives of this course are for students to:

- Gain an understanding about normative ethics and applied ethics through a case study analysis.
- Gain an understanding about research ethics and the research process through engaging in a research project.
- Increase their statistical literacy.
- Gain an understanding about medical device regulations.
- Discuss issues regarding biomedical engineering technology and society.

List of topics

- Ethical theories
- Common versus particular moralities

- Ethical decision making
- Moral status
- History of research ethics
- Research involving humans
- Informed consent
- Confidentiality and privacy
- Research ethics
- Research methods
- Proposal feedback sessions
- Introduction to statistics
- Plagiarism
- Graphs
- Bivariate data
- Probability
- Receiver Operating Characteristic Curve
- Research Design
- Normal Distribution
- Sampling Distributions
- Estimation
- Hypothesis testing
- Type I and Type II Errors
- Testing Means
- Medical Device Regulations (Health Canada)
- Medical Device Evaluation (Health Canada)
- Technology and society

Learning outcomes

By the end of this course, students should be able to:

- Justify a course of action in an ethical dilemma.
- Evaluate the ethics of research involving humans.
- Explain the purpose and results of statistical analysis, including common misinterpretation and misapplication of statistics.
- Describe the regulatory process for medical devices.
- Discuss the impact of biomedical technology with a multidisciplinary audience.
- Design an appropriate research methodology to investigate a research question.

Graduate Attributes (GAs)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. Activities related to the learning outcomes listed above are measured throughout the course and are part of the department's continual improvement process. Graduate attribute measurements will not be taken into consideration in determining a student's grade in the course. For more information, please visit: <https://engineerscanada.ca/>.

Graduate Attribute	Learning outcome(s)
3.1: Investigation: Applied: Complex problem assessment	2, 4
3.2: Investigation: Applied: Design of experiment	4
3.3: Investigation: Applied: Experimental procedure	4
3.4: Investigation: Applied: Data reduction methods and results	3, 4
3.5: Investigation: Applied: Interpretation of data (synthesis) and discussion	3, 4
6.1: Individual and Team Work: Applied: Personal and group time management	6
6.2: Individual and Team Work: Applied: Group culture; group dynamics	6
6.3: Individual and Team Work: Applied: Leadership: initiative and mentoring, areas of expertise, and interdisciplinary teams	6
7.1: Communication Skills: Applied: Instructions	6
7.2: Communication Skills: Applied: Professional documents: writing, design notes, drawings, attributions, and references	6
7.3: Communication Skills: Applied: Oral and written presentations	1, 2, 6
7.4: Communication Skills: Applied: Technical reading	6
7.5: Communication Skills: Applied: Note-taking skills	6
10.1: Ethics and Equity: Developed: Equitable practice	2
10.2: Ethics and Equity: Developed: Professional, accountable and ethical conduct	1, 2

Accreditation Units (AUs)

For more information about Accreditation Units, please visit:

<https://engineerscanada.ca/>.

The course has a total of 46 AUs, divided into:

- Complementary Studies: 60%
- Engineering Science: 40%

Instructor and TA contact

Specific to course offering (tbd)

Textbook (or other resources)

Specific to course offering (tbd)

Evaluation and grading scheme

Specific to course offering (tbd)

Breakdown of course requirements

Specific to course offering (tbd)

Tentative week-by-week breakdown

Specific to course offering (tbd)

General regulations

Specific to course offering (tbd)