



MEMORANDUM

To: Executive Committee of Faculty Council (February 7, 2023)
Faculty Council (February 27, 2023)

From: Professor Dionne Aleman
Associate Dean, Cross-Disciplinary Programs

Date: February 3, 2023; revised February 13, 2023

Re: Proposed Certificate in Justice, Equity, Diversity and Inclusion in Engineering

REPORT CLASSIFICATION

This is a major policy matter that will be considered by the Executive Committee for endorsement and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

BACKGROUND

Over the last few years, core and elective courses within the engineering curricula have been built and developed to keep pace with the broadening and evolving knowledge on the value of social and humanistic considerations within engineering, and the standards of what produces innovative, equitable and better-functioning technology and organizations.

The concept of more curricular acknowledgement and integration of justice, equity, diversity and inclusion within FASE has been raised by the Engineering Society and the Engineering Equity, Diversity and Inclusion Action Group (EEDIAG).

PROPOSED

A Certificate in Justice, Equity, Diversity and Inclusion (JEDI) in Engineering is being proposed to scaffold these transdisciplinary courses and provide undergraduate students in the Core-8 engineering programs and Engineering Science with a deeper knowledge of the social impact and responsibility of engineering decisions and actions.

CONSULTATIONS

The proposal for the JEDI certificate was developed with significant contributions and support from the former FASE Associate Director, Access & Inclusive Pedagogy. Additional development was guided by the Associate Dean, Cross-Disciplinary Programs; Assistant Dean, Diversity,

Inclusion and Professionalism; Assistant Director, Cross-Disciplinary Programs Office; Director, ILEAD; and Director, ISTEP.

Consultations were held with key stakeholders, such as the President and Equity and Inclusion Director of the Engineering Society; Engineering Equity, Diversity and Inclusion Action Group (EEDIAG); Engineers without Borders (EWB); National Society of Black Engineers (NSBE) Executive Leadership; and the Faculty's Inclusion, Diversity, Equity Advisory (IDEA) Committee.

The Critical Studies in Equity and Solidarity Program at New College; the Institute for the History & Philosophy of Science & Technology; and the Women and Gender Studies Institute were also consulted regarding the inclusion of their courses, as was the FAS Dean's Office.

RECOMMENDATION FOR COUNCIL

THAT a Certificate in Justice, Equity, Diversity and Inclusion in Engineering, as described in Report 3732 Revised, be approved effective September 2023.

University of Toronto Proposal to Create a Certificate in Conjunction With an Undergraduate Program

For-credit undergraduate certificates (category 2) are offered in conjunction with an existing undergraduate degree program. They are governed by the [Policy for Certificates \(For-Credit and Not-For-Credit\)](#) and follow the protocols for approval and closure for [minor modifications](#) under the [University of Toronto Quality Assurance Process \(UTQAP\)](#).

Proposed certificate name:	Certificate in Justice, Equity, Diversity and Inclusion in Engineering
Undergraduate degree(s) the certificate will be offered in conjunction with:	Any Engineering Bachelor's Degree (BASc or BASc in Engineering Science)
Faculty/academic division:	Faculty of Applied Science & Engineering (FASE)
Academic unit:	Cross-Disciplinary Programs Office, FASE
Dean's Office contacts:	Dionne Aleman, Associate Dean, Cross-Disciplinary Programs Marisa Sterling, Assistant Dean, Diversity, Inclusion and Professionalism Caroline Ziegler, Faculty Governance and Programs Officer
Version date:	February 13, 2023

1 Summary

Engineering is socio-technical in nature – a problem-solving approach which both exerts and is influenced by social forces. Over the last few years, core and elective courses within the engineering curricula have been built and developed to keep pace with the broadening and evolving knowledge on the value of social and humanistic considerations within engineering and the standards of what produces innovative, equitable and better-functioning technology and organizations. A certificate in justice, equity, diversity and inclusion (JEDI) in engineering is being proposed to scaffold these

transdisciplinary courses and provide undergraduate students in the Core-8 engineering programs and Engineering Science with a deeper knowledge of the social impact and responsibility of engineering decisions and actions. This certificate further incorporates EDI elements into the engineering curriculum, and follows current direction from the Vice Provost Innovations in Undergraduate Education to embed EDI principles in pedagogy, curriculum and program design.

This certificate was developed with significant contributions and support from Mikhail Burke, Associate Director, Access & Inclusive Pedagogy in FASE during the development of this proposal.

2 Effective Date

September 1, 2023

3 Academic Rationale

U of T Engineering's mission includes the ambition to lead in transformative teaching and learning through creativity, multidisciplinary collaboration, and innovation, and as a result, to develop the next generation of makers, innovators and global engineering leaders.

Within both social and academic arenas, there is a continued evolution of the engineering ethos. A growing body of research correlates diversity with excellence in innovation, and sustainability with acting socially responsibility. Hence, discourse on the social considerations within engineering has expanded beyond adherence to ethical codes to include values such justice, equity, diversity and inclusion (JEDI).

This recognition has led to the broadening of ideals that influence who engages in engineering and how the engineering skill-set is leveraged. Considerations for diverse representation, inclusive teams and stakeholder engagement, equitable and just access and design, are being held in higher regard within the spaces where engineers work, research and/or practice. The JEDI values are being quickly recognized within post-secondary institutions, industry and the corporate world, research spaces and the profession's regulatory bodies, with more institutions and businesses explicitly integrating JEDI considerations into their vision and practice. Therefore, there is a growing necessity and demand to have engineers, managers, researchers, and

instructors who are versed in JEDI principles and leverage that knowledge to positively influence the development and impact of their work.

There is an increasing number of existing engineering courses that have a heavy focus on social and/or ethical considerations within engineering and how technology influences and is influenced by society (and its constituents). There are also several courses within relevant departments within the Faculty of Arts & Science that would provide students opportunities to learn foundational knowledge within equity-centric schemas and contextualize technology and society from a humanities perspective. Therefore, this certificate provides a scaffolded opportunity for students to engage learning about JEDI principles and social implications to be applied in engineering contexts.

4 Need and Demand

Considering the truly transdisciplinary nature of JEDI considerations, this certificate will be open to undergraduate students in any engineering discipline.

Completion of the certificate will depend on the availability of, and student interest in, the engineering courses, TEP-coded electives and FAS electives connected to the certificate.

Enrolment spaces in the FAS elective courses will be secured in agreement with the departments and programs and the FAS/FASE Interdivisional Teaching Agreement. The Institute for the History & Philosophy of Science & Technology, the Women and Gender Studies Institute, and the Critical Studies in Equity and Solidarity Program at New College have been consulted and are supportive of the inclusion of these courses and the creation of dedicated enrolment spaces.

5 Admission Requirements

There are no admission requirements for engineering certificate programs. Successful completion of the certificate is recorded on the student's academic transcript as part of their undergraduate program. The certificate is open to all undergraduate students in any engineering discipline.

6 Program Requirements

The certificate consists of three half-course requirements, totaling 1.5 FCE. The courses can be completed as part of the degree requirements (core or CS/HSS electives) in a student's program or taken as extra credits (not counting towards their degree requirements).

Eligible courses for the certificate fall into three broad categories: equity and justice; technology and society; and ethics and broader considerations. Students are required to take one course from each category and no more than two of the three courses can have a non-FASE affiliated course code.

Equity and justice

- TEP324H1: Engineering and Social Justice (FASE)
- WGS273H1: Gender and Environmental (In)Justice (FAS)
- WGS390H1: Land-ing: Indigenous and Black Futurist Spaces (FAS)
- CSE240H1: Introduction to Critical Equity and Solidarity Studies (FAS/New College)

Technology and society

- CME259H1: Technology in Society and the Biosphere I (FASE)
- ESC203H1: Engineering and Society (FASE)
- HPS202H1: Technology in the Modern World (FAS)
- HPS205H1: Science, Technology, and Empire (FAS)

Ethics and broader considerations

- TEP447H1: The Art of Ethical & Equitable Decision Making in Engineering (FASE)
- HPS200H1: Science and Values (FAS)
- TEP449H1: Intercultural Communication and Leadership (FASE)
- TEP445H1: The Power of Story: Discovering Your Leadership Narrative (FASE)

The Faculty of Arts & Science courses listed above represent courses where we have agreement to offer reserved spaces for Engineering students. Within FAS there are many other courses that connect to these concepts. If a student is enrolled in a course that they believe is relevant to this topic, they may make a request for that course to count toward the certificate on a case-by-case basis.

Note: Previously circulated versions of this proposal included MSE490 as a possible course. However, it was removed due to it having a 0.25 credit weight, which would not allow students to achieve the necessary total 1.5 credit weight for a certificate.

7 Consultation

The concept of more curricular acknowledgement and integration of JEDI consideration within FASE has been raised by the Engineering Society and within the Engineering Equity, Diversity and Inclusion Action Group (EEDIAG). Based on this advocacy, initial consultation and development of this certification was guided by:

- Associate Director, Access & Inclusive Pedagogy
- Associate Dean, Cross-Disciplinary Programs
- Assistant Dean, Diversity, Inclusion and Professionalism
- Assistant Director, Cross-Disciplinary Programs Office
- Director, ILEAD
- Director, ISTEP

Further consultation on the proposal was then mediated through sharing and discussing the rationale and proposed program requirements with key stakeholders, including:

- President and Equity and Inclusion Director of the Engineering Society
- Student, staff and faculty membership of the EEDIAG
- Engineers without Borders (EWB) and National Society of Black Engineers (NSBE) Executive Leadership (as draftees of “Report on Course Updates to Include Explicit Equity Content”)
- Inclusion, Diversity, Equity Advisory (IDEA) Committee

The following FAS academic programs were also consulted, as was the FAS Dean’s Office:

- Critical Studies in Equity and Solidarity Program at New College
- Institute for the History & Philosophy of Science & Technology
- Women and Gender Studies Institute

8 Resources

Administration of the certificate program will be managed through the Faculty of Applied Science & Engineering’s Cross-Disciplinary Programs Office as part of its regular activities with guidance (where deemed appropriate) from the Office of Diversity, Inclusion and Professionalism.

Spaces in the existing FAS courses in the course requirements will be included in FASE’s annual Inter-Divisional Teaching request. The aforementioned engineering electives already exist in other departments within their regular budgets.

9 Oversight & Accountability: Review

Minors and certificates in the Faculty of Applied Science & Engineering are subject to periodic review in conjunction with the review of the Cross-Disciplinary Programs Office.

10 Summary of Process Steps & Approvals

Steps	Dates
Development/consultation within CDPO	Summer 2022
Endorsement by partnering Faculties/Divisions	October 2022
Endorsement by Undergraduate Curriculum Committee	January 2023
Consultation with Dean’s Office	January 2023
Consultation with VPAP and FAS Dean’s Office	January-February 2023
Endorsement of Executive Committee of FASE Council	February 7, 2023
Approval of FASE Council	February 27, 2023

Appendix A: Proposed Learning Outcomes and Undergraduate Degree-Level Expectations

The Faculty of Applied Science & Engineering aims to provide all of its undergraduate students with an education that will encourage them to be leaders in society in developing solutions to its most pressing problems. In order to achieve this goal, each graduate will have achieved the Undergraduate Degree-Level Expectations for the BASc described below.

Engineering minors and certificates are designed to recognize students for focusing their degree-program electives in a particular area of study. They are optional structures above and beyond a student's degree requirements and are therefore enhancements to existing rigorous degree-level expectations for engineering programs.

The certificate is structured to scaffold existing learning opportunities at the intersection of engineering and social considerations. In addition to the following Undergraduate Degree-Level Expectations, upon completion of the certificate program, students will be able to:

1. Contextualize the importance of key justice, equity, diversity and inclusion concepts within engineering and design.
2. Navigate the interconnectedness of social and technological development.
3. Create an environment conducive for the engagement of others within engineering contexts.

Degree Level Expectations for Graduates Receiving the Degree of Bachelor of Applied Science

Faculty of Applied Science and Engineering University of Toronto

1. Degree Learning Objectives and Requirements

Overall Learning Objectives

The Faculty of Applied Science and Engineering aims to provide all of its undergraduate students with an education that will allow them to be leaders in society in developing solutions to its most pressing problems. Our graduates will be able and inspired to:

- be leading practitioners of engineering and engineering design
- be known for their technical literacy as well as their knowledge of mathematics and the basic sciences and the role of technology in society
- be able to formulate and solve problems in complex systems independently and in teams
- pursue independent lifelong learning within their field of study and more broadly
- be prepared for careers, including graduate programs, that build upon their advanced technical knowledge
- participate meaningfully as leaders in society

In order to achieve this, each graduate will have achieved the following general learning objectives:

- a. Depth of knowledge that cultivates critical understanding and intellectual rigour in at least one engineering discipline.
- b. Competencies in learning and applying knowledge to solve problems facing society and that are fundamental to responsible and effective participation in the workplace, in the community, in scholarly activity, and in personal life:
 - i. Critical and Creative Thinking
 - ii. Oral and Written Communication
 - iii. Quantitative Reasoning
 - iv. Teamwork
 - v. Information Literacy
 - vi. Ethical Thinking and Decision-Making
- c. Breadth of knowledge across mathematics, basic sciences, engineering sciences, engineering economics and engineering design that cut across the engineering disciplines and across a range of nontechnical areas including the humanities and social sciences and an awareness of the impact of technology on society.
- d. Integration of skills and knowledge developed in a student's course of study through a capstone experience in the upper years.

Requirements to Graduate

In order to graduate with a BAsC degree, each student in the Faculty of Applied Science and Engineering will have completed a full undergraduate program as outlined in the Faculty Calendar within nine calendar years of first registration, exclusive of mandatory absences from his/her program. Current programs include: Chemical, Civil, Computer, Electrical, Industrial, Mineral, Materials and Mechanical Engineering as well as the BAsC in Engineering Science.

The practice of engineering is regulated, by statute, in all Canadian provinces and territories. To become a Professional Engineer (P.Eng.), an individual must satisfy the requirements of the licensing bodies.

These requirements include a degree from an accredited program, successful completion of a professional practice examination in engineering law and ethics, and suitable experience. At present, all programs in the Faculty of Applied Science and Engineering are accredited and evaluated regularly by the Canadian Engineering Accreditation Board (CEAB) of the Canadian Council of Professional Engineers. Therefore, graduation from the Faculty may lead to registration in the provincial or territorial licensing organization, in accordance with licence requirements. No student will be permitted to graduate who does not meet these requirements.

The criteria set out by the CEAB are designed to ensure that each graduate has a foundation in Mathematics and Basic Sciences, a broad preparation in Engineering Sciences and Engineering Design and an exposure to non-technical subjects (complementary studies) that complement the technical aspects of the curriculum. Basic Sciences must include physics and chemistry and also may include elements of life sciences and earth sciences; they impart an understanding of natural phenomena. Engineering Sciences normally involve Mathematics and Basic Sciences but carry knowledge further to creative applications. Complementary Studies include the humanities, social sciences, arts, management, engineering economics and communication skills.

Each program in the Faculty consists of a technical component and complementary studies component. The curriculum for students in their early years forms a basis in the fundamental subjects prior to subsequent specialization in the various engineering disciplines. Students are able to choose from a range of technical electives in their senior years. In the senior years, all programs contain a capstone experience through a design project, which integrates their skills and knowledge and provides students with the opportunity to carry out original work in their chosen fields of study.

There are a set of common requirements, described below, that cut across all programs in the following categories: Coursework, Promotion, English Proficiency, and Practical Experience. In this context, a course is defined as one half-course equivalent, which may consist of a half course ("S", "F" or "H") or half of a full-year "Y" course.

1. **Coursework:** Each program will have courses that provide the following:
 - a. Complementary Studies Electives
 - b. A basic knowledge of Engineering Economics
 - c. Technical Electives

- d. Courses with substantial design content in Years 1, 2 and/or 3
 - e. Capstone course(s) in Years 3 and/or 4 with strong integrative, design and independent work elements
 - f. Across all four years, programs will provide sufficient opportunities for the development of professional awareness and practice.
2. **Promotion:** All undergraduate programs will consist of eight Fall and Winter Sessions taken in order.
- a. To gain credit for a session a student must:
 - i. satisfy the academic regulations to proceed to the succeeding session as described in the calendar and
 - ii. not be subsequently required to repeat the session for which credit is to be gained, and
 - iii. achieve a course mark of 50% or greater in every course taken as part of the academic load in a session, and
 - iv. not have any outstanding designations of 'standing deferred', 'incomplete' or 'No Grade Available' for any course in any session.
 - b. To be eligible to graduate, each student must attain a weighted Session Average of 60% or greater in the final session of their program. Any student who does not achieve a weighted Session Average of 60% in their final session (4W), but has attained a weighted Session Average that allows them to proceed to the next session on probation, shall repeat the final session and achieve a weighted Session Average of 60% or greater to graduate.
3. **English Proficiency:** Each student must show an ability to write English coherently and correctly. Every student will also take at least one course that includes a written communication component within their curriculum. Satisfactory completion of the course or courses is required for graduation.
4. **Practical Experience:** The Faculty requires that all students complete a minimum of 600 hours of practical work before graduation.

2. Degree Level Expectations for the Bachelor of Applied Science

Depth and Breadth of Knowledge

The Faculty ensures that a student has mastered a body of knowledge with appropriate depth by requiring that each student completes the requirements of one of the degree Programs of Study (POST) as described in the Faculty Calendar. The curriculum for students in First Year forms a common basis in the fundamental subjects, including the natural sciences and mathematics, prior to a subsequent specialization in the various engineering disciplines. Each program consists of a technical component and a complementary studies component.

Critical analysis and thinking and analytical skills are emphasized through the student's exposure to an increasingly sophisticated understanding of their program of study. Specialization within the discipline is developed through technical electives taken in the 3rd and 4th years of study. A detailed knowledge of and experience in design is ensured through

the Design Course requirements, beginning with courses in the first three years as well as the Capstone course(s) in each program. Opportunity to further develop these skills is provided through a research thesis that is available in most POSTs.

The Faculty assures that students have breadth of knowledge in a number of ways. Breadth across engineering is assured through a First Year of study that prepares a student for any of the programs of study. Breadth beyond engineering is developed through the Complementary Studies Electives as well as the Engineering Economics requirement.

Knowledge of Methodologies

Every POST has requirements which demonstrates a student's understanding of the methods of engineering design. Students in all engineering programs must successfully complete courses with substantial design in their first three years and a Capstone design course in their senior years. These courses require students to evaluate the appropriateness of various approaches to analyze and solve the design problem and also to devise and sustain arguments for their design. In most POSTs, students have the opportunity to participate in a research thesis course that familiarizes them with the specific methodologies currently in use in the development of knowledge in their discipline.

Application of Knowledge

The application of science and mathematics to solve problems is fundamental to all programs in Engineering and therefore is required in many of the courses within all POST. A minimum level of instruction in Engineering Science and Engineering Design is required, both of which directly involve the application of knowledge.

Communication Skills

The Faculty requires students to communicate information, arguments and analysis accurately and reliably, orally and in writing, to specialist and non-specialists audiences. The requirement for courses with substantial engineering design that are required across all programs require a series of technical reports and presentations with direct involvement with our Engineering Communication Program. In addition, our Capstone Design Courses and research theses all involve a written report and most involve oral presentations. The course requirements for instruction in Complementary Studies also adds to the education our students receive in communication skills. Also, the English Proficiency requirement insures a minimum level of writing ability for all graduates.

Awareness of Limits of Knowledge

Each POST develops, through a sequence of courses starting at the 100-series or 200-series and culminating at the 300-series or 400-series or 500-series of courses, an understanding of a discipline as it is currently appreciated by educators who are at the same time involved in original scholarship in the subject area. The course content at the upper series level is designed, in part, to provide students with an appreciation of the uncertainties, ambiguities and limitations of knowledge in the specific area.

Autonomy and Professional Capacity

The development of an awareness and understanding of professional practice is required for all POST. The required design courses require students to work in teams and also accept responsibility for their own contributions. Students are required to make their own decisions for their own learning through selection of their technical and nontechnical electives. Finally, in completing their course requirements, the Faculty expects strict adherence by students to the Code of Behaviour on Academic Matters, which requires students to not tolerate or encourage the creation of an environment of cheating, misrepresentation or unfairness.

3. Other Degree Level Expectations

The Faculty requires all students to have developed competency in several areas of learning and applying knowledge not identified explicitly in the previous sections. In particular, the Faculty requires students to have developed competencies in quantitative reasoning and in information literacy.

Quantitative reasoning is considered the ability to identify, assemble and interpret quantitative information and make and test hypotheses based on such data. Development of this competency is an explicit part of all POSTs offered by the Faculty.

The Faculty requires all students to develop an advanced understanding of how to obtain information, manipulate and evaluate it and bring diverse sources together to develop a comprehensive understanding of specific issues, solve problems or apply the scientific method to create further knowledge in the discipline. These advanced information literacy skills are developed through the studies in their concentration(s) and are demonstrated in the advanced courses required in each POST.

Appendix B: Proposed Calendar Copy

Course Requirements for the Certificate in Justice, Equity, Diversity and Inclusion

Engineering is socio-technical in nature - a technical process which both exerts and is influenced by social forces. Engineers are agents of social change and a strong understanding and ability to facilitate social considerations within engineering, guided by underlying values of justice, equity, diversity and inclusion (JEDI), is in greater demand than ever before. The value of these ideals is being quickly recognized within post-secondary institutions, industry and the corporate world, research spaces and the profession's regulatory bodies, with more institutions and businesses explicitly integrating JEDI considerations into their vision and practices.

All undergraduate Engineering students are eligible to participate in this certificate program. Students who complete the requirements of the Certificate will receive a notation on their transcript upon graduation.

Eligible courses for the certificate fall into 3 broad categories: Equity & Justice, Technology & Society, Ethics and/or Broader Considerations. The requirements for the Certificate are the successful completion of 1 course from each category and no more than 2 of the 3 courses can have a non-FASE affiliated course code:

Equity and justice

- TEP324H1: Engineering and Social Justice
- WGS273H1: Gender and Environmental (In)Justice
- WGS390H1: Land-ing: Indigenous and Black Futurist Spaces
- CSE240H1: Introduction to Critical Equity and Solidarity Studies

Technology and society

- CME259H1: Technology in Society and the Biosphere I
- ESC203H1: Engineering and Society
- HPS202H1: Technology in the Modern World
- HPS205H1: Science, Technology, and Empire

Ethics and broader considerations

- TEP447H1: The Art of Ethical & Equitable Decision Making in Engineering
- HPS200H1: Science and Values
- TEP449H1: Intercultural Communication and Leadership
- TEP445H1: The Power of Story: Discovering Your Leadership Narrative

The Faculty of Arts and Science courses listed above represent courses where we have agreement to offer reserved spaces for Engineering students. Within FAS there are many other courses that connect to these concepts. If a student is enrolled in a course that they believe is relevant to this topic, they may make a request for that course to count toward the certificate on a case-by-case basis.

Notes:

Availability of the courses for timetabling purposes is not guaranteed; the onus is on the student to ensure compatibility with their timetable. Students must secure approval from their home department before selecting any elective outside their departmental approved list.

Courses	Term	Lec	Lab	Tut	Wgt
Fall Courses					
CSE240H1 - Introduction to Critical Equity and Solidarity Studies	F	2	-	1	0.5
ESC203H1 - Engineering and Society	F	2	-	2	0.5
HPS200H1 - Science and Values	F/S	2	-	-	0.5
HPS202H1 - Technology in the Modern World	F	2	-	1	0.5
TEP445H1 - The Power of Story: Discovering Your Leadership Narrative	F/S	2	-	1	0.5
TEP447H1 – The Art of Ethical & Equitable Decision Making in Engineering	F	3	-	-	0.5
WGS273H1 - Gender and Environmental (In)Justice	F	2	-	1	0.5
Winter Courses					
CME259H1 - Technology in Society and the Biosphere I	S	3	-	1	0.5
HPS200H1 - Science and Values	F/S	2	-	-	0.5
HPS205H1 - Science, Technology, and Empire	S	2	-	1	0.5
TEP324H1 – Engineering and Social Justice	S	2	-	2	0.5
TEP445H1 - The Power of Story: Discovering Your Leadership Narrative	F/S	2	-	1	0.5
TEP449H1 – Intercultural Communication and Leadership	S	2	-	2	0.5
WGS390H1 - Land-ing: Indigenous and Black Futurist Spaces	S	2	-	-	0.5