Final Assessment Report
Nanotechnology Engineering (BASc)
July 2023

Executive Summary

External reviewers found that the Nanotechnology Engineering program (BASc) delivered by the Department of Chemical Engineering and the Department of Electrical and Computer Engineering in the Faculty of Engineering, and the Department of Chemistry in the Faculty of Science was in good standing.

"The NE program has been developed and successfully delivered as a collaboration through three departments. The curriculum is well structured to educate students with necessary fundamental and applied knowledge in the key areas of nanotechnology and provide students with the skills necessary to address key technological challenges. Experiential learning is the core feature of the program, which is obtained through extensive laboratory experience and mandatory Coop term placements."

A total of 14 recommendations were provided by the reviewers, regarding administration, teaching, and engagement/outreach education at the program level; formal budget allocation, teaching, and admissions at the faculty level; and administration at the university level. In response, the program created a plan outlining the specific actions proposed to address each recommendation as well as a timeline for implementation. The next cyclical review for this program is scheduled for 2027-2028.

Enrollment over the past three years

	BASc
2022-2023 (CURRENT YR)	531
2021-2022 (LAST YR)	518
2020-2021 (THREE YRS)	519

This data is based on Active Student Extracts in Quest on July 6, 2023.

Background

In accordance with the University of Waterloo's Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response of the Nanotechnology Engineering program (BASc) delivered by the Department of Chemical Engineering and the Department of Electrical and Computer Engineering in the

Faculty of Engineering, and the Department of Chemistry in the Faculty of Science. A self-study (Volume I, II, III) was submitted to the Associate Vice-President, Academic on March 24, 2022. The self-study (Volume I) presented the program descriptions and learning outcomes, an analytical assessment of the programs, including the data collected from a student survey, along with the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). The CVs for each faculty member with a key role in the delivery of the program(s) were included in Volume II of the self-study.

From Volume III, two arm's-length external reviewers were selected by the Associate Vice-President, Academic: Dr. Liying Jiang, Professor and Associate Chair - Graduate Research Programs, Mechanical and Materials Engineering, University of Western Ontario, and Dr. Larry D. Unsworth, Professor of Chemical and Materials Engineering, University of Alberta.

Reviewers appraised the self-study documentation and conducted a remote visit to the University on January 23-23, 2023. An internal reviewer from the University of Waterloo, Dr. Brian Dixon, Professor of Biology, was selected to accompany the external reviewers. The visit included interviews with the Associate Vice-President, Academic; Dean of the Faculty of Engineering; Dean of the Faculty of Science; Undergraduate Associate Deans; Director of the Program, Director and Associate Director of First Year Engineering, Chairs and Associate Chair from all three departments, as well as faculty members, staff and current undergraduate student representatives and student society representatives. The Review Team also had an opportunity to visit with representatives from the library, technical staff, and Co-operative Education.

Following the site visit, the external reviewers submitted a report on their findings, with recommendations. Subsequently, the program responded to each recommendation and outlined a plan for implementation of the recommendations. Finally, the Dean responded to the external reviewers' recommendations, and endorsed the plans outlined by the program.

This final assessment report is based on information extracted, in many cases verbatim, from the self-study, the external reviewers' report, the program response and the Dean's response.

Program Characteristics
The Nanotechnology Engineering program provides education in key areas of nanotechnology, including fundamental chemistry, physics, engineering of nanostructures and nanosystems, and theories and techniques employed in the modelling, design, fabrication, and characterization of technological applications. Its multidisciplinary nature requires an extensive knowledge base that is significantly broader than that of typical engineering programs. The program aims to provide students with a thorough understanding of physical phenomena occurring at the nano-scale, the ability to apply that knowledge to the analysis of physical situations, and to solve problems through the consideration and deliberate design of nano-materials and -devices.

Students gain very extensive laboratory experience through the program under the direction of a large team of experienced instructors, and this is a hallmark feature of the program. Emphasis is placed on training with modern instrumentation techniques that are employed in research and development in emerging nano-technologies. Exceptionally well-equipped laboratories, which include research-grade instruments and a cleanroom, are dedicated to the undergraduate program.

All students participate in work-integrated learning through a mandatory cooperative education component. During work terms, students are required to take online professional development courses through the Professional Development program (WatPD) to supplement on-the-job training.

Summary of Strengths, Challenges and Weaknesses based on Self-Study

Strengths
- The interdisciplinary Nanotechnology Engineering program is much broader in comparison to other engineering disciplines, pulling expertise from Chemistry, Chemical Engineering and Electrical Engineering. The fundamental science background in the core curriculum is a significant strength of this program, which provides a solid foundation for the technical elective courses. NE provides a large number of technical electives, 8 total, where 4 can be taken from outside the NE program, including other engineering departments or departments outside the faculty.
- Students receive significant laboratory experience under the guidance of highly experienced lab instructors. NE laboratories are housed in purpose-built facilities, including state-of-the-art, industrial-grade equipment and what we believe to be the only cleanroom in Canada for undergraduate training. Students are sufficiently trained on advanced techniques, e.g., scanning electron microscopy, to be able to later book these instruments to support the development of their prototypes in their design projects.
- Courses are delivered by leading researchers drawn from the program's three departments in two faculties in a collaboration essential to delivery of the broad curriculum.
- NE cohorts undertake a wide variety of Capstone Design projects in their final year. Student teams work on problems of their own selection and develop solutions, including prototypes, that are often novel and highly innovative. The development of prototypes is supported by program funding for each group.

- The academic experience is complemented by co-operative education work terms, where students can learn while working in varied roles. This is a core strength of the program.
- The quality of the program is evidenced by the early career outcomes of our graduating students, who go on to succeed in engineering, academic and scientific positions, many of which support their own entrepreneurial endeavours.
- The program undergoes a regular process of reflection and improvement through the "graduate attributes and continual improvement process", which is a requirement to maintain CEAB accreditation. This process is working and, with resources devoted to this on an ongoing basis, we expect to see continued progress in this area. Students are regularly consulted to identify areas of concern and actions are taken to address these where appropriate. Over the past six years, a number of curriculum improvement actions have been taken, including:
    - Introduction of a first-year core course, NE109 Societal and Environmental Impacts of Nanotechnology, to provide a clear focus for the program's content.
    - We have provided a mechanism for students to take technical electives outside of the nanotechnology program, which provides additional opportunity to explore areas of interest.
    - Enhancement of the design experience through an overhaul of the NE100 Introduction to Nanotechnology Engineering course, the "Design Days" initiative, and enhancements to the capstone design course and elective laboratories.
    - Introduction of a third-year technical elective NE381 Introduction to Nanoscale Biosystems to enhance the biotechnology content of the program.
    - Introduction of first-year core course, NE140 Linear Circuits, to resolve an identified curriculum gap.
    - Introduction of a requirement that one complementary studies elective be a communication course.
    - Reduction of the number of complementary studies electives (CSEs) by one (note that this change first appeared in the 2019/20 calendar) to reduce student workload.

Challenges
- Feedback from students and employers indicates an ongoing issue with the recognition and understanding of what nanotechnology is, particularly in relation to "nanotechnology jobs." We believe this is in part a communication issue and have identified the need for a clearer message about the program and related opportunities to the students, faculty, staff and industry.

- Students' acquisition of co-op employment was more challenging in the beginning of the program but has now improved, with 2018 showing the largest ever number of employed students for the program. However, a perception of employment challenges persists, particularly with regard to a "lack of nano jobs." It seems that many stakeholders, including students, faculty, staff and industry, remain unclear about how nanotechnology jobs fit into current industrial sectors.
- While breadth and depth are highlighted above as a strength of the program, managing the balance between them is an ongoing curriculum challenge. This is complicated by the existing communication lines between departments, faculties and faculty members, because NE students have backgrounds that do not easily line up with those of students in other departments, such that the delivery of content to NE students cannot simply be a mirror of what is provided to other departments.
- The program is currently well-resourced, but we identify two potential issues:
  - First, some issues have been encountered with the quality of sessional instructorsassigned to courses when regular faculty instructors have been absent. We will identify opportunities to provide better support to these sessional instructors and monitor how often sessional instructors are required.
  - Second, the program's facilities and equipment, including the cleanroom, instruments, etc., are aging. We anticipate a need for increased spending on maintenance and replacement; a plan is in place to manage this challenge.
- Coordinating administration of, and strengthening engagement to, the program across 2 Faculties and 3 Departments is a challenge given that faculty are affiliated to Departments and Faculties, not programs. Although the Program Director has responsibility for the program, only the Associate Directors report to the Program Director, and the reporting structure falls back to individual Departments. Any task change for instructors will require home department approval rather from the program director. In addition, critical information, such as leaves or accident report, are often delayed or not reported to the NE directors.
- Faculty members will not necessarily identify themselves as NE. Faculty members identify themselves as Chemical Engineers, Electrical Engineers or Chemists teaching NE and thus there is a cultural rift between the students and faculty in terms of identity.

Weaknesses
- The engineering design content in the first three years of the curriculum has been identified as a weakness. We have overhauled the introductory NE100 course to have a clear design focus and piloted the first "Nano Design Day" for first-year students. These

first offerings have been successful, and we plan to build on this initiative to enhance the design components of the first to third years of the program.

- The breadth of the program also presents a weakness: it is challenging to ensure that a student goes in depth in any area.
- The students' workload is high compared to that of other engineering programs, which may lead to undue levels of stress in our students. We are very attentive to this issue and take measures to address it (e.g., elimination of one CSE course).
- It is also challenging to maintain faculty engagement, given the inter-department and -faculty structure of the program; initiatives are underway to promote greater faculty engagement and communication around the undergraduate curriculum, including regular general meetings of involved faculty and staff and subject-area-specific curriculum meetings.

Summary of Key Findings from the External Reviewers

The Nanotechnology Engineering program is, "well aligned with the strategic plans of both the Faculty of Engineering and University of Waterloo. The implementation of professional and transferable skills development through mandatory courses is also one of the merits. The multidisciplinary nature of the program trained students in a broader area with extensive knowledge, offering more options for the advancement of their future careers. We shared a particularly positive assessment of the NE undergraduate program. Some considerations and a series of recommendations are provided for further enhancement."

Program Response to External Reviewers' Recommendations

PROGRAM LEVEL RECOMMENDATIONS

1. Administrative: Hold faculty meetings, regularly but not overly frequently, to disseminate information as a departmental meeting would.

    Potential result: NE ownership by all faculty involved.

    Response
    Program Response:
    The Program Director will arrange town-hall meetings for each team to discuss topics of concern and disseminate information to the staff and faculty in the NE program. This meeting will be introduced in the Fall 2023 term.

    Dean of Engineering's Response:
    I support the director's approach related to providing information to faculty members related to the NE program. Since the director and associate directors each come from

the departments participating in the NE program, another venue for dissemination is the regular department meetings.

Dean of Science's Response:
The Faculty of Science also supports the approach of the Director, with the expectation that the Associate Directors and faculty from each participating department understand their role in disseminating information related to the NE program.

2. Administrative: The NE Director makes a budget related to measurable outcomes from strategic planning.
Potential result: Risks associated with ad hoc budget process are mitigated and will allow for longer term management of large costs (maintenance, instrument renewal) and strategic initiatives.

Response
Program Response:
The program director will prepare a proposed program budget by February of each year, beginning in 2024, with inputs from the NE executive committee members. The committee should complete and approve the final version of the program budget before March 1 of each year. The budget should include (1) operating costs from each laboratory, (2) costs related to student activities, (3) new capital equipment purchases, (4) staff team building expenses, (5) recruitment, and (6) miscellaneous.
The proposed budget should also include a forward-looking multiyear capital expense plan which includes new capital expenditures for new labs or replacements.

Dean of Engineering's Response:
I support this approach related to a proposed annual budget for the NE program.

Dean of Science's Response:
The Faculty of Science also supports the proposed annual budget approach for the NE program.

3. Administrative: Professors are available to teach from 8 am to 5 pm.

Potential result: Administrative load for scheduling is streamlined, and allows for undergraduate program flexibility by removing the constraint of 'professor working hours'.

Response
Program Response:
UW may consider some of the personal constraints of the instructors and try to accommodate them during the development of a teaching schedule. However,

instructors are still expected to deliver courses during normal business hours as defined by the University.

Dean of Engineering's Response:
I agree that it would be difficult for the program director to impose teaching times on faculty members but I can work with the two department chairs in engineering to ensure there is more flexibility in the teaching times similar to our other engineering programs.

Dean of Science's Response:
The Faculty of Science will support the chemistry department chair to ensure flexibility in teaching times in support of the NE program.

4. Teaching: Generate hand-off document (1 pg) for each course that summarizes:
    a. content that students normally have problems with stated through recurring student feedback
    b. examples of syllabus, midterm, and final exams
    c. upload to on-line class materials, only for instructors
    d. coop student hired to facilitate

Potential result: Sessionals, lecturers, and those who step in for a course rarely will have a baseline to understand the course, have similar evaluation metrics, prepare for areas students need reinforcement, and maintain similar offerings from one lecturer to another.

Response
Program Response:
Instructors are required to distribute NE course outlines to the students during the first week of each academic term. A copy of the course outline is also delivered to the program coordinator as a record. Course outlines contain information on the topics to be delivered and the grade distributions of course assessments. Some of the course outlines will be posted online for public viewing after receiving consent from the instructors.

In the future, the NE Program Coordinator will request instructors to grant access to course websites on Waterloo LEARN. This is a UW educational website designed to facilitate instructors. Upon granting access to the teaching materials, future instructors will have access to the teaching materials, such as presentation slides, homework, quizzes, or exams. The amount of teaching materials available will depend on the authorization granted by the authors. The NE Program Coordinator will notify

instructors of this service at the beginning of each term. We plan to implement this in Fall 2023 term.

Dean of Engineering's Response:
I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation.

5. Teaching: Allow written student feedback twice per semester for all classes, regardless of year, with professor response in class.

   Potential result: Students think once per semester is too early, and do not hear back regarding feedback and how it might or might not be implemented by the professor.

   Response
   Program Response:
   The NE program will increase the number of class representative meetings from one to two per term. Both class representatives (4 – 5 students) and course instructors will attend these meetings. During the meeting, students will disclose course-related issues to the corresponding instructor and discuss possible solutions/implementations. Meeting minutes will be created for the record. Increasing the number of class rep meetings to two per term will allow the NE administration to track the progress recommended by the stakeholders.

   NE Director and Program Coordinator will also remind the class representatives to disseminate the meeting minutes to the entire class. We plan to implement this in Fall 2023 term.

   Dean of Engineering's Response:
   I support the director's response to this recommendation.

   Dean of Science's Response:
   The Faculty of Science also supports the director's response to this recommendation.

6. Engagement and Outreach Education: Leverage Capstone and NanoDesign Day to engage industry, forming an NE advisory council that incorporates industrial and government representatives.

   Potential results: Advancing awareness of NE, industrial feedback on nano related fields, and potential research opportunities.

Response

    Program Response:

This is an excellent recommendation and could be achieved. A few local technology companies, such as Alchemy, Angstrom Engineering, and VueReal, may be interested. Other global companies that have a strong tie with the UW coop program will also be explored, such as Tesla and J&J.

A possible way to increase the visibility of the NE program is to invite companies to be judges for the Fourth-Year Design Project Symposium (FYDP) and/or Poster Sessions. In addition, the NE program may invite industry representatives to provide seminars on UW campus. The NE Associate Director will manage this activity. We expect to implement this during Winter 2024 during the FYDP events.

    Dean of Engineering's Response:

I support the director's response to this recommendation.

    Dean of Science's Response:

The Faculty of Science also supports the director's response to this recommendation.

7. Engagement and Outreach Education: Conduct NE specific outreach (through new or existing outreach activities) to high schools to achieve EDI initiatives as well as education of high school students on NE careers/opportunities.

   Potential results: Enhance pool of 1st year applicants, provide general knowledge to community regarding NE.

   Response

       Program Response:

   The NE Associate Director will coordinate the outreach activities with the Associate Dean of Outreach, Equity and Diversity from the Faculty of Engineering. This includes but is not limited to activities with students from the Indigenous, Black, and other underrepresented communities. The NE program will allocate two coops each year to facilitate these outreach programs and develop hands-on experiments to highlight the excitement of the NE field. Some of the initiatives that the NE program may contribute to include, but are not limited to, Catalyst summer programs for grade 10-12 students, STEMpowered Camps for Black Youth, and workshops for Indigenous Youth who are participating in Land Camps. A detailed plan is being drafted and is expected to be completed by December of 2023.

       Dean of Engineering's Response:

As the director has indicated, we engage in significant outreach activities to a range of diverse students to showcase our various engineering programs.

Dean of Science's Response:

The Faculty of Science also supports the director's response to this recommendation, but it is recognized that there is an opportunity for greater and targeted outreach in Science

FACULTY LEVEL RECOMMENDATIONS

8. Formal Budget Allocation: Formalize a budget by the NE Director tied to measurable outcomes from strategic planning related to NE program operations.

   Potential results: Manage foreseeable large costs (maintenance, instrument renewal), develop multi-year strategic program initiatives, while minimizing unnecessary exposure to risks associated with an ad hoc budget process.

   Response

   Program Response:

   This recommendation links to "Program level recommendation #1". Working with the Director and Associate Directors, the NE Curriculum Committee is best suited to develop and monitor program learning outcomes. The Committee can provide input for needs re: urgent instrument maintenance and plans/rationale for instrument renewal or replacement (the latter allowing for new experiments to be developed, replacing older ones). A multi-year renewal plan could be implemented with the Director/Associate Directors monitoring outcomes.

   Dean of Engineering's Response:

   I support the director's response to this recommendation.

   Dean of Science's Response:

   The Faculty of Science also supports the director's response to this recommendation

9. (a) Teaching: Develop mechanism for NE leadership group to manage instructors who teach within the NE program.

   Response

   Program Response:

   The NE Director or their designate will work with Associate Chairs or their designate to oversee instructors of courses within the NE program. This team of administrators will meet each term after the first NE class representative meeting to go over any instructor-related issue. The NE Program Coordinator will also request instructor teaching assignments from the Associate Chairs or their designate at least one term prior to the

courses being offered. This will allow the NE administrators to ensure appropriate instructors are assigned to the courses. This item is planned to be implemented in Fall 2023 term.

Dean of Engineering's Response:
I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation.

9. (b) Teaching: Provide NE Director the ability to review student evaluations of instructors.

Potential results: The NE leadership group should have the ability to guide who teaches in that program, and ability to ascertain who needs support to ensure program integrity.

Response
Program Response:
Associate Dean, Teaching & Student Experience will grant access to student evaluations of courses within the NE program to the NE Director or their designate. This item has been executed.

Dean of Engineering's Response:
I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation

10. Teaching: Do not require instructor consent for approved NE electives. This unnecessary barrier for students in an approved course, required for their degree, should not exist.

Potential results: Undergraduate and administration time will be used more effectively.

Response
Program Response:
It is important to clarify that the NE program-offered electives do not require instructor approval for approved NE electives. However, courses outside of the NE program will need approval. The approval process for non-NE courses will be difficult to change as each department and faculty has its own policy and requirements. No action is necessary for this recommendation.

Dean of Engineering's Response:

I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation, but we are committed to reviewing our courses to reduce unnecessary barriers to all students.

11. (a) Teaching: Leverage CTE to build a summer course that sessionals can take to fill already known knowledge gaps that sessionals have and have the host department require sessionals to pass it prior to hiring as a sessional.

Response
Program Response:
This item is not selected for implementation. Since the UW sessional instructors are forming a union, any hiring requirement will need to go through a collective bargaining process between the university and the union. Hence, this recommendation will be difficult to implement in the near term. However, the NE program will suggest sessional instructors enroll in training offered by CTE. A special note will be distributed to all of the NE instructors each term to provide information regarding the supporting facilities for teaching. A selection of CTE courses can be found on the Centre for Teaching Excellence website depending on the sessional instructors' knowledge gap.
https://uwaterloo.ca/centre-for-teaching-excellence/support-faculty-and-staff/support-new-faculty
We planned to implement this in Fall 2023 term.

Dean of Engineering's Response:
I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation.

11. (b) Teaching: More experienced TAs should be assigned to sessionals or new course instructors.

Potential results: Consistent course delivery and evaluation metrics to enhance student education.

Response
Program Response:
This is already a practice that is in place and will continue.

Dean of Engineering's Response:
I support the director's response to this recommendation.

Dean of Science's Response:
The Faculty of Science also supports the director's response to this recommendation.

12. Admissions: Develop, with admissions, an inclusive pathway to ensure students with non-standard backgrounds can pursue higher education in a way that maintains the rigor of the Engineering degree. A potential solution is a preliminary year of tailored studies where standard courses could be offered to fill knowledge gaps and prepare these students for a 1st year application process where they will be competitive.

Potential results: Enhanced 1st year applicants, as well as meeting the standard for EDI in admissions by accounting for non-standard backgrounds of still exceptional students.

Response
Program Response:
This item is not selected for implementation because it is beyond the ability of the program to implement. However, the University is taking steps that may address the reviewers' concerns.".

The University of Waterloo is conducting an admissions process review. The goal of the review is to streamline our admissions processes and remove barriers that might adversely affect equity, diversity, inclusion, and anti-racism on campus. The review was initiated by the Registrar's Office in December 2021 and it is expected to present a comprehensive set of recommendations in the near future. Engineering admissions has participated in the review process and provided feedback. The final report and its recommendations will be presented to the university this year.

While at this time there are no pathways programs in Waterloo Engineering, the university has begun experimenting with pathways programs in other disciplines so the possibility of something similar may not be ruled out. As a university, it is important to maintain certain standards, particularly within engineering programs. Our goal is to ensure that students entering our programs have the skills and knowledge to succeed in our programs. High school courses are the way that we currently assess preparation for our programs. These courses are available online and are easily accessible so they provide a suitable mechanism for the fair comparison of all applicants. We currently do not offer pathway programs into any of our engineering programs. These programs exist in many Ontario universities and mechanisms already exist for students to transfer into our programs from these Ontario universities. We also recognize that our engineering programs may not be a perfect fit for every applicant.

Dean of Engineering's Response:

I support the director's response to this recommendation.

Dean of Science's Response:

The Faculty of Science also supports the director's response to this recommendation, but we are committed to increasing access of students from non-standard backgrounds to programs similar to and aligned with NE to help meet the intent of the recommendation.

UNIVERSITY LEVEL RECOMMENDATIONS

13. Follow up with NE Director after 1 year to verify why some recommendations were not executed.

Response

Quality Assurance and Continuous Improvement Office Response:
Our Institutional Quality Assurance Process requires the program to submit a Progress Report in which they provide an update on the actions taken in response to the reviewers' recommendations. The Progress Report will be reviewed by the Associate Vice-President, Academic and will be submitted to Senate Undergraduate Council for approval.

Dean of Engineering's Response:
I have nothing further to add to this.

Dean of Science's Response:
The Faculty of Science supports the response of the Quality Assurance and Continuous Improvement Office.

14. Support counseling and accessibility services to respond to the significant increase in student need.

Response

Dean of Engineering's Response:
We continue to provide new ways of improving the well-being of all of our engineering students and have adjusted our Associate Dean's portfolio related to teaching to also include student experience. We have also provided additional resources and have hired well-being officers across the Faculty of Engineering.

Dean of Science's Response:
The Faculty of Science is adjusting our Associate Dean roles to ensure greater support to students. The new and adjusted Associate Dean (AD) roles are AD for a Diverse, Inclusive and Safe Science, and AD for Faculty and Student Engagement. The AD changes and the *Future of Science* strategic planning process being initiated in the Faculty of Science will lead to new supports and resources for students.

Recommendations Not Selected for Implementation

We selected not to implement recommendations #3, #10, #11a, and #12.

Recommendation 3: Professors are available to teach from 8 am to 5 pm.

No action is needed for this recommendation as the instructors are already required to teach during normal business hours as defined by the University of Waterloo.

Recommendation 10: Do not require instructor consent for approved NE electives. This unnecessary barrier for students in an approved course, required for their degree, should not exist.

No action is required for this item as the instructor's consent is already not required from the approved NE electives. Changing the approval process for non-NE courses will be difficult to implement because it requires a change of policy among departments and the faculty has its own policy and requirements.

Recommendation 11a: Leverage CTE to build a summer course that sessionals can take to fill already known knowledge gaps that sessionals have and have the host department require sessionals to pass it prior to hiring as a sessional.

Sessional instructors are organizing a union at the University of Waterloo. Any change in the hiring requirement for sessional instructors will require collective bargaining between the UW and the union.

Recommendation 12: Develop, with admissions, an inclusive pathway to ensure students with non-standard backgrounds can pursue higher education in a way that maintains the rigor of the Engineering degree. A potential solution is a preliminary year of tailored studies where standard courses could be offered to fill knowledge gaps and prepare these students for a 1st year application process where they will be competitive.
The FoE does not have a pathway for students with non-standard backgrounds. The NE program will follow this faculty policy.

Implementation Plan

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	Hold faculty meetings, regularly but not overly frequently, to disseminate information as a departmental meeting would.	The Program Director will arrange town-hall meetings for each team.	Program Director	Planned to be executed in Fall term, 2023
2.	The NE Director makes a budget related to measurable outcomes from strategic planning.	The program director will prepare a proposed program budget by Feb with inputs from the NE executive committee members. The committee should complete and approve the final version of the program budget before March 1 of each year.	Program Director and Executive Committee	Planned to be executed in March 2024
3.	Professors are available to teach from 8 am to 5 pm.	Not selected for implementation		
4.	Generate hand-off document (1 pg) for each course that summarizes: a. content that students normally have problems with stated through recurring student feedback b. examples of syllabus, midterm, and final exams c. upload to on-line class materials, only for instructors coop student hired to facilitate	The NE course outlines are requested during the first week of each term and posted online for the public after receiving consent from individual faculty. It is not mandatory for the faculty to give consent to the public posting of the outline. In the future, the NE Program Coordinator will request access to all NE courses on LEARN so teaching materials may be available for those who teach the course in the future.	Program Coordinator	Planned to be executed in Fall 2023
5.	Allow written student feedback twice per semester for all classes, regardless of year, with professor	The NE program will increase the number of class representative meetings from one to two per term.	Program Coordinator	Planned to be executed in Fall 2023

	response in class.			
6.	Leverage Capstone and NanoDesign Day to engage industry, forming an NE advisory council that incorporates industrial and government representatives.	This is an excellent recommendation and could be achieved.	NE Associate Director	Planned to be executed in Fall 2023
7.	Conduct NE specific outreach (through new or existing outreach activities) to high schools to achieve EDI initiatives as well as education of high school students on NE careers/opportunities.	The NE Associate Director will coordinate the high school outreach activities with the Associate Dean's Outreach Office to educate high school students about nanotechnology careers and opportunities.	NE Associate Director	Planned to be executed in Fall 2023
8.	Formalize a budget by the NE Director tied to measurable outcomes from strategic planning related to NE program operations.	This recommendation links to "Program level recommendation #1".	Program Director and Executive Committee	Planned to execute this in Winter 2024
9a.	Develop mechanism for NE leadership group to manage instructors who teach within the NE program.	The NE Director or their designate will work with Department Associate Chairs to oversee instructors of courses within the NE program.	NE Director and Department Associate Chairs	Planned to be executed in Fall 2023
9b.	Provide NE Director the ability to review student evaluations of instructors.	Associate Dean, Teaching & Student Experience will grant access to student evaluations of courses within the NE program to the NE Director or their designate.	Associate Dean, Teaching & Student Experience	Executed in Winter term 2023
10.	Do not require instructor consent for approved NE electives. This unnecessary barrier for students in an approved course, required for their degree, should not exist.	Not selected for implementation		
11a.	Leverage CTE to build a summer	Not selected for implementation		

	course that sessionals can take to fill already known knowledge gaps that sessionals have and have the host department require sessionals to pass it prior to hiring as a sessional.			
11b.	More experienced TAs should be assigned to sessionals or new course instructors.	This is already a practice that is in place and will continue.	Department Associate Chairs	Executed
12.	Develop, with admissions, an inclusive pathway to ensure students with non-standard backgrounds can pursue higher education in a way that maintains the rigor of the Engineering degree. A potential solution is a preliminary year of tailored studies where standard courses could be offered to fill knowledge gaps and prepare these students for a 1st year application process where they will be competitive.	Not selected for implementation		

The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for the Implementation Plan.

Date of next program review   **2027-2028**

Date
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Signatures of Approval

[signature]

9/11/2023
_____
Chair/Director   Date

Mary Wells

_____
Faculty Dean of Engineering   Date

[signature]   _Sept 12/23_

_____
Faculty Dean of Science   Date

[signature]

August 18, 2023
_____
Associate Vice-President, Academic   Date
(For undergraduate and augmented programs)