

## ACADEMIC COUNCIL REPORT

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### ACTION REQUESTED:

Recommendation   
Decision   
Discussion/Direction   
Information

DATE: 27 June 2023

FROM: Undergraduate Studies Committee

SUBJECT: Program Review Final Assessment Report – Bachelor of Science in Physics

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### COMMITTEE MANDATE:

In accordance with Article 8 of the Ontario Tech University Institutional Quality Assurance Process (IQAP) Cyclical Review (CPR) and Auditing Procedures, the appropriate standing committee of Academic Council (USC or GSC) is responsible for approving the Final Assessment Report (FAR), Executive Summary, and Implementation Plan (IP) resulting from the Review.

Additionally, in accordance with Article 6 of the IQAP Curriculum Change Procedures, editorial revisions to Program Learning Outcomes are considered Minor Program Adjustments and are sent to the standing committee for approval.

### BACKGROUND/CONTEXT & RATIONALE:

In academic years 2020-2022 a program review was scheduled for the Bachelor of Science in Physics. The site visit was conducted in December 2022. Following receipt of the External Examiners Report, the Dean and Program respond and an IP is prepared by the Dean. This IP is presented to the Academic Resource Committee for review and further follow-up. At the completion of a CPR the appropriate standing committee of Academic Council (USC or GSC) will review and approve the FAR, Executive Summary, and IP that synthesize the recommendations resulting from the review, identify the strengths of the program as well as the opportunities for program improvement and enhancement, and outline the agreed-upon plans for this improvement.

### RESOURCES REQUIRED:

The Faculty's plans to address any resource needs are outlined in the action plan. Information and support will be required from various areas of the University in order to

implement the plan. The Academic Resource Committee has reviewed the resources identified in the IP.

**COMPLIANCE WITH POLICY/LEGISLATION:**

The Ontario Universities Council on Quality Assurance (Quality Council), established by the Council of Ontario Universities in July 2010, is responsible for oversight of the Quality Assurance Framework processes for Ontario Universities. The Council operates at arm's length from both Ontario's publicly assisted universities and Ontario's government. Under the Quality Assurance Framework, academic programs must undergo a cyclical review at least every eight years following their implementation. The purpose of the cyclical program review is to critically examine the components of a program with the assistance of outside reviewers with the goal of continuous improvement. A program review's purpose is not solely to demonstrate the positive aspects of the program, but also to outline opportunities that will lead to improvements for the future.

**CONSULTATION AND APPROVAL:**

The Academic Resource Committee reviewed the Implementation Plan April 17, 2023. The Implementation Plan was presented to the Science Faculty Council on May 2, 2023.

**NEXT STEPS:**

- Following presentation of the Executive Summary and IP to Academic Council and the Board of Governors, a Final Assessment Report (FAR), the Executive Summary, and the IP will be sent to the Quality Council as required under the Quality Assurance Framework. A summary report is then posted on the Ontario Tech corporate website.
- The FAR, Executive Summary, and IP will be provided to the Faculty, through the Dean, to serve as the basis for the continuous improvement and monitoring of the program. A report from the program outlining the progress that has been made in implementing the recommendations will be put forward in eighteen months' time.

**SUPPORTING REFERENCE MATERIALS:**

- Executive Summary
- Implementation Plan
- PLO Enhancement



**FINAL ASSESSMENT REPORT**  
**Executive Summary**  
**Cyclical Program Review**

<b>Degree Program:</b>	<b>Bachelor of Science (Honours) in Physics</b>
<b>Components:</b>	<ul style="list-style-type: none"> <li>• <b>Comprehensive</b></li> <li>• <b>Comprehensive, with co-op option</b></li> <li>• <b>Astrophysics</b></li> <li>• <b>Astrophysics, with co-op option</b></li> <li>• <b>Nanotechnology and Clean Energy</b></li> <li>• <b>Nanotechnology and Clean Energy, with co-op option</b></li> </ul>
<b>Dean:</b>	<b>Dr Greg Crawford</b>
<b>Date:</b>	<b>April 25, 2023</b>

Under Ontario Tech University's Institutional Quality Assurance Process (IQAP) and the Ontario Quality Assurance Framework (QAF), all programs are subject to a comprehensive review at least/at minimum every eight years to ensure that they continue to meet provincial quality assurance requirements and to support their ongoing rigour and coherence.

In academic years 2020-2022 a program review was scheduled for Bachelor of Science in Physics. This is the second program review for this program. A timeline of the review is provided below.

<b>Program Review Timeline</b>	<b>Date</b>
Program Review start date:	Oct. 5, 2020
Self Study submitted/approved:	Sept. 13, 2022
Site Visit:	Dec. 8-9, 2022
External Reviewers Report received:	Jan. 10, 2023
Program Response received:	Feb. 15, 2023
Decanal Response received:	Mar. 15, 2023

The external reviewers provided evidence and recommendations in their report consistent with concerns raised by the Program in the self-study brief and during the site visit. Overall, the outcome of the program review was very productive and a clear implementation plan has been developed to ensure the highest standard of academic excellence is met within the Bachelor of Science in Physics program.

The reviewers identified the modern curriculum, the astrophysics specialization, and size of the program as significant strengths in the Physics program. The program size leads directly to a close-knit community, better individual support for students, more opportunities for students, innovative teaching in small classes, and award-winning faculty. An area of improvement for the program was noted as additional laboratory equipment to better support first year students. Areas for enhancement included maintaining social engagement and increasing opportunities for experiential learning, co-op placements and research opportunities.

The review consisted of two external reviewers. During the virtual site visit, the reviewers met with the following groups and individuals:

The site visit took place on **December 8-9, 2022**.

The review consisted of two external reviewers: **Drs. Williams and Crandles**.

During the virtual site visit, the reviewers met with the following groups and individuals: members of the Faculty as well as key stakeholders at the University; including Dr. Langis Roy – Deputy Provost; Dr. Greg Crawford – Dean of Science; Dr. Joseph MacMilliam – Undergraduate Program Director; Stephen Thickett – Director of Planning and Operations (Student Life); Emily Tufts – Associate University Librarian; members of the internal assessment team and a number of faculty, staff, and students.

The external reviewers identified eight recommendations identifying specific steps to be taken to improve the program. A common theme in the recommendations highlighted the current efforts and continued need to improve the student experience and retention in the Physics program. The prioritized list of recommendations is available in the Implementation Plan.

A Final Assessment Report (FAR) has been prepared to synthesize the reports and recommendations resulting from the review, identifying the strengths of the program as well as the opportunities for program improvement and enhancement. The Implementation Plan (IP) presents a timeline of the follow-up and resource requirements addressing the recommendations from the external reviewers' report. Both documents, accompanied by this Executive Summary (ES), will be delivered to the appropriate standing committee of Academic Council (USC/GSC) for approval on **May 16, 2023**.

<b>Governance</b>	<b>Document(s)</b>	<b>Type of review</b>	<b>Date</b>
Faculty Council	IP	Feedback	May 2, 2023
Resource Committee	IP	Resource review	April 17, 2023
USC/GSC	FAR, ES, IP	Approval	May 16, 2023
Quality Council	FAR, ES, IP	QAF requirement	
Academic Council	ES, IP	For information	
Board of Governors	ES, IP	For information	
Corporate Website	ES, IP	QAF requirement	

**Due Date for 18-Month Follow-up Report:** September 17, 2024

**Date of Next Cyclical Review:** 2027-2029  
**Timeframe for associated site visit:** Winter 2029

**IMPLEMENTATION PLAN**  
**April 25, 2023**  
**Bachelor of Science (Honours) in Physics**  
**Program Review**  
**Dean: Dr. Greg Crawford**

The Implementation Plan is a critical outcome of the Cyclical Program Review process. The Dean solicits feedback on the Implementation Plan through Faculty Council and the plan is reviewed by the Provost, through the Resource Committee, to examine resource implications and allocations. A Final Assessment Report (FAR) and Executive Summary are prepared synthesizing the program review reports and responses, following review of the Implementation Plan by the Resource Committee. The plan proceeds through Ontario Tech’s governance process and is posted on the corporate website.

The table below presents a timeline of the follow-up and resource requirements addressing the recommendations from the external reviewers’ report.

	<b>Recommendation</b> <i>(corresponding # from reviewers’ report)</i>	<b>Action Item(s)</b>	<b>Specify role of person responsible</b>	<b>Timeline for action and monitoring</b>	<b>Resource Requirements</b>
1.	(a) Invest in enough 1st year lab equipment so they do not need to be offered on a rotating basis	Work on a plan up a plan to build up the required equipment (with priorities identified)	Dean, UPD, Lab Coordinator, DPO; institutional budget approval	Meeting to discuss: Sept. 2023 (or earlier); Preliminary budget submission: Dec. 2023	Preliminary estimate: \$200K across 5 years
	(b) Additional training for 1 <sup>st</sup> year lab TAs	Physics faculty to assess feasibility (and any costs), review options and develop a plan	Physics faculty; consultation with Dean/DPO (resources needed)	Develop plan: Dec. 2023; (resources would need to be approved and allocated; implementation plan (Aug. 2024)	TBD

3.	Consider hiring a computational astrophysicist to replace retiring research faculty	Dean to consult with Physics faculty; seek approval to post for Fall 2023	Dean, Physics Faculty; Provost (hiring approval)	Dean to meet with Physics faculty (May 2023) Seek hiring approval (by September 2023)	Approval of faculty replacement posting
4.	Modify names of two 3 <sup>rd</sup> year courses	Modify names of these courses (slight variations on what was recommended)	Physics faculty (course change proposals)	Submit course change proposals (by December 2023)	N/A
5.	Support increases in physics co-op participation by:  (a) Holding a broader, university-level discussion about co-op resourcing  (b) contact alumni about possible co-op positions;	(a) Once the results of a recent external review of experiential learning/co-op are made available, determine how co-op resourcing may be impacted  (b) Develop an approach to increase Physics alumni engagement (including possible co-op positions)	(a) Dean(s), Provost, Experiential Learning admin  (b) Physics faculty, Dean, DPO, VP Advancement, Alumni Office	(a) Determine budget implications (for Science co-op), based on university response to review recommendations and assess next steps (July 2023)  (b) Alumni plan developed by July 2023	(a) Budget implications pending  (b) TBD
6.	Build a better relationship with the library	Engage the Science Librarian in some upper-year courses focused on research techniques	Physics faculty	At least one upper year course with a librarian presentation by April 2024	N/A
7.	Initiate a conversation with the Education Faculty to see if a collaborative program can be revitalized	Initiate conversations with the Education Faculty	Physics faculty; Dean	Initiate conversations with the Education Faculty (November 2022)	TBD

\*The Dean shall be responsible for monitoring and reporting on the Implementation Plan.

## Recommendations not Addressed and Rationale

#	Recommendation not Addressed	Rationale
1	c. Full-time faculty should teach first year classes	We generally aspire to have at least one full-time faculty teach at least one section of first year courses. With a limited complement of Physics faculty, we need to balance the first year, relatively generalized student experience with the specialized, upper level Physics student experience.
2	Initiate a broader discussion across the faculty about dedicated student study space	Space at the university is at a premium; we are currently focusing on trying to acquire permanent space to support student success (e.g., Science Café) which would likely also serve as Physics student study space (though not dedicated space)
8	Reduce the number of courses being taught by contract faculty by adding at least one additional full-time faculty member	A large number of situations have arisen over the past few years that have resulted in a higher percentage of sessional contracts. Upon review, the inherent teaching capacity among the Physics faculty appears to be sufficient to meet the basic programmatic needs. To better manage resources and maintain the quality of the student experience, we will both continue to monitor the number of leaves and course releases and, if necessary, revisit the breadth of course/specialization offerings.
9	Work with the Dean to ensure professional development opportunities to enhance teaching	There is already significant support for professional development: (1) Professional development can already be up to 10% of a faculty member's workload; (2) all faculty are provided a professional development allowance (currently \$2.5K / year); (3) professional development leaves are framed within the CA; (4) to date, there have been two professional development leaves requested and approved within the Faculty of Science; both came from Physics faculty.

**Due Date for 18-Month Follow-up Report:** September 17, 2024

**Date of Next Cyclical Review:** 2027-2029





### Cyclical Program Review: Summary of program learning outcome enhancements

[This form should be used in cases where program learning outcomes have been enhanced for an existing undergraduate or graduate program. These updated program learning outcomes should be the result of a program review and have been developed with guidance from CIQE. This form will be appended to the Final Assessment Report]

<b>Faculty:</b> Science	
<b>Program:</b> Bachelor of Science (Honours) in Physics	
<b>Review year:</b> 2020-2022	
<b>Undergraduate:</b> <input checked="" type="checkbox"/>	<b>Graduate:</b> <input type="checkbox"/>

#### **Original program learning outcome(s):** (Provide all of the initial program learning outcomes)

- Describe and interpret the concepts, theories and principles of Physics and the related physical and biological sciences.
- Analyze, evaluate and apply the scientific concepts, techniques or processes needed in the study and application of Physics and the related physical and biological sciences, and investigate innovative solutions in line with the current state of knowledge in Physics to significant related scientific problems.
- Describe and explain effectively experimental results, theoretical solutions, and general knowledge of Physics and the related physical and biological sciences to both technical experts and members of the general public, utilizing written, spoken and visual format.
- Foster a culture of science and interest in Physics within the greater community, and contribute as effective participant in multi-disciplinary and multicultural teams, in both membership and leadership roles
- Recognize and utilize contemporary laboratory and measurements techniques and procedures, and apply the appropriate safety protocols.
- Plan and implement experiments and investigations, critically examine the results, draw valid conclusions, and evaluate the level of uncertainty in experimental results and theoretical predictions
- Apply relevant numerical skills including statistical analysis as necessary for physical sciences
- Use current Information technology to access, store and retrieve information, to acquire and process data, and to analyze and solve problems

**Total number of original outcomes: 8**

**Proposed enhanced learning outcomes:** (Updated outcomes as a result of the program review learning outcome workshops)

- Demonstrate a broad and deep knowledge of fundamental physical concepts that govern the universe and its constituents.
- Develop, apply and assess mathematical models of physical systems to real world problems.
- Investigate and explain the physical universe through analytical, simulation, and experimental techniques.
- Analyze, interpret and draw conclusions from data.
- Communicate complex physical concepts, methodologies, and results in a variety of formats within a professional context and to society.
- Recognize problems and areas of physics that are not yet understood.
- Apply the skillset of a physicist to problems in other science and non-science fields.
- Apply the scientific knowledge they have gained in a responsible and ethical way in service of a just, informed society.

**Total number of enhanced outcomes: 8**

**Have the enhanced outcomes been mapped to the degree-level expectations (DLEs)?**

Yes       No

**If no, this should be completed no later than:**

**Are you providing any additional supporting documents?**  Yes       No

**If yes, which (list all)?**

UDLE alignment map is available upon request from CIQE.

**CIQE INTERNAL APPROVAL**

Appended to FAR	
FAR approved by USC/GSC	
Final Approved FAR & Outcomes Posted and sent to Faculty	