

**NOTICE OF MEETING**  
There will be a meeting of the  
**PROGRAM DEVELOPMENT COMMITTEE (PDC)**  
Monday, January 18, 2021 at 2:00pm-4:00pm  
MS Teams  
**AGENDA**

**Formal Business**

- 1 Approval of Agenda
- 2 Minutes of Meeting of December 16, 2020
- 3 Business Arising from the Minutes
- 4 Outstanding Business

**Items for Approval**

- 5 Reports/New Business
  - 5.1 Bachelor of Arts Honours Economics (Applied Economics and Policy Stream) – Major Program Change (Form B) Nurlan Turdaliev  
Chris Houser  
PDC210118-5.1
  - 5.2 BSc in Environmental Science (Applied Environmental Science Stream) – Major Program Change (Form B) Joel Gagnon  
Chris Houser  
PDC210118-5.2
  - \*5.3 Physics – Minor Program Changes (Form C) Steven Rehse  
PDC210118-5.3
  - \*5.4 School of the Environmental – Minor Program Changes (Form C) Maria Cioppa  
PDC210118-5.4
  - \*5.5 Liberal Arts and Professional Studies (LAPS) – Minor Program Change (Form C) Cheryl Collier  
PDC210118-5.5
  - \*5.6 Engineering (Graduate) – New Course Proposal (Form D) Hoda ElMaraghy  
PDC210118-5.6
  - \*5.7 Physics – New Course Proposals (Form D) Steven Rehse  
PDC210118-5.7

**Items for Information**

- \*5.8 Physics – Summary of Minor Course and Calendar Changes (Form E) Steven Rehse  
PDC210118-5.8
- \*5.9 Biology – Summary of Minor Course and Calendar Changes (Form E) Julie Smit  
PDC210118-5.9
- \*5.10 Physics (Graduate) – Course Learning Outcomes Steven Rehse  
PDC210118-5.10

## Items for Approval

- 6.0 Draft PDC Reports on University Program Reviews and Status Reports (CONFIDENTIAL)** **Erika Kustra**  
*(Sent in a separate package)* PDC210118-6.0
- 6.1** Bachelor of Environmental Studies (BES) 3<sup>rd</sup> Biennial Status Report PDC210118-6.0a
  - 6.2** Bachelor of Interdisciplinary Arts and Science 3<sup>rd</sup> Biennial Status Report
  - 6.3** Business 1<sup>st</sup> Biennial Status Report
  - 6.4** Computer Science - Summary and Analysis
    - 6.4a** Self-Study, Report of the External Reviewers, AAU/Head's Response, Dean's Response
  - 6.5** Economics 1<sup>st</sup> Biennial Status Report
  - 6.6** Forensics 2nd Biennial Status Report
  - 6.7** General Science 1<sup>st</sup> Biennial Status Report
  - 6.8** History 3<sup>rd</sup> Biennial Status Report
  - 6.9** Kinesiology (MHK) 3<sup>rd</sup> Biennial Status Report
  - 6.10** Liberal Arts and Professional Studies 1<sup>st</sup> Biennial Status Report
  - 6.11** Mathematics and Statistics 2nd Biennial Status Report
  - 6.12** Physics - Summary and Analysis (with course learning outcomes)
    - 6.12a** Self-Study, Report of the External Reviewers, AAU/Head's Response, Dean's Response
  - 6.13** Psychology - Summary and Analysis
    - 6.13a** Self-Study, Report of the External Reviewers, AAU/Head's Response, Dean's Response
  - 6.14** School of the Environment 1<sup>st</sup> Biennial Status Report
  - 6.15** Sociology, Anthropology, Criminology 1<sup>st</sup> Biennial Status Report

## **7 Question Period/Other Business**

- 7.1 Report of PDC Calendar Subcommittee** **Patti Weir**  
PDC210118-7.1
- 7.2 Update from PDC Subcommittee Refining the Indigenous Question on the Program/Course Change Forms** **Erika Kustra**

## **8 Adjournment**

Please carefully review the 'starred' (\*) agenda items. As per the June 3, 2004 Senate meeting, 'starred' item will not be discussed during a scheduled meeting unless a member specifically requests that a 'starred' agenda item be 'unstarred', and therefore open for discussion/debate. This can be done any time before (by forwarding the request to the secretary) or during the meeting. By the end of the meeting, agenda items which remain 'starred' (\*) will be deemed approved or received.

**University of Windsor  
Program Development Committee**

**5.1 Bachelor of Science Honours Environmental Science - Applied Environmental Science Stream - Major Program Change (Form B)**

Item for: **Approval**

**MOTION: That the Bachelor of Science Honours Environmental Science - Applied Environmental Science Stream be approved. ^**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The School of the Environment is proposing a new stream, **Applied Environmental Science**, within the Bachelor of Science Honours Environmental Science program to recognize the ambitions of some college graduates from environmentally related program.
- This stream will facilitate a new degree completion pathway, structured as a '2+2' where students will earn a diploma from a recognized CAAT (or equivalent) in two years, followed by completing their degree at the University of Windsor in an additional two years.
- The proposal has been approved by the School of the Environment Council, the Faculty of Science Coordinating Council and the Provost.
- *See attached.*

## A. Basic Program Information

Faculty(ies)	Science
Department(s)/School(s)	School of the Environment
Name of Program as it Will Appear on the Diploma (e.g., Bachelor of Arts Honours Psychology with thesis)	Bachelor of Science Honours Environmental Science - Applied Environmental Science Stream
Proposed Year of Offering* [Fall, Winter, Spring]: *(subject to timely and clear submission)	Fall 2021
Mode of Delivery:	Classroom
Planned steady-state Student Enrolment (per section B.4.2)	45 students (steady state starts in year two).
Normal Duration for Completion:	2 years (full time) following the completion of a recognized two-year College of Applied Arts and Technology (CAAT) diploma or equivalent in a relevant environmental field
Will the program run on a cost-recovery basis?	Yes

## B. Major Program Changes - Overall Plan

### B.1 Objectives of the Program/Summary of Proposal (QAF section 2.1.1; Ministry section 4)

*Please provide a rationale for the proposed change, including a brief statement about the direction, relevance and importance of the revised program. Describe the overall aim and intended impact of the revised program. Describe the consistency of the revised program with the institution's mission, goals and objectives as defined in its strategic plan. (to view the strategic plan go to: [www.uwindsor.ca/president](http://www.uwindsor.ca/president))*

**Relevance and Importance:** Within Canada, the environmental job market is thriving, and reached 24,500 job ads online in 2018 (ECO Canada, 2019). Specific fields within the environmental sector have communicated the need for inter-organization collaboration between universities and colleges (ECO Canada, 2018) as well as curricular programming to address labour gaps, particularly in agri-science and agri-business (Government of Canada, 2018; Ghanam, 2017; University of Windsor, 2017).

To help address these needs, the School of the Environment is proposing a new stream, **Applied Environmental Science**, within the Bachelor of Science Honours Environmental Science program to recognize the ambitions of some college graduates from environmentally related programs (i.e., graduates who have an in-depth scientific knowledge of environmental theories, concepts, and techniques, as well as significant applied experiences garnered through the completion of a CAAT diploma, or equivalent). The environmental-related programs considered in Ontario include: Environmental Technician (MCU code 52700) and Forestry Technician (MCU 54203). Additional CAAT programs across Canada could be applicable and will be reviewed for consideration on an ad-hoc basis. This stream will facilitate a new degree completion pathway, structured as a '2+2' where students will earn a diploma from a recognized CAAT (or equivalent) in two years, followed by completing their degree at the University of Windsor in an additional two years. The Dean of Science has discussed this new stream and degree completion pathway with the Vice President Academic at St. Clair College and has received their support. St. Clair college will also help advertise and promote this program to their students as well as advice students on how to successfully transfer into this new stream (see Appendix B for the letter of support).

This new stream aligns with the Ontario Government's movement towards transfer systems (Ontario MTCU, 2011) by offering a transparent pathway for students to move between postsecondary institutions without repeating previously learned material. Furthermore, this new stream will cater to the growing demand for hybrid higher education in Ontario (Brown, 2016) and the increasing number of job openings in environmental fields (ECO Canada,

2018; see additional employment data in 'B.4 Demand for the Modified program' Table 1). This new stream will increase the overall enrollment in Science, specifically in the School of the Environment, by recruiting college graduates to complete the new stream while not requiring additional resources beyond what is associated with typical program growth.

This new stream, although distinct from the traditional four-year Environmental Science degree, has been mapped to show equivalency in terms of the program-level learning outcomes and careful consideration has been given to the program standards students would have met following the successful completion of their CAAT diploma (or equivalent). The new stream offers complementary, yet equivalent, learning outcomes with differing focuses when compared to the traditional four-year degree. CAAT program standards have been mapped against the stream learning outcomes to ensure students entering the stream are sufficiently prepared to be successful. The new stream recognizes the applied experiences students will have garnered through their CAAT diploma, whereas the traditional 4-year program will offer students enhanced learning opportunities such as undergraduate research experiences and access to a greater range of courses from which to choose that offer high-impact learning experiences compared to those students in the new stream. While both programs offer hands-on experiences, students in the traditional 4-year program will gain these through the University of Windsor, while students in the stream would have already acquired these at the college; thus, students within the new stream will not negatively impact the availability of high impact courses for students in the 4-year program.

**Aim and Impact:** This new stream in Applied Environmental Science will offer a degree completion pathway for CAAT graduates from selected environmental-related programs. Specifically, students may obtain a Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream following the completion of an environmental-related CAAT (or equivalent) diploma program (see section C.1 Admission Requirements for more information on admission). Degree completion pathways will vary depending on the CAAT diploma program students complete; however, all students will complete 20 courses at the University of Windsor. Providing different degree completion pathways from environmental-related CAAT programs will ensure that courses within CAAT diploma programs are not duplicated (see C.2. Program Curriculum Structure/Program of Study for details on course requirements for each degree completion pathway). These degree completion pathways will help to streamline and harmonize the student experience. The stream will provide an efficient pathway for students to combine their career-oriented college education with a strong theoretical science background. Students will receive diverse learning experiences from a variety of sources, including experiential learning and high impact practices that will position them for future career success as well as opportunities to pursue post-graduate education. Please see section 'C.4 Learning Outcomes' for a detailed description of the knowledge, skills, and abilities students will have gained upon successful completion of the new program stream.

Please note, some entering CAAT students may have to complete courses from a summer bridging program (i.e., Foundations of Science Preparation Program) from Continuing Education to ensure they meet the basis for admission with respect to the pre-requisite course entrance requirements, should the student be deficient of required specific courses in their prior CAAT or secondary school education. However, this will vary by student depending on their educational background. Please see Appendix C for confirmation that Continuing Education is committed to offering Foundation programming in July 2020.

The availability of this stream, which recognizes the courses students completed at a CAAT, will allow the Faculty of Science to remain competitive with other institutions that have transfer/articulation agreements in place and provide accessible and transparent opportunities for movement between postsecondary institutions, thus aligning with the Ontario Government's "Policy Statement for Ontario's Credit Transfer System" (Ontario MTCU, 2011). We believe our degree completion pathways will be an attractive option for students wanting to earn a university degree, due to the potential cost savings compared to direct entry into a four-year degree program (Trick, 2013). Students will also earn two credentials - a diploma and degree in four years (assuming full time status).

**Consistency with Institutional Goals:** This new stream recognizes a range of environmental areas (e.g., forestry, horticulture, etc.) and aligns with several *Strategic Areas of Program Strength and Expansion* within the SMA by addressing 'Environment and Ecosystem Adaptation and Recovery', 'Physical and Chemical Sciences' (point five and

ten within the program areas of strength) and 'Engineering, Science, and Computing' (point three within program areas of expansion). This program also aligns with the area of 'Health and Wellness' which is both a program area of strength (point six) and expansion (point 1) in the SMA. This new stream will help address the need for trained persons within the environmental sector (ECO Canada, 2019) and will contribute to the University of Windsor's commitment to providing learning experiences that will prepare students for life after graduation and employment in the environmental sector by recognizing the importance of applied and theoretical learning experiences. The proposed stream also contributes to the University of Windsor's mission, goals and objectives through improving the student learning experience in the area of career preparation and innovations in teaching and learning excellence, through the provision of high impact learning experiences. This stream will also provide additional opportunities to build partnerships with colleges and expand the University of Windsor's college-university pathway development.

## References:

Brown, L. (2016). Transferring credits between college and university can be rocky. *Maclean's*. Retrieved from <https://www.macleans.ca/education/college/transferring-credits-between-college-and-university-can-be-rocky/>

ECO Canada. (2019). Environmental job market trends in 2018. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Job-Posting-Trends-2018-June-2019.pdf>

ECO Canada. (2018). Environmental assessments and the workforce in Canada. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Environmental-Assessments-and-the-Workforce-in-Canada.pdf>

Government of Canada. Agriculture and Agri-Food Canada. (2018). The Government of Canada invests in innovation to support the Canadian greenhouse sector. Retrieved from <https://www.canada.ca/en/agriculture-agri-food/news/2018/11/the-government-of-canada-invests-in-innovation-to-support-the-canadian-greenhouse-sector.html>

Ghanam, D. (2017). Agri-business centre of excellence: A feasibility study on creating a sector-specific skills training and education facility for the Leamington area. Retrieved from <http://leamingtonchamber.com/wp-content/uploads/2017/12/Final-ACE-Report.pdf>

Ontario Ministry of Training, Colleges and Universities. (2011). Policy statement for Ontario's credit transfer system. Retrieved from [https://www.ontransfer.ca/files\\_docs/content/pdf/en/news\\_and\\_events/news\\_and\\_events\\_2.pdf](https://www.ontransfer.ca/files_docs/content/pdf/en/news_and_events/news_and_events_2.pdf)

Trick, D. (2013) College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

University of Windsor. (2017). University of Windsor Community Consultations Winter 2017. Retrieved from [http://www.uwindsor.ca/president/sites/uwindsor.ca.president/files/report\\_on\\_community\\_consultations\\_2017.pdf](http://www.uwindsor.ca/president/sites/uwindsor.ca.president/files/report_on_community_consultations_2017.pdf)

## B.2 Changes to Program Content (QAF Section 2.1.4)

*Evidence that the revised curriculum is consistent with the current state of the discipline or area of study.*

We are proposing a new stream in **Applied Environmental Science**. This new stream will recognize students who have an in-depth scientific knowledge of environmental theories, concepts, and techniques, as well as significant applied experience gained through their CAAT diploma program or equivalent. As such, this stream is consistent with the current discipline of environmental science.

Across Canada, there are a number of diploma-to-degree pathways, and transfer and articulation agreements between universities and colleges for environmental programs (e.g., Western, Trent University, University of Guelph, Algoma University, University of British Columbia, University of Alberta). Providing college graduates from specific environmental diploma programs an opportunity to receive credits towards a university degree is common within the current state of the discipline. For example, institutions such as York University offer block transfer arrangements with colleges. Similarly, Durham College and the University of Ontario Institute of Technology (UOIT) have adopted a 2+2 model with a summer bridging program for college graduates wishing to transfer to high-affinity degree programs at UOIT. Algoma University offers a '2+2 diploma to degree program' where students from specific college environmental programs (e.g., Forestry Technician, Natural Environment Technician) receive 60 transfer credits towards a BSc in Environmental Science (Honours) and subsequently complete 60 additional course credits (i.e., 20 courses over four semesters) at the University of Algoma. Therefore, there is precedence for credit transfer and degree completion pathways between universities and colleges, along with an appropriate bridge program to ensure a college graduate will both satisfy the program entrance requirements and are prepared to succeed in their university classes.

### **B.2.1 Unique or Innovative Curriculum, Program Delivery, or Assessment Practices (QAF Section 2.1.4)**

*State the unique or innovative curriculum, program delivery, or assessment practices distinguishing the revised program from existing programs elsewhere.*

Through the degree completion pathways, from recognized environmental-related diploma programs, students will be admitted into the Bachelor of Science Honours Environmental Science - Applied Environmental Science Stream. The enrollment in this stream will consist only of graduates from two-year CAAT diploma programs in environmentally related fields, or equivalent. Three-year diploma programs in relevant environmental-related fields will be analyzed for additional potential credit transfer on an ad-hoc basis, while considering minimum residency and core course requirements. This structure will facilitate a sense of community and collaboration among peers. The new stream will benefit students by recognizing the value of career-oriented educational experiences learned at college, while complementing these applied experiences with in-depth scientific knowledge, theories, and principles gained through university courses. Additionally, this new degree completion pathways, facilitated through the new stream, will streamline and harmonize the student experience by ensuring college course content is not duplicated, while offering a diverse learning opportunity as students will arrive from different environmental-related fields allowing for multidisciplinary information sharing and varied perspectives.

The new stream and degree completion pathways were intentionally designed based upon the analysis of CAAT program standards set forth by the Ministry of College and Universities (MCU). Program standards apply to all similar programs of instruction offered by publicly funded colleges across the province. The development of program standards by the Ministry first started in the 1990s to bring more consistency to college programming, broaden the skills of college graduates to include essential employability skills and provide accountability for the quality and relevance of college programs (MCU, 2017). Thus, by mapping these program standards against our curriculum and utilizing the information to develop a customized program stream and degree completion pathways, rather than targeting specific programs at specific CAATs, we are able to widen our recruitment scope to any CAAT program in Ontario that falls under these standards (see Appendix D for details on the review and analysis of CAAT program standards and curriculum mapping). In addition to working within the program standard framework set forth by MCU, these institutions are required to follow a rigorous quality review process at a program level basis on a regular frequency.

In most jurisdictions, the cost to the government and the student of a degree achieved through two years at the college followed by two year at the university is lower than a four-year university program (Trick, 2013.). As a result, our degree completion pathways allow students to gain applied educational experiences at the college, while also saving money compared to completing four years of full time study at a university.

#### **References:**

MCU. (2017). Published college program standards. Retrieved from <http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/>

Trick, D. (2013). College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

### B.2.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing or revising this program, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

Indigenous content, perspectives, and material may be included in various courses at the discretion of the instructor. Individual instructors will review course materials and identify areas where indigenous content can be integrated to provide the indigenous perspective of a topic.

### B.3 Changes to Program Name and Degree Designation/Nomenclature (QAF Section 2.1.1; Ministry section 1)

*Explanation of the appropriateness of the proposed new name and degree designation for the program content and current usage in the discipline*

The proposed name for the new stream, **Applied Environmental Science** recognizes both the subject area of study and the applied/technical educational experiences students received within their CAAT diploma. Therefore, we believe the name is representative of the program content and current usage in the discipline.

### B.4 DEMAND FOR THE MODIFIED PROGRAM

#### B.4.1 Expected Impact of the Proposed Changes to Student and Market Demand

*Describe the tools and methodology used to conduct the market assessment in support of the proposed program revisions.*

*Provide Quantitative evidence of student and market demand for the revisions to the program, both within and outside the local region (e.g., responses/statistics from surveys, etc.).*

Multiple secondary data sources were used to assess the market demand for the new stream in Applied Environmental Science. Across data sources, evidence suggests that the environmental sector is thriving and there are a large number of job opportunities available for new graduates within Ontario and across Canada. The new program stream will help address the need for trained individuals within the environmental sector.

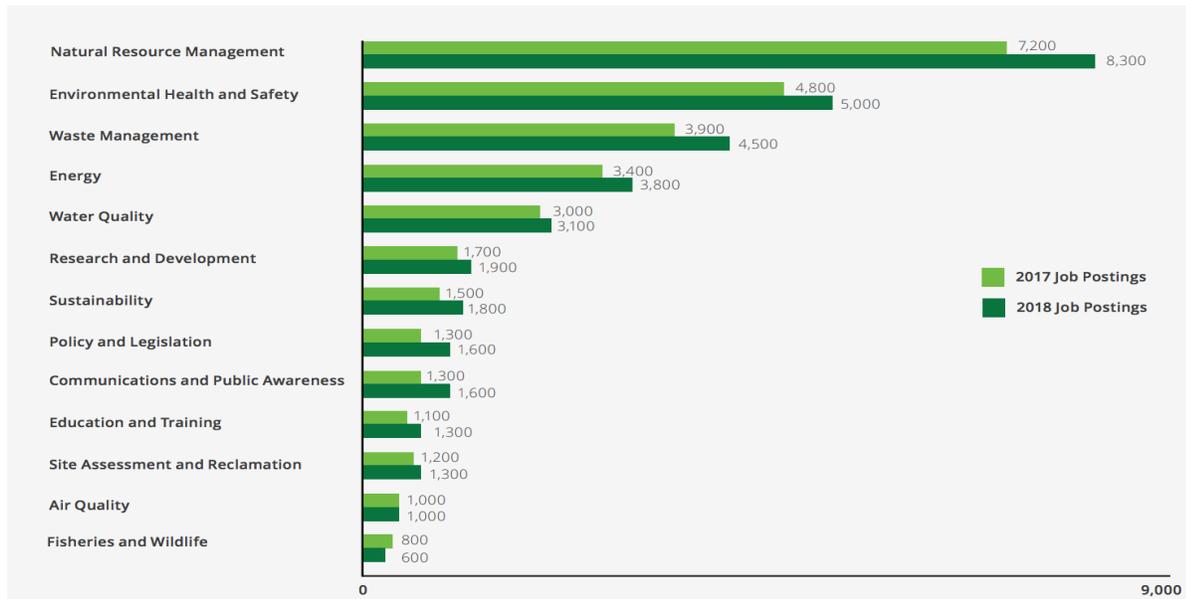
**Labour Market Data:** There is consistent evidence supporting the need for trained individuals to support the growing environmental sector (ECO Canada, n.d.). The Environmental Careers Organization (ECO) provides a comprehensive analysis of labour trends within the environmental profession in Canada. Specifically, ECO Canada gathers and analyzes skill and labour market trends using job posting analysis, real-time labour market information, secondary statistics, and sector profiling. ECO Canada classifies environmental into three areas:

- environmental protection (i.e., air quality, water quality, site assessment and reclamation, waste management, health and safety)
- resource management (i.e., energy, fisheries and wildlife, natural resource management)
- environmental sustainability (i.e., sustainability, education and training, research and development, policy and legislation, and communication and public awareness) (ECO, 2019)

Within Canada, the environmental job market continues to expand and reached 24,500 job ads online in 2018 – an 8% increase from 2017, and 17% increase from 2016. Ontario had the largest share of environmental job ads in 2018 (35%). There has been an increase in the number of job postings for 11 of the 13 environmental sectors (see Figure 1 below) suggesting that there is demand for individuals who are skilled in these areas (ECO Canada, 2019). Furthermore, *Indeed Canada* illustrated that careers as director of environmental services, environmental

scientists, environmental technicians, environmental specialists, and environmental compliance specialists are in demand and growing rapidly (Dubé, 2018). Many of these positions would benefit from the combination of a college diploma and university degree. As such, students who complete the Applied Environmental Science stream will be prepared with the scientific knowledge of environmental theories, concepts, and techniques as well as the hands-on experiences garnered through their college diplomas that are necessary to hold careers in the aforementioned environmental areas.

**Figure 1. Number of Environment Job Ads, by Environmental Sector, 2017 and 2018**



ECO Canada. (2019). Environmental job market trends in 2018. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Job-Posting-Trends-2018-June-2019.pdf>

Within Ontario, labour market information suggests that there are growing job opportunities within a number of environmental fields (Ministry of Labour, Training and Skills Development, 2017; see Table 1 for examples). Given that this new stream recognizes CAAT diplomas in a number of environmental areas (e.g., environmental technician) as well as requires the completion of 20 core university courses, students will develop both a depth and breadth skills to be well-positioned for a multitude of careers in the environmental sector (see Table 1).

**Table 1. Employment statistics**

Job profile	Median income	Projected number of job openings (2017-2021)	Job outlook (2017-2021)	Number of job postings	Unemployment rate
Biologist and related scientists	\$74,703	2,001-3,000	Above average*	803	4.3% <sup>+</sup>
Natural and applied science policy researchers, consultants and program officers	\$85,673	1,001-2,000	Undetermined	89	3.3% <sup>+</sup>
Inspectors in public and environmental health and occupational health and safety	\$78,208	4,001-5,000	Above average	1116	4% <sup>+</sup>
Agricultural representatives, consultants and specialist	\$59,237	101-200	Undetermined	40	3% <sup>+</sup>

Landscape and horticulture technicians and specialists	\$48,831	1,001-2,000	Above average	123	5.3% <sup>+</sup>
Managers in horticulture	\$47,045	201-300	Average*	24	1.8% <sup>+</sup>
Contractors and supervisors landscaping, grounds maintenance and horticulture services	\$43,643	\$4,001-5,000	Average	113	3.6% <sup>+</sup>
Biological technologists and technicians	\$61,533	801-900	Average*	92	8.3%
Forestry professionals	\$81,943	101-200	Above average*	18	2.8% <sup>+</sup>
Forestry technologists and technicians	\$63,172	201-200	Average*	68	10%
Supervisors, logging and forestry	\$74,618	101-200	Undetermined	0	5.4% <sup>+</sup>

**Note:** These data were gathered from the Ministry of Training, Colleges and Universities Ontario's labour market website for the aforementioned job profiles.

<sup>^</sup>Job outlook ratings can tell you how future demand for this job is expected to compare with other jobs across Ontario.

\*indicates this occupation was assessed as part of a broader group of similar occupations due to sample size restrictions.

<sup>+</sup>Unemployment rate is below the National unemployment rate (5.5% as of June 2019) within Canada:

<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028703>

Biologist and related scientists: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2121>

Natural and applied science policy researchers, consultants and program officers:

<https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=4161#projJobOpeningsSection>

Inspectors in public and environmental health and occupational health and safety:

<https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2263>

Agricultural representatives, consultants and specialist: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2123>

Landscape and horticulture technicians and specialists: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2225>

Managers in horticulture: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=0822>

Contractors and supervisors landscaping, grounds maintenance and horticulture services:

<https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=8255>

Biological technologists and technicians: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2221>

Forest professionals: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2122>

Forestry technologists and technicians: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=2223>

Supervisors, logging and forestry: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=8211>

The labour data from ECO Canada and the MCU's Ontario's labour market analysis provide strong support that there are current and projected job openings in many environmental sectors that have low unemployment rates and positive job outlooks. The Applied Environmental Stream will facilitate recognition of students' hands-on experiences gained through the completion their college diplomas and the in-depth scientific knowledge they will acquire through the core courses completed at the University of Windsor. This combination of theoretical and applied scientific knowledge will ensure students are attractive candidates for these jobs. Please see section 'B.4.4 Evidence of Societal Need for the Revised Program' for information on employer and organizational requests for trained individuals in environmental sectors.

**Student data:** It is projected that the number of students seeking a baccalaureate education across all disciplines will increase from 50,000 to 104,000 from 2009 to 2025 (Trick, 2013). Projected Ontario cost scenarios for college-to-university transfer programs suggest cost savings to students who can complete a university degree in a total of four years of study (e.g., 2 years at college + 2 years at university; 2+2 model). Savings exist for technology programs up until a college student requires more than five years of study (Trick, 2013). College graduation rates from environmental programs (see Table 2) suggest that there is a large pool of potential students to attract into the Applied Environmental Science stream. Our projected enrollment of 25 students per year would require us to attract a modest ~5.1% of college graduates each year from environmental-related programs. We believe meeting this target will be very feasible and that our new stream will be an attractive option to college graduates wishing to earn a university degree due to potential cost savings and the opportunity to earn two credentials in a four-year span. Following the approval of this new program stream, the Faculty of Science will formally begin their recruitment plan. This includes emailing recruitment flyers to all program coordinators of relevant environmental science related programs as well as launching a social media campaign targeted towards individuals who meet the

program’s demographics. In the Spring of 2021, additional recruitment efforts (e.g., site visits) will take place in order to achieve the projected steady state in year two. The Dean within the Faculty of Science has discussed this new stream and degree completion pathway with the Vice President Academic at St. Clair College and has received their support. St. Clair college will help advertise the program (see Appendix B).

**Table 2. Number of graduates of full-time postsecondary college programs**

Program	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
<i>Environmental Technician</i>	347	326	346	338	374	331
<i>Forest Technician</i>	133	129	119	123	148	154
<b>Total</b>	480	455	465	461	522	485

Data source: Ministry of Training, Colleges and Universities. (2018). Labour Market. Retrieved from <https://www.app.tcu.gov.on.ca/eng/labourmarket/employmentprofiles/compare.asp>

Based upon the review of market demand and college graduation rates, the proposed new stream will assist students with the development of technical knowledge and skills in environmental fields, addressing a current gap in the labour market.

## References

Dubé, D. (2018). 7 ‘green jobs’ for environmentally conscious Canadians in demand now. Retrieved from <https://globalnews.ca/news/4154971/7-green-jobs-in-demand/>

ECO Canada. (2019). Environmental job market trends in 2018. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Job-Posting-Trends-2018-June-2019.pdf>

ECO Canada. (2018). Environmental assessments and the workforce in Canada. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Environmental-Assessments-and-the-Workforce-in-Canada.pdf>

ECO Canada. (n.d.). Environmental assessment analyst. Retrieved from <https://www.eco.ca/career-profiles/environmental-assessment-analyst/>

Ministry of Labour, Training and Skills Development. (2017). Ontario’s labour market. Retrieved from <https://www.ontario.ca/page/labour-market>

Trick, D. (2013). College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

### B.4.1.1 Percentage of Domestic and International Students (Ministry section 5)

*Expected proportion (percentage) of domestic and international students. For graduate programs, identification of undergraduate or master’s programs from which students would likely be drawn.*

We expect all students to be domestic.

### B.4.2 Estimated Enrolments (QAF section 2.1.9; Ministry section 5; Senate Co-op Policy)

*Provide details on projected enrolments for the revised program in the following tables.*

*For Co-op programs: normally an annual intake of a minimum of 20 students is required for new co-op programs or programs with other experiential learning component.*

<i>Projected enrolment levels for the first five years of operation of the revised program. (If the program is in operation, use actual and projected data.)</i>	First Year of Operation	Second Year of Operation	Third Year of Operation	Fourth Year of Operation	Fifth Year of Operation (Steady-state enrolment overall)
<i>In the regular program (non-co-op)</i>	25	45	45	45	
<i>In the co-op/experiential learning stream (if applicable)</i>					
<i>For co-op options: projected number of international students enrolled in the co-op stream</i>					

<i>Annual projected student intake into the first year of the revised program: (this may differ from the “first year of operation” projected enrolments which could include anticipated enrolments from students transferring into the second, third, or fourth year of the program)</i>	25 Attrition of 5 by year two
<i>Annual projected student intake into the first year of the co-op/experiential learning version of the revised program: (this may differ from the “first year of operation” projected enrolments which could include anticipated enrolments from students transferring into the second, third, or fourth year of the program)</i>	N/A

#### **B.4.3 New Involvement in a Collaborative Program/Changes to Collaborative Program (QAF section 1.6)**

*If this is a new collaborative program with another college/university, or revision to a collaborative program, identify partners and institutional arrangements for reporting eligible enrolments for funding purposes.*

N/A

#### **B.4.4 Evidence of Societal Need for the Revised Program (Ministry section 6)**

*Describe the tools and methodology used to assess societal need.*

*Elaborate on the*

- 1) dimensions of (e.g., socio-cultural, economic, scientific, or technological),*
- 2) geographic scope of (e.g., local, regional, provincial, or national), and*
- 3) anticipated duration of, and trends in, societal need for graduates of the modified program*

*Provide evidence that the proposed program revisions respond to societal need for graduates of the revised program and/or changes in the field, including sources of data and expert input or feedback collected to support this change in direction.*

A report realised by The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concluded that biodiversity is decreasing at a faster rate than any time in history (Díaz et al., 2019) and linked five key drivers of changes to nature: 1) changes in land and sea use; 2) direct exploitation of organisms; 3) climate change; 4) pollution; 5) and invasive alien species. Authors provided evidence that global goals for conserving and sustainably using nature and meeting sustainability cannot be met by current trajectories and goals for 2030 and argued for transformative changes across economic, social, political, and technological realms (Díaz et al., 2019). In order to facilitate these transformative changes and minimize the negative impact of the five key factors

changing nature, society must have individuals trained in environmental fields to support concerted efforts to transform the current state of biodiversity globally. Beyond the data provided within this report, researchers have noted the loss of biodiversity on Earth as Earth's sixth mass extinction (Ceballos, Ehrlich, & Dirzo, 2017). The new stream in Applied Environmental Science will support the training of students to be environmentally conscious and responsible citizens capable of being part of the multi-faceted changes needed to protect the environment, including the ability to make informed decisions regarding environmental resources.

Beyond the global need for awareness and action towards sustainability, organizations and employers have noted skill gaps within different environmental sectors as well as the need for targeted curricula. Specifically, there is strong and urgent need for inter-organization collaboration from universities, colleges, research institutions, and industry to help develop skills related to environmental assessment (ECO Canada, 2018). This new stream will help cater to the call for collaboration between colleges and universities in order to communicate environmental assessment knowledge and expertise. Within the agri-business sector, there has been a consistent labour shortage within the greenhouse industries (Government of Canada, 2018; The Ontario Greenhouse Alliance, 2006) and employers have noted skills gaps in all levels of the agri-business sector and often have a difficult time recruiting trained individuals for a number of positions (e.g., grower, crop scout, etc.). As a result, employers have suggested that experiential learning opportunities within post-secondary programs would help prepare students for a profession in the agri-business sector (Ghanam, 2017). Similarly, industry stakeholders at the 2017 University of Windsor Community Consultations requested support for the local agriculture industry, including expanding research, curricular, and programming in agri-science/agri-business and greenhouse technologies. As such, the proposed new stream will help to address the shortage of trained and qualified individuals by recognizing important applied skills gained through the college and complimenting these with relevant scientific theory learned through university courses. For information on labour and student market demand, please see section B. 4.1.

This new stream will facilitate college-to-university transfers in a visible way and address the movement towards comprehensive, transparent, and consistently applied credit transfers (Ontario MTCU, 2011). Our diploma-to-degree model which is facilitated through a degree completion pathway, will ensure cost saving for students and the government by eliminating credit duplication and improve Ontario's ability to meet the demand for a skilled and flexible workforce through building capacity and flexibility in postsecondary education (Ontario MTCU, 2011). Moreover, the demand for hybrid higher education in Ontario is growing, with 55,000 students each year switching institutions, and 40% of these students moving from a college to a university (Brown, 2016). Based on cost projections determined by the Higher Education Quality Council of Ontario, our suggested pathway for students completing a degree will offer a less expensive route to earning a degree compared to students completing the direct entry route into university (Trick, 2013).

## References

- Brown, L. (2016). Transferring credits between college and university can be rocky. *Maclean's*. Retrieved from <https://www.macleans.ca/education/college/transferring-credits-between-college-and-university-can-be-rocky/>
- Ceballos, G., Ehrlich, P. R., Dirzo, R. (2017). Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines. *Proceedings of the National Academy of Sciences of the United States of America*, 114(3). E6089–E6096.
- Díaz, S., Settele, J., Brondízio, E., Ngo, H. T., Guèze, M., Agard, J., . . . Zayas, C. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Retrieved from [https://www.ipbes.net/sites/default/files/downloads/spm\\_unedited\\_advance\\_for\\_posting\\_htn.pdf](https://www.ipbes.net/sites/default/files/downloads/spm_unedited_advance_for_posting_htn.pdf)
- ECO Canada. (2018). Environmental assessments and the workforce in Canada. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Environmental-Assessments-and-the-Workforce-in-Canada.pdf>

Ghanam, D. (2017). Agri-business centre of excellence: A feasibility study on creating a sector-specific skills training and education facility for the Leamington area. Retrieved from <http://leamingtonchamber.com/wp-content/uploads/2017/12/Final-ACE-Report.pdf>

Government of Canada. Agriculture and Agri-Food Canada. (2018). The Government of Canada invests in innovation to support the Canadian greenhouse sector. Retrieved from <https://www.canada.ca/en/agriculture-agri-food/news/2018/11/the-government-of-canada-invests-in-innovation-to-support-the-canadian-greenhouse-sector.html>

Ontario Ministry of Training, Colleges and Universities. (2011). Policy statement for Ontario's credit transfer system. Retrieved from [https://www.ontransfer.ca/files\\_docs/content/pdf/en/news\\_and\\_events/news\\_and\\_events\\_2.pdf](https://www.ontransfer.ca/files_docs/content/pdf/en/news_and_events/news_and_events_2.pdf)

The Ontario Greenhouse Alliance. (2006). Greenhouses grow Ontario: An economic impact study of the greenhouse industry in Ontario. Retrieved from <http://www.planscape.ca/planscapePDFs/50-plan1.pdf>

Trick, D. (2013) College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

University of Windsor. (2017). University of Windsor Community Consultations Winter 2017. Retrieved from [http://www.uwindsor.ca/president/sites/uwindsor.ca.president/files/report\\_on\\_community\\_consultations\\_2017.pdf](http://www.uwindsor.ca/president/sites/uwindsor.ca.president/files/report_on_community_consultations_2017.pdf)

#### **B.4.5 Duplication (Ministry section 7)**

*List similar programs offered by other institutions in the Ontario university system. Resources to identify similar programs offered in Ontario include [www.electronicinfo.ca](http://www.electronicinfo.ca), [www.electronicinfo.ca/einfo.php](http://www.electronicinfo.ca/einfo.php), and [www.oraweb.uacc.ca/showdcu.html](http://www.oraweb.uacc.ca/showdcu.html). Also, list similar programs in the geographically contiguous area, e.g., Michigan/Detroit.*

Degree programs in Science are available at most institutions across Ontario, as are programs in Environmental Science. Within Ontario there are a number of diploma-to-degree pathways as well as transfer and articulation agreements between universities and colleges for environmental programs. Some of the institutions that offer these programs include, though are not limited to\*:

- Western
- Trent University
- University of Guelph
- Algoma University
- York University
- Lakehead
- Royal Military College of Canada

Despite the possible similarities that exist, it is important for the School of the Environment to offer degree completion pathways for college students in order to stay competitive with other institutions' programming.

\*Note: for a comprehensive list of all transfer options, please see: [https://www.ontransfer.ca/index\\_en.php](https://www.ontransfer.ca/index_en.php)

#### **B.4.5.1 Demonstrate that Societal Need and Student Demand Justify Duplication (Ministry section 7)**

*If the revised program is similar to others in the system, demonstrate that societal need and student demand justify the duplication. Identify innovative and distinguishing features of the revised program in comparison to similar programs.*

Despite the existence of diploma-to-degree pathways and transfer and articulation agreements between universities and colleges for environmental programs at other institutions, the growing number of available jobs within environmental sectors (ECO Canada, 2019), along with the mounting concern over the current state of biodiversity across the globe (Díaz et al., 2019), justifies any similarities. Furthermore, the new stream requires no additional resources beyond those associated with typical program growth, but will increase the overall enrollment in the School of the Environment. The availability of this stream, which recognizes the courses students completed at the college, will allow the Faculty of Science and School of the Environment to remain competitive with other institutions that have transfer/articulation agreements in place. We believe our diploma-to-degree pathway will be an attractive option to students as programs at other institutions may take longer to complete in order for students to earn their degrees. Furthermore, the Applied Environmental Stream recognizes any college environmental-related program which aligns with specific Ministry Program Standards, which allows for a larger recruitment scope and differentiates itself from institutions whose transfer/articulation agreements are tied to specific colleges.

Díaz, S., Settele, J., Brondízio, E., Ngo, H. T., Guèze, M., Agard, J., . . . Zayas, C. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Retrieved from:

[https://www.ipbes.net/sites/default/files/downloads/spm\\_unedited\\_advance\\_for\\_posting\\_htn.pdf](https://www.ipbes.net/sites/default/files/downloads/spm_unedited_advance_for_posting_htn.pdf)

ECO Canada. (2019). Environmental job market trends in 2018. Retrieved from <https://www.eco.ca/wp-content/uploads/ECO-Canada-Job-Posting-Trends-2018-June-2019.pdf>

## **B.5 RESOURCES**

*[The resource impact of a proposal is almost never neutral. Note: Proposers must also complete and submit the attached **Budget Summary** (Appendix A) with the revised program proposal.]*

### **B.5.1 Resources Available**

#### **B.5.1.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the program change(s). Please do not name specific individuals in this section.*

Courses within this new stream are offered regularly within the current academic calendar, such that there are no anticipated additional resources, aside from a small number of GAs/TAs required to offer this new stream. The vast majority of courses are offered from the School of the Environment; which has considerable capacity for growth and will be able to accommodate the projected increases in enrollment. The core university courses required are regularly offered by faculty members within departments within Science. Faculty teaching courses within this stream have current knowledge and expertise that are central to the program curriculum.

Administrative tracking will be provided within the UWinsite Student system. Academic advising will occur within the School of the Environment. The advisor responsible for the B.Sc. Honours Environmental Science will also advise students on matters related to the new stream, including appropriate sequencing and course selection.

#### **B.5.1.1a Faculty Members Involved in the Delivery of the Program**

*Complete the following table listing faculty members in the AAU offering the program as well as faculty members from other AAUs who are core to the delivery of the revised program. Indicate in the table the involvement of each faculty member in the revised and existing program(s) offered by the AAU.*

**Note:** Faculty program affiliations will be the same for the existing and new programs stream. In addition to faculty from the School of the Environment, only the faculty members from departments outside of the School of the

Environment (e.g., biology, chemistry, etc.) who teach core courses within this new stream were included in the table below.

Faculty Name and Rank (alphabetical)	Graduate Faculty member (for graduate programs only)	Program Affiliation: indicate faculty affiliation to the EXISTING program(s)	Program Affiliation: indicate faculty affiliation to the REVISED program
<b>Category 1: Tenured Professors teaching exclusively in the AAU offering the program</b>			
Dr. Ihsan Al-Aasm, Professor	N/A	School of the Environment	School of the Environment
Dr. Maria Cioppa, Associate Professor	N/A	School of the Environment	School of the Environment
Dr. Ken Drouillard, Professor	N/A	School of the Environment	School of the Environment
Dr. Aaron Fisk, Professor	N/A	School of the Environment	School of the Environment
Dr. Joel Gagnon, Professor, Director	N/A	School of the Environment	School of the Environment
Dr. Chris Houser, Professor, Dean of Science	N/A	School of the Environment	School of the Environment
Dr. Hugh MacIsaac, Professor	N/A	School of the Environment	School of the Environment
Dr. Robert McKay, Professor	N/A	School of the Environment	School of the Environment
Dr. Ali Polat, Professor	N/A	School of the Environment	School of the Environment
Dr. Iain Samson, Professor	N/A	School of the Environment	School of the Environment
Dr. Frank Simpson, Professor	N/A	School of the Environment	School of the Environment
Dr. Christopher Weisener, Professor	N/A	School of the Environment	School of the Environment
Dr. Jianwen Yang, Professor	N/A	School of the Environment	School of the Environment

<b>Category 2: Tenure-track Professors teaching exclusively in this AAU</b>			
Dr. Jill Crossman, Assistant Professor	N/A	School of the Environment	School of the Environment
Dr. Cameron Proctor, Assistant Professor	N/A	School of the Environment	School of the Environment
<b>Category 3: Ancillary Academic Staff such as Learning Specialists Positions</b>			
Ms. Michelle Bondy, AAS I	N/A	School of the Environment	School of the Environment
Ms. Alice Grgicak-Mannion, AAS III	N/A	School of the Environment	School of the Environment
Dr. Pardeep Jasra, AAS II	N/A	School of the Environment	School of the Environment
<b>Category 4: Limited-term Appointments teaching exclusively in this AAU</b>			
...			
<b>Category 5: Tenure or tenure-track or LTA professors involved in teaching and/or supervision in other AAUs, in addition to being a member of this AAU</b>			
...			
<b>Category 6: Sessionals, Sessional Lecturers, and other non-tenure track faculty</b>			
Dr. Neil Porter, Sessional Lecturer II	N/A	School of the Environment	School of the Environment
<b>Category 7: Others- Tenure, tenure-track, LTA professors, or sessionals involved in teaching and/or supervision in other AAUs.</b>			
Dr. Belalia Mohamed, Assistant Professor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Phil Dutton, Associate Dean, Faculty of Science	N/A	Chemistry and Biochemistry	Chemistry and Biochemistry
Dr. Catherine Febria, Assistant Professor	N/A	Integrative Biology	Integrative Biology
Dr. Azra Ghumman, Sessional instructor	N/A	Chemistry and Biochemistry	Chemistry and Biochemistry
Dr. Nigel Hussey, Associate Professor	N/A	Integrative Biology	Integrative Biology
Dr. Abida Mansoor, Sessional instructor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Dan Mennill, Associate Dean, Graduate Studies & Research	N/A	Integrative Biology	Integrative Biology
Dr. Trevor Pitcher, Associate Professor	N/A	Integrative Biology	Integrative Biology

Dr. Animesh Sarker, Lecturer	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Julie Smit, Learning Specialist, iBio Undergraduate Chair and Advisor	N/a	Integrative Biology	Integrative Biology
Dr. Jing Wang, Sessional instructor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Zhuo Wang, Associate Professor	N/A	Chemistry and Biochemistry	Chemistry and Biochemistry

#### **B.5.1.1b Faculty Expertise Available and Committed to Supporting the Revised Program**

*Assess faculty expertise available and actively committed to supporting the revised program. Provide evidence of a sufficient number and quality of faculty who are qualified to teach and/or supervise in the revised program, and of the appropriateness of this collective faculty expertise to contribute substantially to the revised program.*

*Include evidence (e.g., qualifications, research/innovation/scholarly record) that faculty have the recent research or professional/clinical expertise needed to:*

- *sustain the program*
- *promote innovation, and*
- *foster an appropriate intellectual climate.*

All courses from the University of Windsor are offered from the School of the Environment, Department of Integrative Biology, Department of Chemistry and Biochemistry, and Department of Mathematics and Statistics. These courses are offered regularly within the undergraduate calendar and are already taught by expert faculty. As such, there is already a sufficient number of highly qualified faculty to support this new stream. The faculty teaching these courses are specialists in the area who have expertise in the subjects that are central to the new program stream. These expert faculty have published in leading national and international journals on topics (or similar topics) to the courses offered within the program.

#### **B.5.1.1c Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program**

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the revised program.*

There is no anticipated reliance on adjunct, limited-term, or sessional faculty beyond what is already being used.

#### **B.5.1.1d Graduate Faculty Qualifications and Supervisory Loads (FOR GRADUATE PROGRAMS ONLY)**

*Explain how supervisory loads will be distributed, and describe the qualifications and appointment status of faculty who will provide instruction and supervision in the revised program.*

N/A

#### **B.5.1.1e Financial Assistance for Graduate Students (where appropriate) (FOR GRADUATE PROGRAMS ONLY)**

*Where appropriate to the revised program, provide evidence that financial assistance for graduate students will be sufficient to ensure adequate quality and numbers of students.*

N/A

#### **B.5.1.1f Other Available Resources (Ministry sections 3 and 4)**

*Provide evidence that there are adequate resources available and committed to the revised program to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities, including for example:*

- staff support,
- library,
- teaching and learning support,
- student support services,
- space,
- equipment,
- facilities
- GA/TA

Courses within this new stream are offered regularly within the current academic calendar so there are no anticipated additional resources required to offer this new stream aside from a small number of additional GAs/TAs. Most of the courses within this stream are offered from the School of Environmental Science which has considerable capacity for growth and will be able to accommodate the projected increases in enrollment. There are no anticipated new resources required to sustaining the educational experience of undergraduate students beyond what is associated with natural enrollment growth over time.

**B.5.1.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)**

*Describe the reliance of the proposed program revisions on existing resources from other campus units, including for example:*

- existing courses,
- equipment or facilities outside the proposer’s control,
- external resources requiring maintenance or upgrading using external resources

*Provide relevant details.*

The majority of courses within this stream are offered through the School of the Environment. There are a small number of courses in biology, chemistry, and math and statistics that students must complete. Programs that offer these courses can accommodate the increased enrolment numbers as our projected enrolment from the new stream of 25 students per year aligns with typical program growth.

**B.5.1.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the revised program.*

N/A

**B.5.1.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the revised program. (e.g., streamlining existing programs and courses, deleting courses, etc.)*

N/A

**B.5.1.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to run the revised program.*

<b>Faculty:</b>	No change beyond what is expected from normal enrollment growth
<b>Staff:</b>	No change beyond what is expected from normal enrollment growth
<b>GA/TAs:</b>	Additional GA support needed for courses that require increased lab sections to accommodate enrollment increase

### **B.5.1.5b Additional Institutional Resources and Services Required by all Affected Areas or Departments**

*Describe all **additional institutional resources and services** required by all affected areas or departments to run the revised program, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	No change
<b>Teaching and Learning Support:</b>	No change
<b>Student Support Services:</b>	No change
<b>Space and Facilities:</b>	No change
<b>Equipment (and Maintenance):</b>	No change

### **C. Program Details**

#### **C.1 Admission Requirements (QAF section 2.1.2)**

*Describe new or changes to*

- *program-specific admission requirements,*
- *selection criteria,*
- *credit transfer,*
- *arrangements for exemptions or special entry, and*
- *alternative admission requirements, if any, for admission into the program, such as minimum average, additional language requirements or portfolios, recognition of prior work or learning experience (and how this will be assessed), etc.*

- 1) Graduates of a two-year Ontario College Diploma from an environmental-related program from a qualifying Ontario or equivalent College of Applied Arts and Technology (CAAT), with a cumulative average of a least a B (73%) grade), are eligible for admission to Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream degree program offered by the School of the Environment at the University of Windsor under the provisions of this agreement. The Dean of Science or their designate has the authority to admit students from qualifying colleges in equivalent diploma programs within Canada pending that they meet all other admission requirements.
- 2) In addition to the appropriate two-year Diploma and grade point average, applicants to the Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream are required to have successfully completed MHF4U, SCH4U, and SBI4U or their equivalent courses. Students who have not completed these courses or their equivalents will be required to complete the equivalent courses within the Foundations of Science Preparation Program.
- 3) Students admitted to the Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream will obtain the equivalent of 2 years of Advanced Standing (or awarded 20 course transfers).
- 4) Students are normally required to complete twenty (20) courses at the University of Windsor in fulfillment of the requirements of the Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream.
- 5) The Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream will be reviewed and amended, if appropriate, by the School of the Environment every five years following the approval of the stream. This timing corresponds with the review frequency undertaken by the CAAT diploma programs forming the basis of admission and this frequency of review will ensure the program curriculum and requirements adapt to these standards as they shift.

Recognized environmental-related programs include:

- Environmental Technician (MCU code 52700)
- Forestry Technician (MCU 54203)
- Any environmental-related program from a qualifying Ontario CAAT or other Canadian College deemed equivalent by the Dean of Science or their designate.

**Note:** Three-year diploma programs in relevant environmental fields will be analyzed for additional potential credit transfer on an *ad hoc* basis, while considering minimum residency and core course requirements.

### C.1.1 Admission Requirements and Attainment of Learning Outcomes (QAF section 2.1.2)

*Demonstrate that admission requirements for the revised program are sufficient to prepare students for successful attainment of the intended learning outcomes (degree level expectations) established for completion of the program.*

Admission requirements ensure that students entering the Bachelor of Science Honours Environmental Science - Applied Environmental Science Stream meet an equivalent basis of admission as students entering directly from high school into the Bachelor of Science Honours Environmental Science program. Students in the Applied Environmental Stream will complete the same core courses as those students in the Honours Environmental Science program (excluding courses that are deemed equivalent to the material covered in the CAAT programs). As such, students will be prepared to successfully meet the intended learning outcomes for this new stream. Additionally, prior research suggests that students transferring from college to university are satisfied with their academic preparation (Decock, McCloy, Liu, & Hu, 2011).

#### Reference:

Decock, H., McCloy, U., Liu, S., and Hu, B. (2011). The Transfer Experience of Ontario Colleges who Further their Education – An analysis of Ontario’s College Graduate Satisfaction Survey. Toronto: Higher Education Quality Council of Ontario.

### C.2 Program Curriculum Structure/Program of Study (QAF sections 2.1.4 and 2.1.10)

*Provide evidence of a program structure and faculty research that will ensure the intellectual quality of the student experience.*

*NB: For graduate programs, provide evidence that each graduate student in the revised program is required to take a minimum of two-thirds of the course requirements from among graduate-level courses. Include course requirements with course numbers and course names.*

*Identify in **BOLD** and **STRIKETHROUGH** the changes to program requirements.*

#### Pathway 1: Environmental Technician

**Total courses:** 20

#### Degree requirements:

Required courses (10 courses): BIOL-1111 or BIOL-1013, CHEM-1100, CHEM-1110, MATH-1760 or MATH 1720, STAT 2910, BIOL-2101, ESCI-1111, ESCI-2131, ESCI-2210, ESCI-2421

Electives (10 courses): BIOL-3250, BIOL-4241, BIOL-4280, ESCI-2141, ESCI-2705, ESCI-1141, ESCI-2721, ESCI-2400, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3711, ESCI-3751, ESCI-4500, ESCI-4710, ESCI-4721

Note:

- A review of program standards and their elements of performance was done for each CAAT environmental-related program to ensure minimal duplication of course content within degree requirements. Courses that were deemed sufficiently covered by the program standards were removed from the degree requirements.

**Pathway 2: Forestry Technician**

**Total courses:** 20

**Degree requirements:**

Required courses (10 courses): CHEM-1100, CHEM-1110, MATH-1760 or MATH 1720, BIOL-2101, ESCI-1100, ESCI-1111, ESCI-2131, ESCI-2210, ESCI-2141, STAT-2910

Electives (10 courses): BIOL-3250, BIOL-4241, BIOL-4280, ESCI-2421, ESCI-2705, ESCI-1141, ESCI-2721, ESCI-2400, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3711, ESCI-3751, ESCI-4500, ESCI-4710, ESCI-4721

**Courses used to calculate the major average are:**

**Pathway 1: Environmental Technician**

BIOL-2101, ESCI-1111, ESCI-2131, ESCI-2210, ESCI-2421, BIOL-3250, BIOL-4241, BIOL-4280, ESCI-2141, ESCI-2705, ESCI-1141, ESCI-2721, ESCI-2400, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3711, ESCI-3751, ESCI-4500, ESCI-4710, ESCI-4721

**Pathway 2: Forestry Technician**

BIOL-2101, ESCI-1100, ESCI-1111, ESCI-2131, ESCI-2210, ESCI-2141, BIOL-3250, BIOL-4241, BIOL-4280, ESCI-2421, ESCI-2705, ESCI-1141, ESCI-2721, ESCI-2400, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3711, ESCI-3751, ESCI-4500, ESCI-4710, ESCI-4721

**Description of thesis option (if applicable):**

N/A

**Provide requirements for the Co-op/Experiential Learning Component AND a description of how the program requirements differ for students who complete the experiential learning option and those who opt not to (if applicable). [If the co-op/experiential learning component is new (not part of the existing stand-alone program), a PDC Form B is required]:**

N/A

**Explain how credit will be awarded for the experiential learning component (length of component, credit weighting, etc.):**

N/A

**Guidelines for experiential learning/co-op work term reports:**

N/A

**General length of experiential learning/co-op work term:**

N/A

Is the completion of the experiential learning/co-op component a requirement of the program?

N/A

**C.3.1 For Graduate Program ONLY (QAF sections 2.1.3 and 3; Senate Co-op Policy)**

**C.3.1.1 Normal Duration for Completion**

*Provide a clear rationale for program length that ensures that the revised program requirements can be reasonably completed within the proposed time period.*

N/A

**C.3.1.2 Program Research Requirements**

*For research-focused graduate programs, provide a clear indication of the nature and suitability of the major research requirements for completion of the revised program.*

N/A

**C.3.1.3 New or Changes to Fields in a Graduate Program (optional)**

*Where fields are contemplated, provide the following information:  
The master's program comprises the following fields: ...[list, as applicable]  
The PhD program comprises the following fields: ...[list, as applicable]*

N/A

**C.3.2 For All Program Proposals**

**C.3.2.1 New or Changes to Standing Required for Continuation in Program**

*Minimum average requirements for continuation in the program.  
Must conform to the regulations for standing required for continuation in the program as set out in Senate policy.  
  
Specify new or changes to standing required for continuation in the experiential learning option or co-op option of the revised program, where applicable.*

Continuation in this new stream is consistent with the Bachelor of Science Honours Environmental Science.

**C.3.2.2 New or Changes to Standing Required for Graduation**

*Minimum average requirement to graduate in the program.  
Must conform to the regulations for standing required for continuation in the program as set out in Senate policy.  
  
Specify new or changes to standing required for graduation in the experiential learning option or co-op option of the revised program, where applicable.*

Graduation from this stream is consistent with the Bachelor of Science Honours Environmental Science.

**C.3.2.3 New or Changes to Suggested Program Sequencing**

*Provide suggested program sequencing for each year of the revised program, ensuring that all pre-requisites are met in the sequencing.  
  
Where applicable, provide work/study/placement sequencing for each year of the experiential learning/co-op version of the revised program. Please ensure that all pre-requisites are met in the sequencing.*

*For Co-op programs: The proposed work/study sequence or alternative arrangement should allow for year-round availability of students for employers (if appropriate) and, wherever possible, should meet the guidelines for co-operative education as set out by the Canadian Association for Co-operative Education (see Policy on Co-op Programs).*

### **Environmental Technician**

#### **Year 1:**

Summer: BIOL-1013

Fall: BIOL-2101, CHEM-1100, MATH-1760 or MATH-1720, ESCI-2210, STAT-2910

Winter: ESCI-1111, CHEM-1110, ESCI-2421, 1 elective

#### **Year 2:**

Fall: ESCI 2131, 4 Electives

Winter: 5 Electives

### **Forestry Technician**

#### **Year 1:**

Fall: BIOL-2101, CHEM-1100, MATH-1760 or MATH-1720, ESCI-1100, STAT-2910

Winter: ESCI-1111, CHEM-1110, ESCI-2141, 2 Electives

#### **Year 2:**

Fall: ESCI-2131, ESCI-2210, 3 Electives

Winter: 5 Electives

## **C.4 NEW OR CHANGES TO LEARNING OUTCOMES (Degree Level Expectations)(QAF section 2.1.1, 2.1.3, and 2.1.6)**

### **COMPLETE THIS TABLE FOR UNDERGRADUATE PROGRAMS**

*In the following table, provide the specific learning outcomes (degree level expectations) that constitute the overall goals of the Combined program or Concurrent offering (i.e., the intended skills and qualities of graduates of this program). Link each learning outcome to the Characteristics of a University of Windsor Graduate by listing them in the appropriate rows.*

*A learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate. All University of Windsor programs should produce graduates able to demonstrate each of the nine characteristics. Program design must demonstrate how students acquire all these characteristics. All individual courses should contribute to the development of one or more of these traits: a program in its entirety must demonstrate how students meet all of these outcomes through the complete program of coursework.*

*Proposers are strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes (degree level expectations).*

***For Combined Programs and Concurrent Offerings:** The program learning outcomes would include the outcomes for the two standalone programs with a few additional outcomes to reflect the benefits of pursuing the two disciplines in an integrated manner. [For learning outcome A, the integration of knowledge can be within a program and between the two programs.]*

***For programs with an Experiential Learning or Co-op Option:** Include learning outcomes for the program with a few additional outcomes highlighted to reflect the benefits of pursuing the experiential learning/co-op option.*

<p><b>Program Learning Outcomes (Degree Level Expectations)</b>  <i>This is a sentence completion exercise. Please provide a minimum of 1 learning outcome for each of the boxes associated with a graduate attribute.</i></p> <p><u>At the end of this program, the successful student will know and be able to:</u></p>	<p><b>Characteristics of a University of Windsor Graduate</b></p> <p><u>A UWindsor graduate will have the ability to demonstrate:</u></p>	<p><b>COU-approved Undergraduate Degree Level Expectations</b></p>
<p>A.</p> <ol style="list-style-type: none"> <li>1. Describe the features, processes, and materials of the environment using appropriate scientific language.</li> <li>2. Explain theoretical concepts related to environmental systems.</li> <li>3. Explain the impact of natural process and human activities on environmental systems.</li> <li>4. Make and record field and lab observations and measurements and apply knowledge of environmental systems and processes to interpret those observations and measurements (also relevant to B).</li> </ol>	<p>A. the acquisition, application and integration of knowledge</p>	<ol style="list-style-type: none"> <li>1. Depth and Breadth of Knowledge</li> <li>2. Knowledge of Methodologies</li> <li>3. Application of Knowledge</li> <li>5. Awareness of Limits of Knowledge</li> </ol>
<p>B.</p> <ol style="list-style-type: none"> <li>5. Review and evaluate scientific research, data sets, and technical documents in a relevant environmental field (also relevant to D).</li> </ol>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>	<ol style="list-style-type: none"> <li>1. Depth and Breadth of Knowledge</li> <li>2. Knowledge of Methodologies</li> <li>3. Application of Knowledge</li> <li>5. Awareness of Limits Knowledge</li> </ol>
<p>C.</p> <ol style="list-style-type: none"> <li>6. Apply scientific knowledge to evaluate solutions to environmental challenges (also relevant to A).</li> </ol>	<p>C. critical thinking and problem-solving skills</p>	<ol style="list-style-type: none"> <li>1. Depth and Breadth of Knowledge</li> <li>2. Knowledge of Methodologies</li> <li>3. Application of Knowledge</li> <li>5. Awareness of Limits of Knowledge</li> </ol>
<p>D.</p> <ol style="list-style-type: none"> <li>7. Interpret data using scientific principles (also relevant to B).</li> </ol>	<p>D. literacy and numeracy skills</p>	<ol style="list-style-type: none"> <li>4. Communication Skills</li> <li>5. Awareness of Limits of Knowledge</li> </ol>
<p>E.</p> <ol style="list-style-type: none"> <li>8. Explain how environmental science can be used for responsible resource exploitation and environmental management (also relevant to F).</li> </ol>	<p>E. responsible behaviour to self, others and society</p>	<ol style="list-style-type: none"> <li>5. Awareness of Limits of Knowledge</li> <li>6. Autonomy and Professional Capacity</li> </ol>
<p>F.</p> <ol style="list-style-type: none"> <li>9. Communicate scientific ideas using written, spoken, numerical, and visual formats (also relevant to D)</li> </ol>	<p>F. interpersonal and communications skills</p>	<ol style="list-style-type: none"> <li>4. Communication Skills</li> <li>6. Autonomy and Professional Capacity</li> </ol>

<b>Program Learning Outcomes (Degree Level Expectations)</b> <i>This is a sentence completion exercise. Please provide a minimum of 1 learning outcome for each of the boxes associated with a graduate attribute.</i>  <u>At the end of this program, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b>  <u>A UWindsor graduate will have the ability to demonstrate:</u>	<b>COU-approved Undergraduate Degree Level Expectations</b>
G. 10. Integrate and apply scientific knowledge in a group or leadership role.	G. teamwork, and personal and group leadership skills	4. Communication Skills 6. Autonomy and Professional Capacity
H. 11. Identify techniques to avoid environmental damage and promote sustainability (also relevant to E).	H. creativity and aesthetic appreciation	2. Knowledge of Methodologies 3. Application of Knowledge 6. Autonomy and Professional Capacity
I. 12. Monitor and recognize advances in knowledge and theory within the environmental sector.	I. the ability and desire for continuous learning	6. Autonomy and Professional Capacity

#### C.4.1 Revised Program Structure and Regulations Ensure Learning Outcomes Can be Met

*Describe how the revised program's structure and regulations ensure that the specified learning outcomes can be met by successful students.*

While the recognized environmental-related college programs are different, they have certain common elements (i.e., knowledge, skills, and abilities) within their Ministry Program Standards that have been captured in the Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream learning outcomes. Therefore, regardless of the college program students completed, students will be prepared to successfully meet the learning outcomes of the new stream (see Appendix D for more information on curriculum mapping).

CAAT graduates would have achieved sophisticated knowledge in one area of environmental science within their diploma program and would have achieved 'reinforcement' in the technical components of the stream learning outcomes. However, upon entering the new stream and following the corresponding degree completion pathway, students will be introduced to a broader scope of scientific literature and theoretical concepts. As such, all CAAT graduates will enter the Applied Environmental Science Stream with an 'introductory' level understanding of the program learning outcomes. As they progress through the stream, they will gain more depth and breadth of scientific knowledge and techniques in a range of environmental areas.

The new stream includes course-specific assessments that will be used to evaluate students' mastery of the learning outcomes. These assessments may include, though are not limited to: examinations, papers (e.g., research papers, literature reviews, reflection papers), presentations, laboratory reports, and assignments. The structure of the stream is scaffolded to ensure students can meet the learning outcomes as well as progress from 'introduction' to 'mastery' of some stream learning outcomes through the completion of specific elective courses. There will also be many opportunities for students to reinforce and practice these skills. Please see Appendix D for a copy of the curriculum map.

#### C.4.2 Impact of Experiential Learning Component on Attainment of Learning Outcomes

*For programs with a proposed experiential learning or co-op component: describe how the experiential learning/co-op component changes the emphasis or the means of achieving the intended learning outcomes for the program.*

There are no new or revised experiential learning components.

**C.4.3 Mode of Delivery (QAF section 2.1.5)**

*Demonstrate that the proposed modes of delivery are appropriate to meet the new or revised program learning outcomes. Discuss online vs. face-to-face (e.g., lecture, seminar, tutorial, lab) modes of delivery, as well as specialized approaches intended to facilitate the acquisition of specific skills, knowledge, and attitudes.*

Courses primarily rely on face-to-face offerings and delivery may vary according to instructor. Approaches may include: standard lectures with active learning techniques embedded (e.g., discussions), tutorials, laboratories, field trips, field work, integrative review of research papers, presentations, and written assignments.

Field courses will take place at various locations (public and private sites) based upon the course requirements. The modes of delivery and the teaching methods used will provide students with a variety of learning experiences and assist them in developing the knowledge, skills, and abilities to meet the program learning outcomes.

**C.5 Student Workload**

*Provide information on the expected workload per course credit (3.0) of a student enrolled in this revised program. (For assistance with this exercise, proposers are encouraged to contact the Centre for Teaching and Learning.)*

<b>Expected Workload per 3.0 Course Credit/Week</b>	<b>Average Time per week the Student is Expected to Devote to Each Component Over the Course of the Program</b>
Lectures	1-3
Tutorials	0-1
Practical experience/lab	0-3
Service or experiential learning	0
Independent study	2-3
Reading and work for assessment, including meeting classmates for group work/project assignments (essays, papers, projects, laboratory work, etc.)	2-3
Studying for tests/examinations	1
Other: <i>[specify]</i>	Field work: ~ 2 weeks in duration.

**Compare the student workload for this program with other similar programs in the AAU:**  
 The core university courses for this stream are courses that are completed by students enrolled in the Bachelor of Science Honours Environmental Science program (excluding those courses that were deemed redundant). Therefore, the workload for the new stream is consistent with the workload for a student completing a Bachelor of Science Honours Environmental Science.

**D. MONITORING AND EVALUATION (QAF section 2.1.6)**

*Describe and explain the appropriateness of the proposed methods of assessing student achievement given the new or revised intended learning outcomes and degree level expectations.*

Curriculum mapping was undertaken to ensure assessments were sufficiently measuring students' ability to meet the indent learning outcomes. These planned assessment activities are intended to focus on achievement of knowledge and skills in environmental science. This is consistent with the stream learning outcomes. Assessments may take different forms, including though not limited to: examinations, laboratory/field reports and/or assignments, research projects, written documents (e.g., research papers, literature reviews), and presentations. Following the completion of curriculum mapping, it is evident that assessments adequately align with, and measure students' achievement of the program learning outcomes (see Appendix C for a copy of the curriculum map).

For an overview of assessment methods that may be used to evaluate students' achieving the learning outcomes, please see Table 2: Alignment of assessments & learning outcomes.

The academic advisor within the School of the Environment will be responsible for overseeing that requirements are being met as well as how student process through the program. As questions arise students can consult the academic advisor.

**Table 2. Alignment of assessments & learning outcomes**

<b>Courses</b>	<b>Assessments*</b>	<b>Alignment with Learning Outcomes (PLO)</b>	<b>Sequence</b>
BIOL-1111 <sup>+</sup> or BIOL-1013	Examinations	PLO1-PLO9, PLO11, PLO12	Year 1
CHEM-1100 <sup>+</sup>	Examinations	PLO1, PLO9	Year 1
CHEM-1110 <sup>+</sup>	Examinations	PLO1, PLO9	Year 1
MATH-1720 or MATH 1760 <sup>+</sup>	Examinations	PLO7	Year 1
STAT-2910 <sup>+</sup>	Examinations	PLO7	Year 1
ESCI-1100 <sup>+</sup>	Examinations Written assignment	PLO1-PLO3, PLO5-PLO9, PLO11, PLO12	Year 1
ESCI-1111 <sup>+</sup>	Examinations	PLO1-PLO3, PLO5-PLO9, PLO11, PLO12	Year 1
BIOL-2101 <sup>+</sup>	Examinations Lab assignments	PLO1-PLO4, PLO6, PLO8-PLO12	Year 1
ESCI-2210 <sup>+</sup>	Examinations Research paper Presentation	PLO1-PLO3, PLO5-PLO12	Year 1
ESCI-2131 <sup>+</sup>	Examinations Problem sets	PLO1-PLO3, PLO5-PLO9	Year 1
ESCI-2141 <sup>+</sup>	Examinations Lab assignments	PLO1-PLO9, PLO11, PLO12	Year 1
ESCI-2421 <sup>+</sup>	Examinations lab assignments	PLO1-PLO4, PLO6, PLO8-PLO12	Year 1
ESCI-1141 <sup>^</sup>	Examination Lab exercises	PLO1-PLO5, PLO7-PLO9, PLO11, PLO12	Year 2
ESCI-2721 <sup>^</sup>	Examinations Lab assignments Peer review article synthesis	PLO1-PLO9, PLO11, PLO12	Year 2
ESCI-2400 <sup>^</sup>	Examinations Lab exercises Lab report	PLO1-PLO12	Year 2
ESCI-3301 <sup>^</sup>	Examinations Lab exercises Problem sets	PLO1-PLO7, PLO9, PLO11	Year 2
ESCI-3310 <sup>^</sup>	Examinations Assignments	PLO1-PLO3, PLO5-PLO12	Year 2
ESCI-3400 <sup>^</sup>	Examinations Lab report Oral presentation	PLO1-7, PLO9, PLO10	Year 2
ESCI-3610 <sup>^</sup>	Oral and written presentations Environmental impact assessment term project and report	PLO1-PLO3, PLO5-PLO12	Year 2
ESCI-3711 <sup>^</sup>	Labs assignments Examinations	PLO1, PLO4, PLO5, PLO7, PLO9, PLO10, PLO12	Year 2
ESCI-3751 <sup>^</sup>	Examinations Written work (e.g. essay) Reports Lab exercises	PLO1-PLO3, PLO5-PLO12	Year 2
ESCI-4721 <sup>^</sup>	Examinations Debate	PLO1-PLO3, PLO5-PLO12	Year 2

	Written work (e.g. essay) Discussion Case study Presentation Reports		
ESCI-2705 <sup>^</sup>	Field work and assignments Laboratory notes/documentation Final reports	PLO1-PLO10, PLO12	Year 2
BIOL-3250 <sup>^</sup>	Examinations Lab assignments	PLO1, PLO3, PLO6, PLO7-PLO12	Year 2
BIOL-4241 <sup>^</sup>	Examinations Lab assignments	PLO1, PLO3, PLO6, PLO7-PLO12	Year 2
BIOL-4280 <sup>^</sup>	Examinations Lab assignments	PLO1, PLO2, PLO3, PLO8-PLO12	Year 2
ESCI-2141 <sup>^</sup>	Examinations Labs and exercises	PLO1-PLO12	Year 2
ESCI-4500 <sup>^</sup>	Examinations Labs and exercises	PLO1-PLO12	Year 2
ESCI-4710 <sup>^</sup>	Environmental site assessment assignments Term paper and seminar (based on environmental impact case studies) Examinations	PLO1-PLO12	Year 2
ESCI-4721 <sup>^</sup>	Examinations Labs and exercises	PLO1, PLO2, PLO3, PLO5-PLO12	Year 2

**Notes:**

\* Required course for one of the pathways.

<sup>^</sup> Elective course.

\* This is not a comprehensive list of assessments as there may be additional assessments used within courses that test students' achievement of certificate LOs.

**D.1 Plan for Documenting And Demonstrating Student Performance Consistent with Learning Outcomes**

*Describe the plan for documenting and demonstrating student performance level and demonstrate its consistency with the new or revised stated learning outcomes and degree level expectations.*

As the stream evolves, student success and performance level will be tracked through consultation, student feedback, and grades. The academic advisor within the School of the Environment will be responsible for monitoring student progression and responding to student questions regarding the stream. All courses will contribute to students' attainment of the program learning outcomes.

Please see Appendix D for the curriculum map and Table 2 for how course assessments may align with program learning outcomes.

**E. NEW OR REVISIONS TO EXPERIENTIAL LEARNING/CO-OP COMPONENT ONLY (Senate Co-op Policy)**

*[Complete this section ONLY if the program change includes new or revisions to the experiential learning/co-op component involving paid or unpaid placements.]*

Note: There are no new or revised experiential learning components.

**E.1 Experiential Learning Component and Nature of Experience**

*Describe the new or revised experiential learning component and the nature of the experience (field placement, required professional practice, service-learning, internship, etc.)*

N/A

## E.2 Knowledge and Skills Brought to the Workplace

*Provide a description of the knowledge and skills that students will be bringing to the workplace/placement based on the revised curriculum.*

N/A

## E.3 Evidence of Availability of Placements

*Provide evidence of the availability of an adequate number of positions of good quality both inside and outside the Windsor area for the new or revised co-op/experiential learning option (including names and contact information of potential employers, written statements or surveys from potential employers; and employer feedback concerning the hiring of graduates).*

*Provide a summary of the types of positions that would be suitable at each level of work-term.*

*How will these placements/opportunities be developed?*

*[NB: For co-op programs, the majority of Ontario placements should qualify for the Co-op Education tax credit. See Policy on Co-op Programs for more details.]*

N/A

## E.4 Mechanism for Supervision of Placements (QAF section 2.1.9)

*Describe the mechanism that will be established for the supervision of the new or revised experiential learning placements.*

N/A

## E.5 Fees Associated with Experiential Learning Component

*Provide information on the fees associated with the new or revised experiential learning component, if applicable.*

*NB: all proposed fees must be approved as part of the University's operating budget, via the Ancillary Fee Committee.*

N/A

## E.6 AAU Council Approval of New or Revised Co-op Component

*Please obtain signatures for the following statement for new/revised co-op programs.*

*Before a determination can be made regarding the feasibility of a co-op program, there must be a clear indication of support for the program from the AAU. Support implies that the area will provide ongoing departmental funding to establish a co-op faculty representative who will liaise with the Centre for Career Education in the operation of the program and that the area will ensure that an adequate number of faculty members in the AAU or program contribute to the co-operative education program by grading work-term reports, attending and evaluating work-term presentations, assisting in the job development process, establishing a departmental co-op committee as appropriate, etc. (see Policy on Co-op Programs, Summary of AAU/Faculty Member Involvement in a Co-operative Education Program, for more on the role of the AAU and faculty members). This commitment must be agreed to by the AAU Council at a meeting at which the development or modification of a co-op program was considered and approved.*

*Signed agreement by the AAU Head, acting as chair of the AAU Council, that AAU members support the development of the co-op program.\**

Name of AAU Head (typed or e-signature): \_\_\_\_\_

*[Approval of the program by the AAU Council shall constitute agreement and support by AAU members of the development of the co-op program.]*

Name of Director of the Co-op Services (typed or e-signature ): \_\_\_\_\_

*[Approval of the program by the Director of Co-op Services shall constitute agreement and support of the development of the co-op program.]*

### **E.7 Guidelines for the Establishment of New/Revised Co-op Programs: CHECKLIST**

Final Overview:

Please complete this checklist to ensure that the Senate-approved guidelines for the establishment of a new co-op program have been addressed.

#### **Does the proposal:**

- include the endorsement of/involvement by the Centre for Career Education?
- adequately describe the academic program?
- include a strong rationale for co-operative education?
- list the types of positions suitable to students at the junior, intermediate and senior work-term?
- articulate the possibility for international placements at a later point?
- provide for a reasonable proportion of international students to obtain appropriate placement opportunities?
- include a plan to monitor the availability of work placements on an ongoing basis?
- articulate specific learning outcomes (degree level expectations) and co-op requirements?
- include a commitment by the department to adequately support the program by funding a co-op faculty representative?:
- include a commitment by the department to adequately support the program by ensuring that an adequate number of faculty members are willing to grade work term assignments, assist in the job development process, etc.?

#### **Will the program:**

- attract a sufficient number of students including students from outside of the Windsor-Essex region (a minimum annual intake of 20 students enrolled in the co-op component)?
- be able to attract and sustain an adequate number of positions of good quality both inside and outside of the Windsor-Essex region?
- provide year-round availability of students to the workplace in some manner?
- meet the requirements for accreditation by the Canadian Association of Co-operative Education (see guidelines)?

**APPENDIX A – BUDGET SUMMARY SHEET**

Contact the Office of Quality Assurance for assistance in completing this form.

<b>Projections of Enrolment, Expenditures and Revenues (enrolments over 5 years)</b>						
<b>Year</b>	<b>2021-22</b>	<b>2022-23 Steady state</b>	<b>2023-24</b>	<b>2024-25</b>	<b>2025-26</b>	<b>Total</b>
<b>Revenue</b>						
Tuition income*1 (calculation shown in table below)	\$145,000	\$264,915	\$268,875	\$272,925	\$277,020	\$1,228,735
Potential Provincial funding*2	\$145,000	\$264,915	\$268,875	\$272,925	\$277,020	\$1,228,735
Other sources of funding (please list)						
	0	0	0	0	0	<b>0</b>
<b>Total Revenue</b>	<b>\$290,000</b>	<b>\$529,830</b>	<b>\$537,750</b>	<b>\$545,850</b>	<b>\$554,040</b>	<b>\$2,457,470</b>
<b>Expenses</b>						
Additional Sessional Faculty*3	0	0	0	0	0	0
GA/TA*4	\$20,000 (\$5,000 x4)	\$30,300 (5,050x6)	\$30,606 (5,101x6)	\$30,912 (5,152x6)	\$31,224 (5,204x6)	\$143,042
<b>Total Expenses</b>	<b>\$20,000</b>	<b>\$30,300</b>	<b>\$30,606</b>	<b>\$30,912</b>	<b>\$31,224</b>	<b>\$143,042</b>
<b>Net Income</b>	<b>\$270,000</b>	<b>\$499,530</b>	<b>\$507,144</b>	<b>\$514,938</b>	<b>\$522,816</b>	<b>\$2,314,428</b>

\*1 Estimate \$5,800 per full-time equivalent domestic undergraduate student per year in 2021-22, with a 1.5% increase in each future year tuition rates.

\*2 Estimate same amount as tuition per full-time equivalent domestic undergraduate student

\*3 Estimate Sessional Faculty costs of \$10,000 in 2021-22 and a 1% annual increase

\*4 Estimate \$5,000 per GA/TA allocation in 2021-22 and a 1% annual increase

Program Yr	21-22	22-23	23-24	24-25	25-26	
Total Annual intake: 25	25	25	25	25	25	
Attrition of 5 in Year 2		20	20	20	20	
<b>Shown in B.4.2 table &gt;&gt;&gt;</b>	<b>Total Enrol</b>	<b>25</b>	<b>45</b>	<b>45</b>	<b>45</b>	
	FT Tuition	\$5,800	\$5,887	\$5,975	\$6,065	\$6,156
<b>Line 1 of table above &gt;&gt;&gt;</b>	<b>Total Income</b>	<b>145,000</b>	<b>264,915</b>	<b>268,875</b>	<b>272,925</b>	<b>277,020</b>

Appendix B-Letter of Support from St. Clair College



January 24, 2020

Dr. Chris Houser  
Dean, Faculty of Science  
University of Windsor  
401 Sunset Avenue  
Windsor, Ontario  
N9B 3P4

Dear Chris:

After reviewing the block transfer proposals to allow admission for St. Clair College graduates into the Forensics, Environmental Science, Economics, and Chemistry programs, please accept this letter as support to obtain the necessary approvals at the University of Windsor.

These 2 + 2-degree completion pathways will provide opportunities for graduates from programs related to: Police Foundations, business, the environment, and chemistry.

We anticipate that approximately 5 to 10% of graduating students from the aforementioned program areas will be interested in transferring to one of the prescribed degree completion pathways. St. Clair College will assist in advertising and promoting the programs to their students (e.g. sharing flyers, allowing site visits, etc.), as well as advising students on how to successfully transfer to the University of Windsor.

Should you require further information, I may be reached by email at [whabash@stclaircollege.ca](mailto:whabash@stclaircollege.ca) or by telephone at 519-972-2727, extension 5090.

I look forward to our continued collaboration.

A handwritten signature in black ink, appearing to read "Waseem Habash". The signature is stylized with loops and a horizontal line at the end.

Waseem Habash  
Vice President, Academic

**Appendix C –Confirmation from Continuing Education for Foundations of Science Preparatory Programming**

**From:** Jennie Atkins <[jatkins@uwindsor.ca](mailto:jatkins@uwindsor.ca)>  
**Date:** Thursday, December 12, 2019 at 1:20 PM  
**To:** Chris Houser <[Chris.Houser@uwindsor.ca](mailto:Chris.Houser@uwindsor.ca)>  
**Subject:** Foundation Programming

Chris,

Just confirming that Continuing Education is developing Foundation programming which will include the following topics. Our launch date is set for July 2020.

- Calculus
- Algebra
- Chemistry
- Biology
- Statistics

Please let me know if you need further information.

Thanks,

Jennie

---

**Jennie Atkins, MBA, MA**

**Executive Director**

**University of Windsor**

**Continuing Education**

E:[jatkins@uwindsor.ca](mailto:jatkins@uwindsor.ca) W:[continue.uwindsor.ca](http://continue.uwindsor.ca)

## Appendix D-Review and Analysis of CAAT Program Standards

### Background information:

All CAAT program standards and their elements of performance were carefully reviewed and categorized by the Characteristics of a University of Windsor Graduate (see table below). Subsequently, CAAT programs were reviewed and analyzed to determine commonalities in the knowledge, skills, and abilities students would acquire following successful completion of the CAAT program. Commonalities in program standards were found in many areas, including though not limited to: the application of environmental knowledge, research skills (e.g., field measurements, review of scientific research, data sets, and technical documents), critical thinking, communication, responsible behaviour, leadership, creativity/problem solving, and professional development/continuous learning. Following this review and analysis of CAAT program standards and their elements of performance, it was determined that these standards have common elements that were captured in the Applied Environmental Science Stream learning outcomes. Therefore, a decision was made to treat these CAAT diploma programs as a 'block' when developing the curriculum map for the Applied Environmental Science Stream rather than mapping each CAAT program to the stream program learning outcomes. For more information, please see the curriculum map for the stream in In Table 3 below.

CAAT program standards and their elements of performance can be accessed through the following links:

- Environmental Technician (MCU code 52700): <http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/enviro/5270e.pdf>
- Forestry Technician (MCU 54203): <http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/techno/54203.pdf>

Table 3. Curriculum Map

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
College Graduate	I	I	I	I	I	I	I	I	I	I	I	I
BIOL-1111 <sup>+</sup>	I	I	I	I	I	I	I	I	I		I	I
CHEM-1100 <sup>+</sup>	I								I			
CHEM-1110 <sup>+</sup>	I								I			
MATH-1720 (or MATH-1760) <sup>+</sup>							I					
STAT-2910 <sup>+</sup>							R					
ESCI-1100 <sup>+</sup>	I	I	I		I	I	I	R	I		I	I
ESCI-1111 <sup>+</sup>	I	I	I		I	I	I	R	I		I	I
ESCI-2131 <sup>+</sup>	R	R	R		R	R	R	I	R			
ESCI-2141 <sup>+</sup>	R	R	R	R	R	R	R	R	R		R	R
ESCI-2210 <sup>+</sup>	R	R	R		R	R	R	R	R	I	R	R
ESCI-2421 <sup>+</sup>	R	R	R	R		I		I	R	I	R	I
BIOL-2101 <sup>+</sup>	R	R	R	R		R		R	R	I	R	R
ESCI-1141*	I	I	I	I	I		I	I	I		I	I
ESCI-2721*	R	R	R	R	R	R	R	R	R		R	R
ESCI-2400*	R	R	R	R	R	R	R	I	R	R	R	I
ESCI-2705*	R	R	R	R	R	R	R	R	R	R		R
ESCI-3301*	M	R	R	R	R	M	R		M		R	
ESCI-3310*	M	M	M		M	M	M	M	M	M	M	M
ESCI-3400*	M	M	M	M	M	R	M		M	R		
ESCI-3610*	M	M	M		M	M	M	M	M	M	M	M
ESCI-3711*	R			M	R		R		M	M		M
ESCI-3751*	M	M	M		M	M	M	M	M	M	M	M
ESCI-4500*	M	M	M		M	M	M	M	M	M	M	M
ESCI-4710*	M	M	M	M	M	M	M	M	M	M	M	M
ESCI-4721*	M	M	M		M	M	M	M	M	M	M	M
BIOL-3250*	R		R			R		R	R	R	R	R
BIOL-4241*	M		M			M		M	M	M	M	M
BIOL-4280*	M	M	M					M	M	M	M	M

PLO1: Describe the features, processes, and materials of the environment using appropriate scientific language.

PLO2: Explain theoretical concepts related to environmental systems.

PLO3: Explain the impact of natural process and human activities on environmental systems.

PLO4: Make and record field and lab observations and measurements and apply knowledge of environmental systems and processes to interpret those observations and measurements (also relevant to B).

PLO5: Review and evaluate scientific research, data sets, and technical documents in a relevant environmental field (also relevant to D).

PLO6: Apply scientific knowledge to evaluate solutions to environmental challenges (also relevant to A).

PLO7: Interpret data using scientific principles (also relevant to B).

PLO8: Explain how environmental science can be used for responsible resource exploitation and environmental management (also relevant to F).

PLO9: Communicate scientific ideas using written, spoken, numerical, and visual formats (also relevant to D)

PLO10: Integrate and apply scientific knowledge in a group or leadership role.

PLO11: Identify techniques to avoid environmental damage and promote sustainability (also relevant to E).

PLO12: Monitor and recognize advances in knowledge and theory within the environmental sector.

**Notes:**

\*Required courses for one of the pathways

\*Elective courses

PLO = Program learning outcome

I = Introduction

R = Reinforce

M = Mastery

1. While the recognized CAAT programs are different, they have certain common elements within their Ministry Program Standards (or program LOs in the case of Greenhouse Technician) that have been captured in the Applied Environmental Science stream LOs. As such, these programs are treated as a 'block' rather than mapping each program into the stream LOs.

2. CAAT graduates would have achieved sophisticated knowledge in one area of environmental science within their diploma program and would have achieved 'reinforcement' in the technical components of the stream LOs. However, upon entering the Bachelor of Science Honours Environmental Science-Applied Environmental Science Stream, students will be introduced to a broader scope of scientific literature and theoretical concepts. As such, all CAAT graduates will enter the Applied Environmental Science Stream with an 'introductory' level understanding of the PLOs. As they progress through the stream, they will gain more depth and breadth of scientific knowledge and techniques in a range of environmental areas.

5.2 **Bachelor of Arts Honours Economics - Applied Economics and Policy Stream - Major Program Change (Form B)**

Item for: **Approval**

**MOTION: That the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream be approved. ^**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The Department of Economics is proposing a new stream, **Applied Economics and Policy**, within the Bachelor of Arts Honours Economics to recognize the interests of CAAT graduates from two-year computer science and two-year business programs.
- This stream will facilitate a new degree completion pathway, structured as a '2+2' where students will earn a diploma from a recognized CAAT (or equivalent) in two years, followed by completing their degree at the University of Windsor in an additional two years.
- The proposal has been approved by the Department of Economics Council, the Faculty of Science Coordinating Council and the Provost.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

**A. Basic Program Information**

<b>Faculty(ies)</b>	Science
<b>Department(s)/School(s)</b>	Department of Economics
<b>Name of Program as it Will Appear on the Diploma (e.g., Bachelor of Arts Honours Psychology with thesis)</b>	Bachelor of Arts Honours Economics- Applied Economics and Policy
<b>Proposed Year of Offering*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Winter 2021 start advertising for intake in Summer 2021 & Fall 2021
<b>Mode of Delivery:</b>	Classroom
<b>Planned steady-state Student Enrolment (per section B.4.2)</b>	36 students (steady state starts in year four).
<b>Normal Duration for Completion:</b>	2 years (full time) following the completion of a recognized two-year College of Applied Arts and Technology (CAAT) diploma or equivalent in a computer science or business field.
<b>Will the program run on a cost-recovery basis?</b>	

**B. Major Program Changes - Overall Plan**

**B.1 Objectives of the Program/Summary of Proposal (QAF section 2.1.1; Ministry section 4)**

*Please provide a rationale for the proposed change, including a brief statement about the direction, relevance and importance of the revised program. Describe the overall aim and intended impact of the revised program. Describe the consistency of the revised program with the institution's mission, goals and objectives as defined in its strategic plan. (to view the strategic plan go to: [www.uwindsor.ca/president](http://www.uwindsor.ca/president))*

**Relevance and Importance:** The Department of Economics is proposing a new stream, **Applied Economics and Policy**, within the Bachelor of Arts Honours Economics to recognize the interests of CAAT graduates from two-year computer science and two-year business programs. These CAAT programs would provide students with skills that are complementary to economics. Specifically, college graduates from computer science-related programs would have specialized knowledge in program/web development, database design and administration, programming languages, while graduates from the business program would have broad knowledge of business principles as well as their practical comprehension and application. The CAAT programs considered in Ontario include: Computer programming (MCU code 50503), Computer Programmer (no program standards), Computer Engineering Technician (MCU code 50509), Software Engineering Technician (MCU code 50504), and Business (MCU code 50200). Additional CAAT programs across Canada could be applicable and will be reviewed for consideration on an ad-hoc basis. This stream will facilitate a new degree completion pathway, structured as a '2+2' where students will earn a diploma from a recognized CAAT (or equivalent) in two years, followed by completing their degree at the University of Windsor in an additional two years. Given the flexibility of the Bachelor of Arts Honours Economics, and how economic policy can influence a variety of sectors (e.g., health, the environment) we are exploring opportunities for pathways from other college programs (e.g., environmental technician, forestry technician, horticulture, and health-based programs). Please note, the program curriculum/structure for graduates of computer science-related vs business programs are slightly different whereby CAAT graduates of computer science-related programs complete 23 courses upon arrival to UWindsor whereas business CAAT graduates complete 21 courses. Course requirements are described in section C.2.

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

The availability of this stream which recognizes the courses students completed at a CAAT will allow the Faculty of Science to maintain competitive with other institutions that have transfer/articulation agreements in place and provide accessible and transparent opportunities for movement between postsecondary institutions, thus aligning with the Ontario Government's "Policy Statement for Ontario's Credit Transfer System" (Ontario MTCU, 2011). Specifically, this policy states:

"Ontario will have a comprehensive, transparent and consistently applied credit transfer system that will improve student pathways and mobility, support student success and make Ontario a postsecondary education destination of choice. The credit transfer system will assist qualified students to move between postsecondary institutions or programs without repeating prior, relevant learning. (Ontario MTCU, 2011)".

Through this new stream, the Faculty of Science is catering to this need for credit transfer by offering a transparent degree completion pathway which allows students to move between postsecondary institutions without repeating previously learned material. Beyond offering an accessible credit transfer system, this new stream will assist in supporting the demand for hybrid higher education in Ontario (Brown, 2016) and the projected number of job openings in relevant fields (see section B.4.1 Expected Impact of the Proposed Changes to Student and Market Demand). This new stream will increase the overall enrollment in Science, specifically in the Department of Economics, by recruiting college graduates to complete the new stream while not requiring additional resources beyond what is associated with typical program growth. We believe our degree completion pathway, facilitated through this new stream will be an attractive option for students wanting to earn a university degree, due to the potential cost savings compared to direct entry into a four-year degree program (Trick, 2013). Students will also earn two credentials - a diploma and degree in four years (assuming full time status). The Dean of Science has discussed this new stream and degree completion pathway with the Vice President Academic at St. Clair College and has received their support. St. Clair college will also help advertise and promote this program to their students as well as advise students on how to successfully transfer into this new stream (see Appendix B for their letter of support).

The structure of the Bachelor of Art Honours Economics consists of core economics courses but also provides great flexibility in the subject area students can study with economics through their electives (i.e., 17 elective courses from any area of study). This flexibility helps facilitate this degree completion pathway. This new stream, although distinct from the traditional four-year Bachelor of Arts Honours Economics degree, has been mapped to show equivalency in terms of the program-level learning outcomes and careful consideration has been given to the program standards students would have met following the successful completion of their CAAT diploma (or equivalent) in order to ensure minimal duplication in curricula. The new stream offers complementary, yet equivalent, learning outcomes when compared to the traditional four-year degree. Since the Bachelor of Arts Honour Economics provides a great deal of choice in electives from other subject areas, students entering this stream with a computer science or business background will be able to meet the learning outcomes.

**Aim and Impact:** This new stream in Applied Economics and Policy will offer a degree completion pathway for CAAT graduates from two-year computer science or business programs. Specifically, students may obtain a Bachelor of Arts Honours Economics- Applied Economics and Policy Stream following the completion of a computer science or business-related CAAT (or equivalent) diploma program (see section C.1 Admission Requirements for more information on admission). Students entering from a computer science-related CAAT program will complete 23 courses at the University of Windsor, while those entering from the two-year business program will complete 21 courses at the University of Windsor (see C.2. Program Curriculum Structure/Program of Study). A review of all program standards for each CAAT program was completed to ensure minimal duplicated course content. This degree completion pathway will help to streamline and harmonize the student experience and will provide an efficient pathway for students to combine their career-oriented college education with a strong theoretical background in economics. Students will receive diverse learning experiences from a variety of sources, including experiential learning and high impact practices that will position them for future career success as well as opportunities to pursue post-

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

graduate education. Please see section 'C.4 Learning Outcomes' for a detailed description of the knowledge, skills, and abilities students will have gained upon successful completion of the new program stream.

Please note, some entering CAAT students may have to complete courses from a summer bridging program (i.e., Foundations of Science Preparation Program) from Continuing Education to ensure they meet the basis for admission with respect to the pre-requisite course entrance requirements, should the student be deficient of required specific courses in their prior CAAT or secondary school education. However, this will vary by student depending on their educational background. Please see Appendix C for confirmation that Continuing Education is committed to offering Foundation programming in July 2020.

**Consistency with Institutional Goals:** This program has an interdisciplinary focus on economics as it allows students to combine economics with courses from any area of study. This new stream recognizes a range of 2-year CAAT programs in computer science and business aligning with two *Strategic Areas of Program Expansion* within the SMA, including 'Engineering, Science, and Computing' and 'Business, Cultures, and Governance (point three and five within program areas of expansion). This new stream will help address the need for trained persons within the economics sector and will contribute to the University of Windsor's commitment to providing learning experiences that will prepare students for life after graduation and employment by recognizing the importance of applied and theoretical learning experiences. The proposed stream also contributes to the University of Windsor's mission, goals and objectives through improving the student learning experience in the area of career preparation and innovations in teaching and learning excellence, through the provision of high impact learning experiences. This stream also facilitates partnership building with colleges and expands the University of Windsor's college-university pathway development, thus increasing overall enrollment.

**References:**

Brown, L. (2016). Transferring credits between college and university can be rocky. *Maclean's*. Retrieved from <https://www.macleans.ca/education/college/transferring-credits-between-college-and-university-can-be-rocky/>

Ontario Ministry of Training, Colleges and Universities. (2011). Policy statement for Ontario's credit transfer system. Retrieved from [https://www.ontransfer.ca/files\\_docs/content/pdf/en/news\\_and\\_events/news\\_and\\_events\\_2.pdf](https://www.ontransfer.ca/files_docs/content/pdf/en/news_and_events/news_and_events_2.pdf)

Trick, D. (2013) College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

**B.2 Changes to Program Content (QAF Section 2.1.4)**

*Evidence that the revised curriculum is consistent with the current state of the discipline or area of study.*

We are proposing a new stream in **Applied Economics and Policy**. This new stream will recognize students who have an in-depth knowledge of economic concepts and methods used to estimate economic models and solve problems, as well as significant applied experience gained through their CAAT diploma program or equivalent. It is common within the discipline to pair economics with computer science or business. As such, this stream is consistent with the current discipline.

Across Canada, there are a number of diploma-to-degree pathways, and transfer and articulation agreements between universities and colleges (see Ontransfer.ca by Oncat for specific examples). There are a range of institutions that permit varying levels of credit transfer into a range of degree types (e.g., Bachelor of Arts, Bachelor of Science). Providing college graduates from two-year computer science-related or business diploma programs an opportunity to receive credits towards a university degree is common within the current state of the discipline.

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

**B.2.1 Unique or Innovative Curriculum, Program Delivery, or Assessment Practices (QAF Section 2.1.4)**

*State the unique or innovative curriculum, program delivery, or assessment practices distinguishing the revised program from existing programs elsewhere.*

Through the degree completion pathway, from two-year computer science-related or business diploma programs, students will be admitted into the Bachelor of Arts Honours Economics- Applied Economics and Policy. The enrollment in this stream will consist only of graduates from two-year CAAT computer science-related and business diploma programs or equivalent. Given the flexibility of the BA in Economics, and how economic policy can influence a variety of sectors (e.g., health, the environment) we are exploring opportunities for pathways from other college programs (e.g., environmental technician, forestry technician, horticulture, and health-based programs).

Three-year diploma programs in relevant fields will be analyzed for additional potential credit transfer on an ad-hoc basis, while considering minimum residency and core course requirements. This structure will facilitate a sense of community and collaboration among peers. The new stream will benefit students by recognizing the value of career-oriented educational experiences learned at college, while complementing these applied experiences with in-depth scientific knowledge, theories, and techniques gained through university courses. Additionally, these new degree completion pathways will streamline and harmonize the student experience by ensuring college course content is not duplicated, while offering a diverse learning opportunity as students will arrive from different CAAT programs allowing for multidisciplinary information sharing and varied perspectives.

The new stream and degree completion pathway were intentionally designed based upon the analysis of CAAT program standards set forth by the Ministry of Colleges and Universities (MCU). Program standards apply to all similar programs of instruction offered by publicly funded colleges across the province. The development of program standards by the Ministry first started in the 1990s to bring more consistency to college programming, broaden the skills of college graduates to include essential employability skills and provide accountability for the quality and relevance of college programs (MCU, 2017). Thus, by mapping these program standards against our curriculum and utilizing the information to develop a customized program stream and degree completion pathway, rather than targeting specific programs at specific CAATs, we are able to widen our recruitment scope to any CAAT program in Ontario that falls under these standards (see Appendix D for details on the review and analysis of CAAT program standards and curriculum mapping). In addition to working within the program standard framework set forth by MCU, these institutions are required to follow a rigorous quality review process at a program level basis on a regular frequency. Given the quantity of electives in the BA in Economics, CAAT graduates from a computer science-related diploma programs, will complete all the required economics and math courses at the University of Windsor and the courses completed through their diploma program will fulfill their electives.

In most jurisdictions, the cost to the government and the student of a degree achieved through two years at the college followed by two year at the university is lower than a four-year university program (Trick, 2013.). As a result, our degree completion pathways allow students to gain applied educational experiences at the college, while also saving money compared to completing four years of full-time study at a university.

**References:**

MCU. (2017). Published college program standards. Retrieved from <http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/>

Trick, D. (2013). College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

**B.2.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material**

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing or revising this program, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

Indigenous content, perspectives, and material may be included in various courses based upon the discretion of the instructor. Individual instructors will review course materials and identify areas where indigenous content can be integrated to provide a holistic perspective of a topic. Currently, ECON-3410 Economic Growth and Development Theory covers Indigenous content, and in the future, Indigenous material may be included in ECON-3530 Labour Institutions and ECON-3310 The Economics of Legal Procedures, Crime, and Punishment.

**B.3 Changes to Program Name and Degree Designation/Nomenclature (QAF Section 2.1.1; Ministry section 1)**

*Explanation of the appropriateness of the proposed new name and degree designation for the program content and current usage in the discipline*

The proposed name for the new stream, **Applied Economics and Policy** recognizes both the subject area of study and the applied/technical educational experiences students received within their CAAT diploma. Therefore, we believe the name is representative of the program content and current usage in the discipline.

**B.4 DEMAND FOR THE MODIFIED PROGRAM**

**B.4.1 Expected Impact of the Proposed Changes to Student and Market Demand**

*Describe the tools and methodology used to conduct the market assessment in support of the proposed program revisions.*

*Provide Quantitative evidence of student and market demand for the revisions to the program, both within and outside the local region (e.g., responses/statistics from surveys, etc.).*

Degree programs in economics offer students a variety of career paths, often in areas of government and public policy analysis, banking, finance, corporate or competitive strategy, economic research/consulting, stockbroking, and forecasting. As a result, there is a plethora of fields that graduates can explore, particularly given the interdisciplinary nature of the BA Honours Economics. Students within the Applied Economics and Policy Stream are able to combine their computer science or business knowledge garnered from their CAAT diploma and combine it with an economics focus at the University of Windsor. One of the benefits of completing this stream is that it widens the scope of job prospects for CAAT graduates and allows them to draw connections between concepts across subject areas.

**Labour Market Data:**

Multiple job searches were conducted on job posting websites using key words such as ‘economist’, ‘economics’, ‘economic analyst’, and ‘economic researcher’ (searches were performed on January 5<sup>th</sup>, 2020). Below is a summary of the number of postings by search and source:

- Indeed Canada: 93 jobs (keyword ‘economist’); 4,996 jobs (keyword ‘economics’)
- Econ-Jobs.com: 10 jobs
- LinkedIn: 367 jobs (keyword ‘economist’); 427 jobs (keyword ‘economic analyst’); 32 jobs (keyword ‘economic researcher’); 18 (keyword ‘economic analyst policy analysis)
- Workopolis: 89 jobs (keyword ‘economist’)

Based on these searches, there appears to be a number of positions available for graduates of economics.

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

Similarly, within Ontario, labour market information suggests that there are current and projected job opportunities within a number of careers that graduates of the Applied Economics and Policy Stream would be prepared for (Ministry of Labour, Training and Skills Development, 2017; see Table 1 for examples). Notably, these job profiles have low unemployment rates. Given that this new stream recognizes CAAT diplomas in a number of areas, as well as requires the completion of 21-23 university courses in economics and mathematics/statistics, students will develop both a depth and breadth skills to be well-positioned for a multitude of careers (see Table 1).

**Table 1. Employment statistics**

Job profile	Median income	Projected number of job openings (2017-2021)	Job outlook (2017-2021) <sup>^</sup>	Number of job postings	Unemployment rate
Economists and economic policy researchers and analysts	\$88,421	1,001-2,000	Average	1184	2.9%
Banking, credit and other investment managers	\$87,210	5,001-6,000	Average	6,640	2.5% <sup>+</sup>
Baking, insurance and other financial clerks	\$47,542	3,001-4,000	Average	766	4.1% <sup>+</sup>
Supervisors, finance and insurance office workers	\$62,973	6,001-7,000	Undetermined	0	2.3% <sup>+</sup>
Government managers- economic analysis, policy development and program administration	108,669	501-600	Undetermined	0	1%

**Note:** These data were gathered from the Ministry of Training, Colleges and Universities Ontario’s labour market website for the aforementioned job profiles.

<sup>^</sup>Job outlook ratings can tell you how future demand for this job is expected to compare with other jobs across Ontario.

<sup>+</sup>Unemployment rate is below the National unemployment rate (5.5% as of June 2019) within Canada:

<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028703>

Banking, credit and other investment managers: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=0122>

Baking, insurance and other financial clerks: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=1434>

Supervisors, finance and insurance office workers: <https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=1212>

Government managers- economic analysis, policy development and program administration:

<https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=0412>

Economists and economic policy researchers and analysts:

<https://www.iaccess.gov.on.ca/labourmarket/jobProfile/jobProfileFullView.xhtml?nocCode=4162>

The labour data from job searches and the Ministry of Training, Colleges and Universities Ontario’s labour market analysis provide support that there are current and projected job openings in banking, finance, and policy development. The Applied Economics and Policy Stream will facilitate recognition of students’ prior knowledge and hands-on experiences gained through the completion their college diplomas and the in-depth scientific knowledge they will acquire through the economics courses completed at the University of Windsor. This combination of theoretical and applied scientific knowledge will ensure students are attractive candidates for these jobs.

**Student data:** The number of students seeking a baccalaureate education across all disciplines is projected to increase from 50,000 to 104,000 from 2009 to 2025 (Trick, 2013). Given the flexibility of the stream, there is a large pool of potential graduates to attract into the Applied Economics and Policy Stream. Our projected steady state enrollment of 36 students (steady state starts in year four) would require us to attract a modest ~1% of college graduates from these computer science-related or business programs. This is an underestimation as the stream

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

can also accommodate CAAT graduates from other programs (e.g., environmental technician, forestry technician, horticulture, and health-based programs). We believe meeting our steady state target will be very feasible and that our new stream will be an attractive option to college graduates wishing to earn a university degree due to potential cost savings and the opportunity to earn two credentials in a four-year span. Specifically, Trick (2013) estimates cost savings for college-to university transfer programs within Ontario to student who can complete a university degree in a total of four years of study (e.g., 2 years at college + 2 years at university; 2+2 model).

Following the approval of this new program stream, the Faculty of Science will formally begin their recruitment plan. This includes emailing recruitment flyers to all program coordinators of relevant business programs as well as launching a social media campaign targeted towards individuals who meet the programs demographics. In the Winter 2021, additional recruitment efforts (e.g., site visits) will take place in order to achieve the projected steady state. The Dean within the Faculty of Science has discussed this new stream and degree completion pathway with the Vice President Academic at St. Clair College and has received their support. St. Clair College will help advertise and promote this program to their students as well as advise students on how to successfully transfer into this new stream (see Appendix B for the letter of support).

**Table 2. Number of graduates of full-time postsecondary college programs**

<b>Program</b>	<b>2013-2014</b>	<b>2014-2015</b>	<b>2015-2016</b>	<b>2016-2017</b>	<b>2017-2018</b>
<i>Computer Programmer</i>	336	409	447	522	666
<i>Computer Engineering Technician</i>	78	65	67	99	104
<i>Software Engineering Technician</i>	72	55	72	82	101
<i>Business</i>	1,641	2,036	2,091	2,347	2,726
<b>Total</b>	<b>2,127</b>	<b>2,565</b>	<b>2,677</b>	<b>3,050</b>	<b>3,597</b>

Data source: Ministry of Training, Colleges and Universities. (2018). Labour Market. Retrieved from <https://www.app.tcu.gov.on.ca/eng/labourmarket/employmentprofiles/compare.asp>

Based upon the review of market demand and college graduation rates, the proposed new stream will assist students with the development of economics knowledge, addressing a current gap in the labour market.

**References**

Ministry of Labour, Training and Skills Development. (2017). Ontario’s labour market. Retrieved from <https://www.ontario.ca/page/labour-market>

Trick, D. (2013). College-to-University Transfer Arrangements and Undergraduate Education: Ontario in a National and International Context. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Transfer%20Arrangements%20Trick%20ENG.pdf>

**B.4.1.1 Percentage of Domestic and International Students (Ministry section 5)**

*Expected proportion (percentage) of domestic and international students. For graduate programs, identification of undergraduate or master’s programs from which students would likely be drawn.*

We expect all students to be domestic.

**B.4.2 Estimated Enrolments (QAF section 2.1.9; Ministry section 5; Senate Co-op Policy)**

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

*Provide details on projected enrolments for the revised program in the following tables.*

*For Co-op programs: normally an annual intake of a minimum of 20 students is required for new co-op programs or programs with other experiential learning component.*

<i>Projected enrolment levels for the first five years of operation of the revised program. (If the program is in operation, use actual and projected data.)</i>	First Year of Operation	Second Year of Operation	Third Year of Operation	Fourth Year of Operation (Steady-state enrolment overall)	Fifth Year of Operation
<i>In the regular program (non-co-op)</i>	14	26	32	36	36
<i>In the co-op/experiential learning stream (if applicable)</i>					
<i>For co-op options: projected number of international students enrolled in the co-op stream</i>					

<i>Annual projected student intake into the first year of the revised program: (this may differ from the “first year of operation” projected enrolments which could include anticipated enrolments from students transferring into the second, third, or fourth year of the program)</i>	20 Half in each pathway Attrition of 4 by year two.
<i>Annual projected student intake into the first year of the co-op/experiential learning version of the revised program: (this may differ from the “first year of operation” projected enrolments which could include anticipated enrolments from students transferring into the second, third, or fourth year of the program)</i>	N/A

**B.4.3 New Involvement in a Collaborative Program/Changes to Collaborative Program (QAF section 1.6)**

*If this is a new collaborative program with another college/university, or revision to a collaborative program, identify partners and institutional arrangements for reporting eligible enrolments for funding purposes.*

N/A

**B.4.4 Evidence of Societal Need for the Revised Program (Ministry section 6)**

*Describe the tools and methodology used to assess societal need.*

*Elaborate on the*  
 1) dimensions of (e.g., socio-cultural, economic, scientific, or technological),  
 2) geographic scope of (e.g., local, regional, provincial, or national), and  
 3) anticipated duration of, and trends in,  
 societal need for graduates of the modified program

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

*Provide evidence that the proposed program revisions respond to societal need for graduates of the revised program and/or changes in the field, including sources of data and expert input or feedback collected to support this change in direction.*

Within Ontario, increasing the rate of college to university transfers has been a priority (e.g., Kerr, McCloy, & Liu, 2010; Ontario MTCU, 2011). This new stream will respond to the Ontario governments call for visible credit transfers between colleges and universities by assisting qualified students to move between postsecondary institutions or program without repeating prior learning (Ontario MTCU, 2011). Within the 2017-2020 SMA, building partnerships with colleges was an important part of institutional collaborations and partnerships. This new stream will significantly enhance these partnerships by further engaging with college students. This new stream will facilitate a degree completion pathway between colleges to the University of Windsor in a visible way and address this movement towards comprehensive, transparent and consistently applied credit transfers. In doing so, the University of Windsor is streamlining and harmonizing the student experience for CAAT graduates wishing to earn a university degree.

Given the rising cost of education, we believe our 2+2 model will be appealing to students as it offers an opportunity to earn two credentials within a four-year time period. Cost projections suggest our new stream will offer a less expensive route to earning a university degree compared to students pursuing a four-year direct entry into university (Trick, 2013). Savings also exist by eliminating credit duplication. This stream will also improve Ontario's ability to meet the demand for a skilled and flexible workforce through building capacity and flexibility in postsecondary education (Ontario MTCU, 2011). Beyond these possible cost savings, we are responding to the demand for hybrid higher education in Ontario. Each year 55,000 students switch institutions, and 40% of these students move from a college to a university (Brown, 2016). Similarly, Trick (2013) has projected that the number of students seeking a baccalaureate education will increase from 50,000 to 104,000 from 2009 to 2025. Lastly, this stream will also prepare students for post-graduate education (e.g., graduate degrees, law school, etc.) which they would have been previously ineligible for following the completion of the CAAT diploma.

For information on anticipated labour and student market demand trends can be found in section B. 4.1.

**References:**

Brown, L. (2016). Transferring credits between college and university can be rocky. *Maclean's*. Retrieved from <https://www.macleans.ca/education/college/transferring-credits-between-college-and-university-can-be-rocky/>

Kerr, A., McCloy, U., Liu, S. (2010). Forging Pathways: Students who Transfer Between Ontario Colleges and Universities. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/ForgingPathwaysENG.pdf>

Ontario Ministry of Training, Colleges and Universities. (2011). Policy statement for Ontario's credit transfer system. Retrieved from [https://www.ontransfer.ca/files\\_docs/content/pdf/en/news\\_and\\_events/news\\_and\\_events\\_2.pdf](https://www.ontransfer.ca/files_docs/content/pdf/en/news_and_events/news_and_events_2.pdf)

**B.4.5 Duplication (Ministry section 7)**

*List similar programs offered by other institutions in the Ontario university system. Resources to identify similar programs offered in Ontario include [www.electronicinfo.ca](http://www.electronicinfo.ca), [www.electronicinfo.ca/einfo.php](http://www.electronicinfo.ca/einfo.php), and [www.oraweb.aucc.ca/showdcu.html](http://www.oraweb.aucc.ca/showdcu.html). Also, list similar programs in the geographically contiguous area, e.g., Michigan/Detroit.*

Degree programs in Science are available at most institutions across Ontario, as are programs in Economics. Within Ontario there are a number of diploma-to-degree pathways as well as transfer and articulation agreements between universities and colleges. Universities such as York and Algoma have comprehensive transfer agreements

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

that recognize credits for a considerable number of college programs. Given the flexibility of the Bachelor of Arts Honours Economics, this new stream can accommodate many CAAT programs. These transfer opportunities exist for a range of CAAT computer science-related and business programs. Some of the institutions that offer these opportunities include, though are not limited to\*:

- Western
- Trent University
- Algoma University
- York University
- Lakehead
- Laurentian University
- Ryerson
- University of Ottawa

Despite the possible similarities that exist, it is important for the Department of Economics to offer degree completion pathways for college students in order to stay competitive with other institutions' programming.

\*Note: for a comprehensive list of all transfer options, please see: [https://www.ontransfer.ca/index\\_en.php](https://www.ontransfer.ca/index_en.php)

**B.4.5.1 Demonstrate that Societal Need and Student Demand Justify Duplication (Ministry section 7)**

*If the revised program is similar to others in the system, demonstrate that societal need and student demand justify the duplication. Identify innovative and distinguishing features of the revised program in comparison to similar programs.*

Despite the existence of diploma-to-degree pathways and transfer and articulation agreements between universities and colleges, many of the universities require students to complete more than two years of full-time study to earn their degree. As such, we believe our 2+2 degree completion pathway where students earn a college diploma and university degree in four years will be more attractive to students. The new stream requires no additional resources beyond those associated with typical program growth, but will increase the overall enrollment in the Department of Economics and will allow it to remain competitive with other universities that have transfer/articulation agreements in place with colleges. Furthermore, the Applied Economics and Policy Stream articulates to Ministry Program Standards of selected programs, which allows for a larger recruitment scope and differentiates itself from institutions whose transfer/articulation agreements are tied to specific colleges.

**B.5 RESOURCES**

*[The resource impact of a proposal is almost never neutral. Note: Proposers must also complete and submit the attached **Budget Summary** (Appendix A) with the revised program proposal.]*

**B.5.1 Resources Available**

**B.5.1.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the program change(s). Please do not name specific individuals in this section.*

Courses within this new stream are offered regularly within the current academic calendar, such that there are no anticipated additional resources required to offer this new stream beyond what is associated with natural enrollment growth over time. The vast majority of courses are offered from the Department of Economics, which has capacity for growth and will be able to accommodate the projected increases in enrollment. Two courses are offered from the Department of Mathematics and Statistics, which also can accommodate the projected growth

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

in enrollment. If needed, additional course sections will be covered by sessional instructors along with relevant GA/TA support. The core university courses required are regularly offered by faculty members within departments within Science. Faculty teaching courses within this stream have current knowledge and expertise that are central to the program curriculum.

Administrative tracking will be provided within the UWinsite Student system. Academic advising will occur within the Department of Economics. The advisor responsible for the Bachelor of Arts Honours Economics will also advise students on matters related to the new stream, including appropriate sequencing and course selection. St. Clair college has also confirmed that they will advise students on how to successfully transfer into this new stream (see Appendix B for the letter of support).

**B.5.1.1a Faculty Members Involved in the Delivery of the Program**

*Complete the following table listing faculty members in the AAU offering the program as well as faculty members from other AAUs who are core to the delivery of the revised program. Indicate in the table the involvement of each faculty member in the revised and existing program(s) offered by the AAU.*

**Note:** Faculty program affiliations will be the same for the existing and new programs stream. In addition to faculty from the Department of Economics, only the faculty members from departments outside of the Department of Economics who teach core courses within this new stream were included in the table below.

Faculty Name and Rank (alphabetical)	Graduate Faculty member (for graduate programs only)	Program Affiliation: indicate faculty affiliation to the EXISTING program(s)	Program Affiliation: indicate faculty affiliation to the REVISED program
<b>Category 1: Tenured Professors teaching exclusively in the AAU offering the program</b>			
Dr. Marcelo Aarestrup Arbex, Professor	N/A	Economics	Economics
Dr. Tarek Jouini, Associate Professor	N/A	Economics	Economics
Dr. Dingding Li, Associate Professor	N/A	Economics	Economics
Dr. Jay (Hyuk-jae) Rhee, Associate Professor	N/A	Economics	Economics
Dr. Sang-Chul Suh, Professor	N/A	Economics	Economics
Dr. Christian Trudeau, Professor	N/A	Economics	Economics
Dr. Nurlan Turdaliev, Professor and Head	N/A	Economics	Economics
Dr. Yuntong Wang, Professor	N/A	Economics	Economics
<b>Category 2: Tenure-track Professors teaching exclusively in this AAU</b>			
Dr. Yahong Zhang, Assistant Professor	N/A	Economics	Economics
<b>Category 3: Ancillary Academic Staff such as Learning Specialists Positions</b>			
...			
<b>Category 4: Limited-term Appointments teaching exclusively in this AAU</b>			

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

Dr. Jinyue Li, Assistant Professor	N/A	Economics	Economics
Dr. Charlie Xu, Assistant Professor	N/A	Economics	Economics
<b>Category 5: Tenure or tenure-track or LTA professors involved in teaching and/or supervision in other AAUs, in addition to being a member of this AAU</b>			
...			
<b>Category 6: Sessionals, Lecturers, and other non-tenure track faculty</b>			
<b>Category 7: Others- Tenure, tenure-track, LTA professors, or sessionals involved in teaching and/or supervision in other AAUs.</b>			
Dr. Abdo Alfakih, Professor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Abdulkadir Hussein, Professor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Belalia Mohamed, Assistant Professor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Abida Mansoor, Sessional Instructor	N/A	Mathematics and Statistics	Mathematics and Statistics
Mehdi Sangani Monfared, Associate Professor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Animesh Sarker, Lecturer	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Jing Wang, Sessional Instructor	N/A	Mathematics and Statistics	Mathematics and Statistics
Dr. Wai Yee, Professor	N/A	Mathematics and Statistics	Mathematics and Statistics

**B.5.1.1b Faculty Expertise Available and Committed to Supporting the Revised Program**

*Assess faculty expertise available and actively committed to supporting the revised program. Provide evidence of a sufficient number and quality of faculty who are qualified to teach and/or supervise in the revised program, and of the appropriateness of this collective faculty expertise to contribute substantially to the revised program.*

*Include evidence (e.g., qualifications, research/innovation/scholarly record) that faculty have the recent research or professional/clinical expertise needed to:*

- *sustain the program*
- *promote innovation, and*
- *foster an appropriate intellectual climate.*

All courses from the University of Windsor are offered from the Department of Economics and Department of Mathematics and Statistics (three courses). These courses are offered regularly within the undergraduate calendar and are already taught by expert faculty. As such, there is already a sufficient number of highly qualified faculty to support this new stream. The faculty teaching these courses are specialists in the area who have expertise in the

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

subjects that are central to the new program stream. These expert faculty have published in leading national and international journals on topics (or similar topics) to the courses offered within the program.

**B.5.1.1c Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program**

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the revised program.*

There is no anticipated reliance on adjunct, limited-term, or sessional faculty beyond what is already being used. If needed, additional course sections will be covered by sessional instructors.

**B.5.1.1d Graduate Faculty Qualifications and Supervisory Loads (FOR GRADUATE PROGRAMS ONLY)**

*Explain how supervisory loads will be distributed, and describe the qualifications and appointment status of faculty who will provide instruction and supervision in the revised program.*

N/A

**B.5.1.1e Financial Assistance for Graduate Students (where appropriate) (FOR GRADUATE PROGRAMS ONLY)**

*Where appropriate to the revised program, provide evidence that financial assistance for graduate students will be sufficient to ensure adequate quality and numbers of students.*

N/A

**B.5.1.1f Other Available Resources (Ministry sections 3 and 4)**

*Provide evidence that there are adequate resources available and committed to the revised program to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities, including for example:*

- *staff support,*
- *library,*
- *teaching and learning support,*
- *student support services,*
- *space,*
- *equipment,*
- *facilities*
- *GA/TA*

Courses within this new stream are offered regularly within the current academic calendar. Most of the courses within this stream are offered from the Department of Economics which has capacity for growth and will be able to accommodate the projected increases in enrollment. There are no anticipated new resources required to sustaining the educational experience of undergraduate students beyond what is associated with natural enrollment growth over time.

**B.5.1.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)**

*Describe the reliance of the proposed program revisions on existing resources from other campus units, including for example:*

- *existing courses,*
  - *equipment or facilities outside the proposer's control,*
  - *external resources requiring maintenance or upgrading using external resources*
- Provide relevant details.*

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

The majority of courses within this stream are offered through the Department of Economics. There are three introductory courses in mathematics and statistics that students must complete. Departments that offer these courses can accommodate the increased enrolment numbers as our projected steady state enrolment from the new stream is 36 students (steady state).

**B.5.1.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the revised program.

N/A

**B.5.1.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the revised program. (e.g., streamlining existing programs and courses, deleting courses, etc.)

N/A

**B.5.1.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to run the revised program.

<b>Faculty:</b>	If needed, a few additional course sections will be added and covered by sessional instructors.
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	If needed, a few additional GAs/TAs will be added.

**B.5.1.5b Additional Institutional Resources and Services Required by all Affected Areas or Departments**

Describe all **additional institutional resources and services** required by all affected areas or departments to run the revised program, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.

<b>Library Resources and Services:</b>	No change
<b>Teaching and Learning Support:</b>	No change
<b>Student Support Services:</b>	No change
<b>Space and Facilities:</b>	No change
<b>Equipment (and Maintenance):</b>	No change

**C. Program Details**

**C.1 Admission Requirements (QAF section 2.1.2)**

Describe new or changes to

- program-specific admission requirements,
- selection criteria,
- credit transfer,
- arrangements for exemptions or special entry, and

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

- *alternative admission requirements, if any, for admission into the program, such as minimum average, additional language requirements or portfolios, recognition of prior work or learning experience (and how this will be assessed), etc.*

**Pathway 1: Computer science-related CAAT programs:**

- 1) Graduates of a two-year Ontario College Diploma from a computer science-related program from a qualifying Ontario or equivalent College of Applied Arts and Technology (CAAT), with a cumulative average of a least a B (73%) grade), are eligible for admission to Bachelor of Arts Honours Economics - Applied Economics and Policy Stream degree program offered by the Department of Economics at the University of Windsor under the provisions of this agreement. The Dean of Science or their designate has the authority to admit students from qualifying colleges in equivalent diploma programs within Canada pending that they meet all other admission requirements.
- 2) In addition to the appropriate two-year Diploma and grade point average, applicants to the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream are required to have successfully completed MHF4U or the equivalent course. Students who have not completed this course or its equivalents will be required to complete the equivalent course within the Foundations of Science Preparation Program.
- 3) Students admitted to the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream will obtain the equivalent of 2 years of Advanced Standing (or awarded up to 17 course transfers).
- 4) Students are required to complete twenty-three (23) courses at the University of Windsor in fulfillment of the requirements of the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream.
- 5) The Bachelor of Arts Honours Economics-Applied Economics and Policy Stream will be reviewed and amended, if appropriate, by the Department of Economics every five years following the approval of the stream. This timing corresponds with the review frequency undertaken by the CAAT diploma programs forming the basis of admission and this frequency of review will ensure the program curriculum and requirements adapt to these standards as they shift.

Recognized two-year computer programs include:

- Computer programming (MCU 50503)
- Computer Programmer (no program standards)
- Computer Engineering Technician (MCU 50509),
- Software Engineering Technician (MTU 50504)
- Any computer science-related program from a qualifying Ontario CAAT or other Canadian College deemed equivalent by the Dean of Science or their designate.

**Notes:** Three-year diplomas programs in computer science will be analyzed for additional potential credit transfer on an ad-hoc basis, while considering minimum residency and core course requirements.

We are exploring opportunities for pathways from other college programs (e.g., environmental technician, forestry technician, horticulture, and health-based programs) that have relevance to economic policy. Students from these programs would complete Pathway 1 while considering potential course equivalencies.

**Pathway 2: Business CAAT program:**

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

- 1) Graduates of a two-year Ontario College Diploma from a business-related program from a qualifying Ontario or equivalent College of Applied Arts and Technology (CAAT), with a cumulative average of a least a B (73% grade), are eligible for admission to Bachelor of Arts Honours Economics - Applied Economics and Policy Stream degree program offered by the Department of Economics at the University of Windsor under the provisions of this agreement. The Dean of Science or their designate has the authority to admit students from qualifying colleges in equivalent diploma programs within Canada pending that they meet all other admission requirements.
- 2) In addition to the appropriate two-year Diploma and grade point average, applicants to the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream are required to have successfully completed MHF4U or the equivalent course. Students who have not completed this course or its equivalents will be required to complete the equivalent course within the Foundations of Science Preparation Program.
- 3) Students admitted to the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream will obtain the equivalent of 2 years of Advanced Standing (or awarded up to 19 course transfers).
- 4) Students are required to complete twenty-one (21) courses at the University of Windsor in fulfillment of the requirements of the Bachelor of Arts Honours Economics - Applied Economics and Policy Stream.
- 5) The Bachelor of Arts Honours Economics-Applied Economics and Policy Stream will be reviewed and amended, if appropriate, by the Department of Economics every five years following the approval of the stream. This timing corresponds with the review frequency undertaken by the CAAT diploma programs forming the basis of admission and this frequency of review will ensure the program curriculum and requirements adapt to these standards as they shift.

Recognized two-year Business programs include:

- Business (MCU code 50200)
- Any business-related program from a qualifying Ontario CAAT or other Canadian College deemed equivalent by the Dean of Science or their designate.

**Note:** Three-year diplomas programs in business will be analyzed for additional potential credit transfer on an ad-hoc basis, while considering minimum residency and core course requirements.

**C.1.1 Admission Requirements and Attainment of Learning Outcomes (QAF section 2.1.2)**

*Demonstrate that admission requirements for the revised program are sufficient to prepare students for successful attainment of the intended learning outcomes (degree level expectations) established for completion of the program.*

Admission requirements ensure that students entering the Bachelor of Arts Honours Economics-Applied Economics and Policy Stream meet an equivalent basis of admission as students entering directly from high school into the Bachelor of Arts Honours Economics. Generally students in the Applied Economics and Policy Stream will complete the same core courses as those students in the BA Honours Economics program (excluding courses that are deemed equivalent to the material covered in the CAAT programs and where the BA degree program permits choice). As such, students will be prepared to successfully meet the intended learning outcomes for this new stream. Additionally, prior research suggests that students transferring from college to university are satisfied with their academic preparation (Decock, McCloy, Liu, & Hu, 2011).

**Reference:**

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

Decock, H., McCloy, U., Liu, S., and Hu, B. (2011). The Transfer Experience of Ontario Colleges who Further their Education – An analysis of Ontario’s College Graduate Satisfaction Survey. Toronto: Higher Education Quality Council of Ontario.

**C.2 Program Curriculum Structure/Program of Study (QAF sections 2.1.4 and 2.1.10)**

*Provide evidence of a program structure and faculty research that will ensure the intellectual quality of the student experience.*

*NB: For graduate programs, provide evidence that each graduate student in the revised program is required to take a minimum of two-thirds of the course requirements from among graduate-level courses. Include course requirements with course numbers and course names.*

*Identify in **BOLD** and **STRIKETHROUGH** the changes to program requirements.*

**Pathway 1: Computer Science-related CAAT Programs**

**Total courses:** 23

**Degree requirements:** (list of remaining courses required for completion of degree program):

(a) ECON-1100, ECON-1110, ECON-2120 (or STAT-2950), ECON-2210, ECON-2220, ECON-2310, ECON-2320, ECON-3060, ECON-3130, ECON-4140, ECON-4230, ECON-4330, ECON-4070 and seven additional courses, at least five of which have to be at the 3XXX or 4XXX level.

(b) MATH-1260 (or MATH-1250), MATH-1760 (or MATH-1720), and either STAT-2910 or STAT-2920 (if taking STAT-2920, the student must take MATH-1730 as a prerequisite for STAT-2920).

**Pathway 2: Business CAAT Program**

**Total courses:** 21\*

**Degree requirements:** (list of remaining courses required for completion of degree program):

(a) ECON-2120 (or STAT-2950), ECON-2210, ECON-2220, ECON-2310, ECON-2320, ECON-3060, ECON-3130, ECON-4140, ECON-4230, ECON-4330, ECON-4070 and seven additional courses, at least five of which have to be at the 3XXX or 4XXX level.

(b) MATH-1260 (or MATH-1250), MATH-1760 (or MATH-1720), and either STAT-2910 or STAT-2920 (if taking STAT-2920, the student must take MATH-1730 as a prerequisite for STAT-2920).

**Notes:**

- A review of program standards and their elements of performance was done for the CAAT business program to ensure minimal duplication of course content within degree requirements. Courses that were deemed sufficiently covered by the program standards were removed from the degree requirements.
- \*We anticipate 21 required courses for the first cohort of students but with advising and consultation with colleges we believe the required number of courses in the future will be 20. The Faculty of Science will be collaborating with colleges to provide course offerings that will reduce student degree requirements to 20 courses. Colleges will also help advise students on the appropriate electives to complete.

**Courses used to calculate the major average are:**

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

Courses used to calculate the major average are: courses listed under requirement (a), and any courses taken in the major area(s) of study.

**Description of thesis option (if applicable):**

N/A

**Provide requirements for the Co-op/Experiential Learning Component AND a description of how the program requirements differ for students who complete the experiential learning option and those who opt not to (if applicable). [If the co-op/experiential learning component is new (not part of the existing stand-alone program), a PDC Form B is required]:**

N/A

**Explain how credit will be awarded for the experiential learning component (length of component, credit weighting, etc.):**

N/A

**Guidelines for experiential learning/co-op work term reports:**

N/A

**General length of experiential learning/co-op work term:**

N/A

**Is the completion of the experiential learning/co-op component a requirement of the program?**

N/A

**C.3.1 For Graduate Program ONLY (QAF sections 2.1.3 and 3; Senate Co-op Policy)**

**C.3.1.1 Normal Duration for Completion**

*Provide a clear rationale for program length that ensures that the revised program requirements can be reasonably completed within the proposed time period.*

N/A

**C.3.1.2 Program Research Requirements**

*For research-focused graduate programs, provide a clear indication of the nature and suitability of the major research requirements for completion of the revised program.*

N/A

**C.3.1.3 New or Changes to Fields in a Graduate Program (optional)**

*Where fields are contemplated, provide the following information:  
The master's program comprises the following fields: ...[list, as applicable]*

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

*The PhD program comprises the following fields: ...[list, as applicable]*

N/A

**C.3.2 For All Program Proposals**

**C.3.2.1 New or Changes to Standing Required for Continuation in Program**

*Minimum average requirements for continuation in the program.  
Must conform to the regulations for standing required for continuation in the program as set out in Senate policy.  
Specify new or changes to standing required for continuation in the experiential learning option or co-op option of the revised program, where applicable.*

Continuation in this new stream is consistent with the Bachelor of Arts Honours Economics. As per the UWindsor Policy on Standing Required for Continuation in Programs and For Graduation (Undergraduate), standing required for continuation in the Bachelor of Art Honours Economics is 60% for both cumulative average and major average.

**C.3.2.2 New or Changes to Standing Required for Graduation**

*Minimum average requirement to graduate in the program.  
Must conform to the regulations for standing required for continuation in the program as set out in Senate policy.  
Specify new or changes to standing required for graduation in the experiential learning option or co-op option of the revised program, where applicable.*

Graduation from this stream is consistent with the Bachelor of Arts Honours Economics. As per UWindsor Policy on Standing Required for Continuation in Programs and For Graduation (Undergraduate), standing required for graduation in the Bachelor of Art Honours Economics is 60% for cumulative average and 70% for major average.

**C.3.2.3 New or Changes to Suggested Program Sequencing**

*Provide suggested program sequencing for each year of the revised program, ensuring that all pre-requisites are met in the sequencing.  
Where applicable, provide work/study/placement sequencing for each year of the experiential learning/co-op version of the revised program. Please ensure that all pre-requisites are met in the sequencing.  
For Co-op programs: The proposed work/study sequence or alternative arrangement should allow for year-round availability of students for employers (if appropriate) and, wherever possible, should meet the guidelines for co-operative education as set out by the Canadian Association for Co-operative Education (see Policy on Co-op Programs).*

**Pathway 1: Computer Science-related CAAT Programs**

**Year 1:**

Summer: ECON-1100, ECON-1110

Fall: ECON-2210, ECON-2310, MATH-1250 (or MATH-1260), MATH 1720 (or MATH-1760), STAT-2910 (or STAT 2920)

Winter: ECON-2120 (or STAT-2950), ECON-2220, ECON-2320, ECON-3060, ECON-XXXX, ECON-XXXX\*

\*Can be taken as overload or within summer/intersession.

**Year 2:**

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

Fall: ECON-3130, ECON-4230, ECON-4330, ECON-3XXX/4XXX, ECON-3XXX/4XXXX  
Winter: ECON-4070, ECON-4140, ECON-3XXX/4XXX, ECON-3XXX/4XXXX, ECON-3XXX/4XXXX

**Pathway 2: Business CAAT Program**

**Year 1:**

Fall: ECON-2210, ECON-2310, MATH-1250 (or MATH-1260), MATH 1720 (or MATH-1760), STAT-2910 (or STAT 2920)  
Winter: ECON-2120 (or STAT-2950), ECON-2220, ECON-2320, ECON-3060, ECON-XXXX, ECON-XXXX\*

\*Can be taken as overload or within summer/intersession.

**Year 2:**

Fall: ECON-3130, ECON-4230, ECON-4330, ECON-3XXX/4XXX, ECON-3XXX/4XXXX  
Winter: ECON-4070, ECON-4140, ECON-3XXX/4XXX, ECON-3XXX/4XXXX, ECON-3XXX/4XXXX

**C.4 NEW OR CHANGES TO LEARNING OUTCOMES (Degree Level Expectations)(QAF section 2.1.1, 2.1.3, and 2.1.6)**

**COMPLETE THIS TABLE FOR UNDERGRADUATE PROGRAMS**

*In the following table, provide the specific learning outcomes (degree level expectations) that constitute the overall goals of the Combined program or Concurrent offering (i.e., the intended skills and qualities of graduates of this program). Link each learning outcome to the Characteristics of a University of Windsor Graduate” by listing them in the appropriate rows.*

*A learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate. All University of Windsor programs should produce graduates able to demonstrate each of the nine characteristics. Program design must demonstrate how students acquire all these characteristics. All individual courses should contribute to the development of one or more of these traits: a program in its entirety must demonstrate how students meet all of these outcomes through the complete program of coursework.*

*Proposers are strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes (degree level expectations).*

***For Combined Programs and Concurrent Offerings:** The program learning outcomes would include the outcomes for the two standalone programs with a few additional outcomes to reflect the benefits of pursuing the two disciplines in an integrated manner. [For learning outcome A, the integration of knowledge can be within a program and between the two programs.]*

***For programs with an Experiential Learning or Co-op Option:** Include learning outcomes for the program with a few additional outcomes highlighted to reflect the benefits of pursuing the experiential learning/co-op option.*

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

<p><b>Program Learning Outcomes (Degree Level Expectations)</b> <i>This is a sentence completion exercise. Please provide a minimum of 1 learning outcome for each of the boxes associated with a graduate attribute.</i></p> <p><u>At the end of this program, the successful student will know and be able to:</u></p>	<p><b>Characteristics of a University of Windsor Graduate</b></p> <p><u>A UWindsor graduate will have the ability to demonstrate:</u></p>	<p><b>COU-approved Undergraduate Degree Level Expectations</b></p>
<p>Explain economic problems and solutions.</p> <p>Integrate knowledge of economics with statistics in order to estimate economic models (also relevant to C and D).</p>	<p>A. the acquisition, application and integration of knowledge</p>	<p>1. Depth and Breadth of Knowledge 2. Knowledge of Methodologies 3. Application of Knowledge 5. Awareness of Limits of Knowledge</p>
<p>Retrieve and evaluate data from a wide range of public data sources.</p> <p>Use statistical packages in analyzing data.</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>	<p>1. Depth and Breadth of Knowledge 2. Knowledge of Methodologies 3. Application of Knowledge 5. Awareness of Limits Knowledge</p>
<p>Apply economic concepts, theories, and analysis to solve problems (also relevant to D).</p>	<p>C. critical thinking and problem-solving skills</p>	<p>1. Depth and Breadth of Knowledge 2. Knowledge of Methodologies 3. Application of Knowledge 5. Awareness of Limits of Knowledge</p>
<p>Solve economic and related problems using basic mathematical tools (also relevant to C).</p> <p>Organize and interpret a range of economic data on both descriptive and analytical levels.</p>	<p>D. literacy and numeracy skills</p>	<p>4. Communication Skills 5. Awareness of Limits of Knowledge</p>
<p>Provide accurate descriptions and information of solutions to economic and related problems.</p>	<p>E. responsible behaviour to self, others and society</p>	<p>5. Awareness of Limits of Knowledge 6. Autonomy and Professional Capacity</p>
<p>Communicate economic concepts and solutions to problems in written, spoken, and numerical form.</p>	<p>F. interpersonal and communications skills</p>	<p>4. Communication Skills 6. Autonomy and Professional Capacity</p>
<p>Use evidence-informed approaches when applying mathematical principles to solve economic and related problems (also relevant to E).</p>	<p>G. teamwork, and personal and group leadership skills</p>	<p>4. Communication Skills 6. Autonomy and Professional Capacity</p>
<p>Formulate findings and recommendations on economic and related problems in a precise and concise manner.</p>	<p>H. creativity and aesthetic appreciation</p>	<p>2. Knowledge of Methodologies 3. Application of Knowledge 6. Autonomy and Professional Capacity</p>

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

<b>Program Learning Outcomes (Degree Level Expectations)</b> <i>This is a sentence completion exercise. Please provide a minimum of 1 learning outcome for each of the boxes associated with a graduate attribute.</i>  <u>At the end of this program, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b>  <u>A UWindsor graduate will have the ability to demonstrate:</u>	<b>COU-approved Undergraduate Degree Level Expectations</b>
Monitor and identify advances in economic knowledge and theory.	I. the ability and desire for continuous learning	6. Autonomy and Professional Capacity

**C.4.1 Revised Program Structure and Regulations Ensure Learning Outcomes Can be Met**

*Describe how the revised program's structure and regulations ensure that the specified learning outcomes can be met by successful students.*

The structure of the Bachelor of Art Honours Economics consists of core economics courses but also provides great flexibility in the subject area students can study with economics through their electives. This flexibility helps facilitate this degree completion pathway. Specifically, student in the Bachelor of Arts Honours Economics must complete 17 courses from any area of study. The block transfer from the CAAT diploma will fulfill this requirement, and upon arrival to the University of Windsor, students within the Applied Economics and Policy Stream will complete core economics and mathematics courses. As a result, the program learning outcomes for Bachelor of Arts Honours Economics- Applied Economics and Policy Stream primarily relate to economics since CAAT graduates will come from different programs. Ministry Program Standards for the CAAT diploma programs were reviewed and when appropriate included in the stream learning outcomes. Regardless of the college program students completed, students will be prepared to successfully meet the learning outcomes of the new stream (see Appendix D for more information on curriculum mapping).

CAAT graduates from computer science-related programs may not have been exposed to economics so these students would complete introductory courses in economics (ECON-1100, ECON-1110). CAAT graduates from a business would be introduced to economic concepts and theories. Upon entering the new stream, students will be introduced to a broader scope of scientific literature and theoretical concepts that will focus more directly on economics. CAAT graduates from business will enter the Applied Economics and Policy Stream with an 'introductory' level understanding of the program learning outcomes, whereas CAAT graduates from computer science-related programs will gain their introduction through ECON-1100, ECON-1110. As students' progress through the stream, they will gain more depth and breadth of scientific knowledge and mathematical techniques that are focused on economics. Given the nature of the BA in Economics, students have great flexibility in the courses that they can complete as electives; therefore, even though students may begin the program different background they will still be able to meet the learning outcomes.

The new stream includes course-specific assessments that will be used to evaluate students' mastery of the learning outcomes. These assessments may include, though are not limited to: examinations (e.g., quizzes, midterms, final exams), assignments of various formats related to course content (e.g., data analysis, characterization of economic equilibrium and its stability, etc.) papers (e.g., research papers), and presentations. The structure of the stream is scaffolded to ensure students can meet the learning outcomes as well as progress from 'introduction' to 'mastery' of the stream learning outcomes. There will also be many opportunities for

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

students to reinforce and practice these skills through both the required and elective courses within economics. Please see Appendix D for a copy of the curriculum map.

**C.4.2 Impact of Experiential Learning Component on Attainment of Learning Outcomes**

*For programs with a proposed experiential learning or co-op component: describe how the experiential learning/co-op component changes the emphasis or the means of achieving the intended learning outcomes for the program.*

There are no new or revised experiential learning components.

**C.4.3 Mode of Delivery (QAF section 2.1.5)**

*Demonstrate that the proposed modes of delivery are appropriate to meet the new or revised program learning outcomes. Discuss online vs. face-to-face (e.g., lecture, seminar, tutorial, lab) modes of delivery, as well as specialized approaches intended to facilitate the acquisition of specific skills, knowledge, and attitudes.*

Courses primarily rely on face-to-face offerings and delivery may vary according to instructor. Approaches may include: standard lectures with active learning techniques embedded (e.g., discussions), tutorials, research seminar, integrative review of research papers, presentations, and written assignments.

The modes of delivery and the teaching methods used will provide students with a variety of learning experiences and assist them in developing the knowledge, skills, and abilities to meet the learning outcomes.

**C.5 Student Workload**

*Provide information on the expected workload per course credit (3.0) of a student enrolled in this revised program. (For assistance with this exercise, proposers are encouraged to contact the Centre for Teaching and Learning.)*

Expected Workload per 3.0 Course Credit/Week	Average Time per week the Student is Expected to Devote to Each Component Over the Course of the Program
Lectures	1-3
Tutorials	0-1
Practical experience/lab	0-3
Service or experiential learning	
Independent study	2-3
Reading and work for assessment, including meeting classmates for group work/project assignments (essays, papers, projects, laboratory work, etc.)	2-3
Studying for tests/examinations	1
Other: <i>[specify]</i>	

**Compare the student workload for this program with other similar programs in the AAU:**

The core university courses for this stream are courses that are completed by students enrolled in the Bachelor of Arts Honours Economics program. Therefore, the workload for the new stream is consistent with the workload for a student completing a Bachelor of Arts Honours Economics.

**D. MONITORING AND EVALUATION (QAF section 2.1.6)**

*Describe and explain the appropriateness of the proposed methods of assessing student achievement given the new or revised intended learning outcomes and degree level expectations.*

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

Curriculum mapping was undertaken to ensure assessments were sufficiently measuring students’ ability to meet the indent learning outcomes. These planned assessment activities are intended to focus on achievement of knowledge, skills, and methods in economics. This is consistent with the stream learning outcomes. examinations (e.g., quizzes, midterms, final exams), assignments of various formats related to course content (e.g., data analysis, characterization of economic equilibrium and its stability, etc.) papers (e.g., research papers), and presentations. Following the completion of curriculum mapping, it is evident that assessments adequately align with, and measure students’ achievement of the program learning outcomes (see Appendix D for a copy of the curriculum map).

For an overview of assessment methods that may be used to evaluate students’ achieving the learning outcomes, please see Table 2: Alignment of assessments & learning outcomes.

The academic advisor within the Department of Economics will be responsible for overseeing that requirements are being met as well as how student process through the program. As questions arise students can consult the academic advisor.

**Table 2. Alignment of assessments & learning outcomes**

<b>Courses</b>	<b>Assessments*</b>	<b>Alignment with Program Learning Outcomes (PLO)</b>	<b>Sequence</b>
ECON-1100	Examinations	PLO1-PLO12	Year 1
ECON-1110	Examinations	PLO1-PLO12	Year 1
ECON-2210	Examinations	PLO1, PLO5-PLO12	Year 1
ECON-2310	Examinations	PLO1, PLO5-PLO12	Year 1
ECON-3060	Examinations, assignments	PLO2, PLO4-PLO12	Year 1
STAT-2910 or STAT-2920	Examinations	PLO2, PLO3, PLO4, PLO6, PLO10, PLO11	Year 1
ECON-2120 or STAT-2950	Examinations	PLO1-PLO12	Year 1
ECON-2220	Examinations	PLO1, PLO5-PLO12	Year 1
ECON-2320	Examinations	PLO1, PLO5-PLO12	Year 1
MATH-1250 or MATH-1260	Examinations	PLO6, PLO10, PLO11	Year 1
ECON-3130	Examinations, assignments	PLO1-PLO12	Year 2
ECON-4230	Examinations, assignments	PLO1, PLO5-PLO12	Year 2
ECON-4330	Examinations	PLO1, PLO5-PLO12	Year 2
ECON-4070	Assignments, seminar participation, research proposal, presentation, final research paper	PLO1, PLO5-PLO12	Year 2
ECON-4140	Examinations, assignments	PLO1, PLO5-PLO12	Year 2

**Note:** Students are required to take seven additional courses, at least five of which have to be at the 3XXX or 4XXX level. These were not included in the curriculum map or Table 2 given the variety of courses students are able to choose from. However, regardless of the elective chosen, they will provide additional opportunities for reinforcement and mastery of the stream learning outcomes.

\*This is not a comprehensive list of assessments as there may be additional assessments used within courses that test students’ achievement of certificate LOs.

**D.1 Plan for Documenting And Demonstrating Student Performance Consistent with Learning Outcomes**

*Describe the plan for documenting and demonstrating student performance level and demonstrate its consistency with the new or revised stated learning outcomes and degree level expectations.*

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

As the stream evolves, student success and performance level will be tracked through consultation, student feedback, and grades. The academic advisor within the Department of Economics will be responsible for monitoring student progression and responding to student questions regarding the stream. All courses will contribute to students' attainment of the program learning outcomes.

Please see Appendix D for the curriculum map and Table 2 for how course assessments may align with program learning outcomes.

**E. NEW OR REVISIONS TO EXPERIENTIAL LEARNING/CO-OP COMPONENT ONLY (Senate Co-op Policy)**

*[Complete this section ONLY if the program change includes new or revisions to the experiential learning/co-op component involving paid or unpaid placements.]*

Note: There are no new or revised experiential learning components.

**E.1 Experiential Learning Component and Nature of Experience**

*Describe the new or revised experiential learning component and the nature of the experience (field placement, required professional practice, service-learning, internship, etc.)*

N/A

**E.2 Knowledge and Skills Brought to the Workplace**

*Provide a description of the knowledge and skills that students will be bringing to the workplace/placement based on the revised curriculum.*

N/A

**E.3 Evidence of Availability of Placements**

*Provide evidence of the availability of an adequate number of positions of good quality both inside and outside the Windsor area for the new or revised co-op/experiential learning option (including names and contact information of potential employers, written statements or surveys from potential employers; and employer feedback concerning the hiring of graduates).*

*Provide a summary of the types of positions that would be suitable at each level of work-term.*

*How will these placements/opportunities be developed?*

*[NB: For co-op programs, the majority of Ontario placements should qualify for the Co-op Education tax credit. See Policy on Co-op Programs for more details.]*

N/A

**E.4 Mechanism for Supervision of Placements (QAF section 2.1.9)**

*Describe the mechanism that will be established for the supervision of the new or revised experiential learning placements.*

N/A

**E.5 Fees Associated with Experiential Learning Component**

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

*Provide information on the fees associated with the new or revised experiential learning component, if applicable.*

*NB: all proposed fees must be approved as part of the University's operating budget, via the Ancillary Fee Committee.*

N/A

**E.6 AAU Council Approval of New or Revised Co-op Component**

*Please obtain signatures for the following statement for new/revised co-op programs.*

*Before a determination can be made regarding the feasibility of a co-op program, there must be a clear indication of support for the program from the AAU. Support implies that the area will provide ongoing departmental funding to establish a co-op faculty representative who will liaise with the Centre for Career Education in the operation of the program and that the area will ensure that an adequate number of faculty members in the AAU or program contribute to the co-operative education program by grading work-term reports, attending and evaluating work-term presentations, assisting in the job development process, establishing a departmental co-op committee as appropriate, etc. (see Policy on Co-op Programs, Summary of AAU/Faculty Member Involvement in a Co-operative Education Program, for more on the role of the AAU and faculty members). This commitment must be agreed to by the AAU Council at a meeting at which the development or modification of a co-op program was considered and approved.*

*Signed agreement by the AAU Head, acting as chair of the AAU Council, that AAU members support the development of the co-op program.\**

Name of AAU Head (typed or e-signature): \_\_\_\_\_

*[Approval of the program by the AAU Council shall constitute agreement and support by AAU members of the development of the co-op program.]*

Name of Director of the Co-op Services (typed or e-signature ): \_\_\_\_\_

*[Approval of the program by the Director of Co-op Services shall constitute agreement and support of the development of the co-op program.]*

**E.7 Guidelines for the Establishment of New/Revised Co-op Programs: CHECKLIST**

Final Overview:

Please complete this checklist to ensure that the Senate-approved guidelines for the establishment of a new co-op program have been addressed.

**Does the proposal:**

- include the endorsement of/involvement by the Centre for Career Education?
- adequately describe the academic program?
- include a strong rationale for co-operative education?
- list the types of positions suitable to students at the junior, intermediate and senior work-term?
- articulate the possibility for international placements at a later point?
- provide for a reasonable proportion of international students to obtain appropriate placement opportunities?
- include a plan to monitor the availability of work placements on an ongoing basis?

## PROGRAM DEVELOPMENT COMMITTEE

### MAJOR PROGRAM CHANGES

#### FORM B

- articulate specific learning outcomes (degree level expectations) and co-op requirements?
- include a commitment by the department to adequately support the program by funding a co-op faculty representative?:
- include a commitment by the department to adequately support the program by ensuring that an adequate number of faculty members are willing to grade work term assignments, assist in the job development process, etc.?

#### **Will the program:**

- attract a sufficient number of students including students from outside of the Windsor-Essex region (a minimum annual intake of 20 students enrolled in the co-op component)?
- be able to attract and sustain an adequate number of positions of good quality both inside and outside of the Windsor-Essex region?
- provide year-round availability of students to the workplace in some manner?
- meet the requirements for accreditation by the Canadian Association of Co-operative Education (see guidelines)?

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

**APPENDIX A – BUDGET SUMMARY SHEET**

Contact the Office of Quality Assurance for assistance in completing this form.

<b>Projections of Enrolment, Expenditures and Revenues (enrolments over 5 years)</b>						
<b>Year</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>2024-25 Steady stream</b>	<b>2025-26</b>	<b>Total</b>
<b>Revenue</b>						
Tuition income*1 (calculation shown in table below)	\$91,350	\$164,836	\$206,138	\$233,503	\$237,006	\$932,832
Potential Provincial funding*2	\$91,350	\$164,836	\$206,138	\$233,503	\$237,006	\$932,832
Other sources of funding (please list)						
	0	0	0	0	0	<b>0</b>
<b>Total Revenue</b>	<b>\$182,700</b>	<b>\$329,672</b>	<b>\$412,275</b>	<b>\$467,005</b>	<b>\$474,012</b>	<b>\$1,865,664</b>
<b>Expenses</b>						
Additional Sessional Faculty*3	\$20,000 (10,000x2)	\$30,300 (10,100x3)	\$30,603 (10,201x3)	\$30,909 (10,303x3)	\$31,218 (10,406x3)	\$143,030
GA/TA*4	\$10,000 (5,000x2)	\$15,150 (5,050x3)	\$15,303 (5,101x3)	\$15,456 (5,152x3)	\$15,612 (5,204x3)	\$71,521
<b>Total Expenses</b>	<b>\$30,000</b>	<b>\$45,450</b>	<b>\$45,906</b>	<b>\$46,365</b>	<b>\$46,830</b>	<b>\$214,551</b>
<b>Net Income</b>	<b>\$152,700</b>	<b>\$284,222</b>	<b>\$366,369</b>	<b>\$420,640</b>	<b>\$427,182</b>	<b>\$1,651,113</b>

\*1 Estimate \$5,800 per full-time equivalent domestic undergraduate student per year in 2021-22, with a 1.5% increase in each future year tuition rates.

\*2 Estimate same amount as tuition per full-time equivalent domestic undergraduate student

\*3 Estimate Sessional Faculty costs of \$10,000 in 2021-22 and a 1% annual increase

\*4 Estimate \$5,000 per GA/TA allocation in 2021-22 and a 1% annual increase

Shown in B.4.2 table >>> Total enrol                    14                    26                    32                    36                    36  
 FT Tuition        \$    5,800        \$    5,887        \$    5,975        \$    6,065        \$    6,156

	21-22	22-23	23-24	24-25	25-26
Yr 1-PW1	50,750	58,870	74,688	75,813	76,950
Yr 1-PW2	40,600	47,096	59,750	60,650	61,560
Yr 2-PW1		29,435	35,850	48,520	49,248
Yr 2-PW2		29,435	35,850	48,520	49,248
<b>Total</b>	<b>\$ 91,350</b>	<b>\$ 164,836</b>	<b>\$ 206,138</b>	<b>\$ 233,503</b>	<b>\$ 237,006</b>

Line 1 of table above >>>

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

**Appendix B-Letter of Support from St. Clair College**



January 24, 2020

Dr. Chris Houser  
Dean, Faculty of Science  
University of Windsor  
401 Sunset Avenue  
Windsor, Ontario  
N9B 3P4

Dear Chris:

After reviewing the block transfer proposals to allow admission for St. Clair College graduates into the Forensics, Environmental Science, Economics, and Chemistry programs, please accept this letter as support to obtain the necessary approvals at the University of Windsor.

These 2 + 2-degree completion pathways will provide opportunities for graduates from programs related to: Police Foundations, business, the environment, and chemistry.

We anticipate that approximately 5 to 10% of graduating students from the aforementioned program areas will be interested in transferring to one of the prescribed degree completion pathways. St. Clair College will assist in advertising and promoting the programs to their students (e.g. sharing flyers, allowing site visits, etc.), as well as advising students on how to successfully transfer to the University of Windsor.

Should you require further information, I may be reached by email at [whabash@stclaircollege.ca](mailto:whabash@stclaircollege.ca) or by telephone at 519-972-2727, extension 5090.

I look forward to our continued collaboration.



Waseem Habash  
Vice President, Academic

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

**Appendix C –Confirmation from Continuing Education for Foundations of Science Preparatory Programming**

**From:** Jennie Atkins <[jatkins@uwindsor.ca](mailto:jatkins@uwindsor.ca)>  
**Date:** Thursday, December 12, 2019 at 1:20 PM  
**To:** Chris Houser <[Chris.Houser@uwindsor.ca](mailto:Chris.Houser@uwindsor.ca)>  
**Subject:** Foundation Programming

Chris,

Just confirming that Continuing Education is developing Foundation programming which will include the following topics. Our launch date is set for July 2020.

- Calculus
- Algebra
- Chemistry
- Biology
- Statistics

Please let me know if you need further information.

Thanks,

Jennie

---

**Jennie Atkins, MBA, MA**

**Executive Director**

**University of Windsor**

**Continuing Education**

E:[jatkins@uwindsor.ca](mailto:jatkins@uwindsor.ca) W:[continue.uwindsor.ca](http://continue.uwindsor.ca)

**PROGRAM DEVELOPMENT COMMITTEE**  
**MAJOR PROGRAM CHANGES**  
**FORM B**

**Appendix D-Review and Analysis of CAAT Program Standards & Curriculum Mapping**

**Background information:**

All CAAT program standards and their elements of performance were carefully reviewed and categorized by the Characteristics of a University of Windsor Graduate. Subsequently, CAAT programs were reviewed and analyzed to determine commonalities in the knowledge, skills, and abilities students would acquire following successful completion of the CAAT program. Commonalities in program standards were found in many areas, including though not limited to: the application of knowledge, research skills, critical thinking, communication, responsible behaviour, leadership, creativity/problem solving, and professional development/continuous learning. Following this review and analysis of CAAT program standards and their elements of performance, it was determined that these standards have common elements that were captured in the Applied Economics and Policy Stream learning outcomes. The structure of the Bachelor of Art Honours Economics consists of core economics courses but also provides great flexibility in the subject area students can study with economics through their electives. This flexibility helps facilitate this degree completion pathway. Specifically, student in the BA Economics must complete 17 courses from any area of study. The block transfer from the CAAT diploma will fulfill this requirement, and upon arrival to the University of Windsor, students within the Applied Economics Stream will complete core economics and mathematics courses. Therefore, a decision was made to treat these CAAT diploma programs as a 'block' when developing the curriculum map for the Applied Economics and Policy Stream rather than mapping each CAAT program to the stream program learning outcomes. For more information, please see the curriculum map for the stream in Table 3 below.

\*CAAT program standards and their elements of performance can be accessed through the following links:

- Computer Programming (MCU code 50503):  
<http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/techno/50503-computer-programming.pdf>
- Computer Programmer (no program standards)
- Computer Engineering Technician:  
<http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/techno/50509-computer-engineering-technician.pdf>
- Software Engineering Technician:  
<http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/techno/50504-software-engineering-technician.pdf>
- Business (MCU code 50200):  
<http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/business/50200En.pdf>

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

**Table 3. Curriculum Map**

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
<b>Computer-Science CAAT Graduate</b> <small>Will complete ECON-1100 and ECON-1110 @ UWindsor</small>	I	I	I	I	I	I	I	I	I	I	I	I
<b>Business CAAT Graduate</b>	I	I	I	I	I	I	I	I	I	I	I	I
MATH 1250 or MATH 1260						I				I	I	
MATH 1720 or MATH 1760						I				I	I	
STAT 2910 or STAT 2920		I	I	I		I				I	I	
ECON 2210	I				I	I	I	I	I	I	I	I
ECON 2310	I				I	I	I	I	I	I	I	I
ECON 2120 or STAT 2950	I	I	I	I	I	I	I	I	I	I	I	
ECON 2220	R				R	R	R	R	R	R	R	R
ECON 2320	R				R	R	R	R	R	R	R	R
ECON 3060		R		R	R	R	R	R	R	R	R	R
ECON 3130	R	R	R	R	R	R	R	R	R	R	R	R
ECON 4230	M				M	R	M	M	R	R	M	R
ECON 4330	M				M	R	M	M	R	R	M	R
ECON 4140	M	M	R	M	R	M	R	R	R	M	R	R
ECON 4070	M	M	M	M	M	M	M	M	M	M	M	M

**Notes:**

PLO = program learning outcome

I = Introduction

R = Reinforce

M = Mastery

1. While the recognized CAAT programs are different, they have certain common elements within their Ministry Program Standards that have been captured in the Applied Economics and Policy Stream LOs. As such, these programs are treated as a 'block' rather than mapping each program into the stream LOs.
2. Students are required to take seven additional courses, at least five of which have to be at the 3XXX or 4XXX level. These were not included in the curriculum map given the variety of courses students are able to choose from. However, regardless of the elective chosen, they will provide additional opportunities for reinforcement and mastery of the stream learning outcomes.

**PROGRAM DEVELOPMENT COMMITTEE  
MAJOR PROGRAM CHANGES  
FORM B**

PLO1: Explain economic problems and solutions.

PLO2: Integrate knowledge of economics with statistics in order to estimate economic models.

PLO3: Retrieve and evaluate data from a wide range of public data sources.

PLO4: Use statistical packages in analyzing data.

PLO5: Apply economic concepts, theories, and analysis to solve problems

PLO6: Solve economic and related problems using basic mathematical tools.

PLO7: Organize and interpret a range of economic data on both descriptive and analytical levels.

PLO8: Provide accurate descriptions and information of solutions to economic and related problems.

PLO9: Communicate economic concepts and solutions to problems in written, spoken, and numerical form.

PLO10: Use evidence-informed approaches when applying mathematical principles to solve economic and related problems.

PLO11: Formulate findings and recommendations on economic and related problems in a precise and concise manner.

PLO12: Monitor and identify advances in economic knowledge and theory.

**University of Windsor  
Program Development Committee**

\*5.3: **Physics - Minor Program Changes (Form C)**

Item for: **Approval**

**MOTION: That the degree requirements for the Honours Physics, Honours Physics with Thesis, Honours Physics (Medical Physics), Honours Physics (Medical Physics) with Thesis, Minor in Physics be changed according to the program/course change form.^**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The proposal has been approved by the Department of Physics Council and the Faculty of Science Coordinating Council.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
MINOR PROGRAM CHANGES  
FORM C**

<b>TITLE OF PROGRAM(S)/CERTIFICATE(S):</b>	Honours Physics, Honours Physics with Thesis, Honours Physics (Medical Physics), Honours Physics (Medical Physics) with Thesis, Minor in Physics
<b>DEPARTMENT(S)/SCHOOL(S):</b>	Physics
<b>FACULTY(IES):</b>	Science

<b>Proposed change(s) effective as of*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Fall 2021
--	-----------

**A.1 PROGRAM REQUIREMENT CHANGES**

*Please provide the current program requirements and the proposed new program requirements by cutting and pasting from the current undergraduate or graduate web calendar ([www.uwindsor.ca/secretariat/calendars](http://www.uwindsor.ca/secretariat/calendars)) and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Example: Degree requirements: WXYZ-1000, ~~WXYZ-1010~~, WXYZ-1100, WXYZ-2100, WXYZ-3100, WXYZ-4100, plus three additional courses at the **3000-level or** 4000-level.*

**Honours Physics**

Degree Requirements

Total courses: 40 (43 for co-op option)

(a) PHYS-1400, PHYS-1410, PHYS-1500, PHYS-2200, **PHYS-2210**, ~~PHYS-2250~~, PHYS-2500, PHYS-3100, ~~PHYS-3110~~, PHYS-3200, PHYS-3210, PHYS-3500, **PHYS-3900**, PHYS-4130, PHYS-4100, and ~~five~~ **six** courses in Physics at the 3XXX or 4XXX level.

(b) CHEM-1100, CHEM-1110, CHEM-2400, COMP-1400, COMP-1410, MATH-1250 (or MATH-1260), MATH-1720 (or MATH-1760), MATH-1730, MATH-2780, MATH-2790, MATH-3550, ~~GENG-2340~~, ELEC-2170 or COMP-2650.

(c) two of Arts, Humanities and Social Sciences

(d) seven courses from any area.

For co-op stream, in addition:

(e) three co-op terms: PHYS-2980, PHYS-3980, PHYS-4980, (oral and written reports required). Students must maintain major and cumulative averages of 65% or better to qualify for co-op placements.

**Honours Physics with Thesis**

Degree Requirements

Total courses: 40 (43 for co-op option)

(a) PHYS-1400, PHYS-1410, PHYS-1500, PHYS-2200, **PHYS-2210**, ~~PHYS-2250~~, PHYS-2500, PHYS-3100, ~~PHYS-3110~~, PHYS-3200, PHYS-3210, PHYS-3500, **PHYS-3900**, PHYS-4900 (6.0 credits)\*\*, PHYS-4130, PHYS-4100, ~~plus five~~ **and six** additional courses in Physics at the 3XXX or 4XXX level.

(b) CHEM-1100, CHEM-1110, CHEM-2400, COMP-1400, COMP-1410, MATH-1250 (or MATH-1260), MATH-1720 (or MATH-1760), MATH-1730, MATH-2780, MATH-2790, MATH-3550, ~~GENG-2340~~, ELEC-2170 or COMP-2650.

(c) two of Arts, Humanities and Social Sciences

(d) five courses from any area.

\*\*Only students who have maintained a major average of 70% and a cumulative average of 60% will be permitted to enrol in PHYS-4900.

For co-op stream, in addition:

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

(e) three co-op terms: PHYS-2980, PHYS-3980, PHYS-4980, (oral and written reports required). Students must maintain major and cumulative averages of 65% or better to qualify for co-op placements.

#### Honours Physics (Medical Physics)

Degree Requirements

Total courses: 40 (43 for co-op option)

(a) PHYS-1400, PHYS-1410, PHYS-1500, PHYS-2200, **PHYS-2210**, ~~PHYS-2250~~, PHYS-2500, PHYS-3100, ~~PHYS-3110~~, PHYS-3200, PHYS-3210, PHYS-3500, PHYS-3700, **PHYS-3900**, PHYS-4130, PHYS-4100, PHYS-4700, PHYS-4710 and ~~two~~ **three** more courses in Physics at the 3XXX or 4XXX level.

(b) BIOL-1101, CHEM-1100, CHEM-1110, CHEM-2300, CHEM-2400, BIOC-2010 or BIOC-2015, COMP-1400, COMP-1410, MATH-1250 (or MATH-1260), MATH-1720 (or MATH-1760), MATH-1730, MATH-2780, MATH-2790, MATH-3550, ~~GENG-2340~~.

(c) two of Arts, Humanities and Social Sciences.

(d) five courses from any area.

For co-op option, in addition:

(e) three co-op terms: PHYS-2980, PHYS-3980, PHYS-4980, (oral and written reports required). Students must maintain major and cumulative averages of 65% or better to qualify for co-op placements.

#### Honours Physics (Medical Physics with Thesis)

Degree Requirements

Total courses: 40 (43 for co-op option)

(a) PHYS-1400, PHYS-1410, PHYS-1500, PHYS-2200, **PHYS-2210**, ~~PHYS-2250~~, PHYS-2500, PHYS-3100, ~~PHYS-3110~~, PHYS-3200, PHYS-3210, PHYS-3500, PHYS-3700, **PHYS-3900**, PHYS-4900 (6.0 credits)\*\*, PHYS-4130, PHYS-4100, PHYS-4700, PHYS-4710, plus ~~two~~ **three** additional courses in Physics at the 3XXX or 4XXX level.

(b) BIOL-1101, CHEM-1100, CHEM-1110, CHEM-2300, CHEM-2400, BIOC-2010 or BIOC-2015, COMP-1400, COMP-1410, MATH-1250 (or MATH-1260), MATH-1720 (or MATH-1760), MATH-1730, MATH-2780, MATH-2790, MATH-3550, ~~GENG-2340~~.

(c) two of Arts, Humanities and Social Sciences.

(d) three courses from any area.

\*\*Only students who have maintained a major average of 70% and a cumulative average of 60% will be permitted to enrol in PHYS-4900.

For co-op option, in addition:

(e) three co-op terms: PHYS-2980, PHYS-3980, PHYS-4980, (oral and written reports required). Students must maintain major and cumulative averages of 65% or better to qualify for co-op placements.

#### Minor in Physics

The minor in Physics consists of successfully completing each of: GENG-1110 or PHYS-1400, PHYS-1410, ~~PHYS-1500~~, PHYS-2200, ~~PHYS-2250~~, **PHYS-2210**, and PHYS-2500, **and PHYS-3700** and requires a minimum **overall** average of 60% **in these six courses**.

#### A.2 MINOR COURSE CHANGES REQUIRING ADDITIONAL RESOURCES OR AFFECTING DEGREE REQUIREMENTS

*If this is a minor course and calendar change (usually noted on a Form E) requiring additional resources or affecting degree requirements, please provide the current course information and the proposed new course information by cutting and pasting from the current undergraduate or graduate web calendar and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Examples of minor course changes include: deleting courses, course description changes, pre/anti/co- requisite changes, contact hour/lab requirement changes, course title changes, renumbering courses, and/or cross-listing courses. Minor*

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

*course calendar changes, which do not require additional resources or do not affect degree requirements, should be submitted on a Form E.*

N/A

#### B. RATIONALE

*Please provide a rationale for the proposed change(s).*

Responding to (i) student requests, (ii) the needs/demands of the marketplace which employs physics students after graduation, (iii) the needs of current research faculty in the Department of Physics, and (iv) the input / opinions of external IQAP reviewers from similarly sized universities, the Department of Physics is attempting to significantly redesign and improve the curriculum provided in all the programs offered in the Dept. of Physics. The goals of these changes are to: (a) increase flexibility to the students and improve pathways to graduation; (b) give students access to more options in their course selection while improving the efficiency of resources allocated for delivering those courses; (c) greatly enhance the quality and relevance of the hands-on laboratory offerings in the curriculum; (d) remove repetition of material; (e) increase transparency of the content being delivered by renaming/renumbering courses and updates calendar descriptions.

A quick summary of all the changes includes:

- Adding a fourth “introductory physics” course (2210) into the first two-years. Reducing the number of quantum mechanics classes from three to two by moving the content of 3100 to this new course, moving the content of 3110 to 3100, deleting 3110.
- Creating two new optional courses: computational physics and mathematical physics at the 3000 level
- Creating a new mandatory experimental physics pure-laboratory course (3900) which is required for all physics programs and a second course (3910) which will be optional and of interest to experimental physicists. Removing the lab component from 3100 and 3210 and moving experiments into 3900.
- Removing Optics 2250 from the list of required courses (optics is generally considered an optional course in many programs). Introductory optics will be taught in a revised 2000, and Optics will become 3250, an optional course offered at a slightly more advanced level.

The number of required courses has not changed substantially, with one more physics course being required in requirement (a) (but that is an additional “option” for students to choose from) and one less required/name non-physics course in requirement (b).

#### B.1 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In revising this program(s), how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The Department of Physics intends to include Indigenous content into the curriculum in the following way. It is our intention to utilize an awarded OOL grant and a teaching release to redevelop our “History of Physics: The Past” course into a more focused “History of Astronomy” course. As part of this course we would seek to integrate the Indigenous knowledge of the sky and related knowledge, such as creation stories. This information will allow the course to provide a much more complete picture of the historical underpinnings of the relationship between the sky and humanity – not just focusing on Western (i.e. Egyptian, Babylonian, Greek) understanding. The AAU will continue conversations with members of the university’s Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nation-wide conversation when possible.

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the program change(s). Please do not name specific individuals.*

The Department of Physics is committed to supporting these program changes. Current faculty members have expertise that are central to the subject area. These individuals have published in high impact journals on topics that are central to the Honours Physics degree. No new faculty staff or resources are needed or requested.

##### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the revised program. Please do not name specific individuals.*

There are currently available expert faculty within the Department of Physics actively committed to supporting the minor program changes detailed in A1.

##### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the revised program.*

There will be no additional reliance on adjunct limited-term, and sessional faculty beyond what is currently being used.

##### C.1.3 Graduate Faculty Qualifications and Supervisory Loads (FOR GRADUATE PROGRAMS ONLY)

*Explain how supervisory loads will be distributed, and describe the qualifications and appointment status of faculty who will provide instruction and supervision in the revised program.*

N/A

##### C.1.4 Financial Assistance for Graduate Students (where appropriate) (FOR GRADUATE PROGRAMS ONLY)

*Where appropriate to the revised program, provide evidence that financial assistance for graduate students will be sufficient to ensure adequate quality and numbers of students.*

N/A

##### C.2 Other Available Resources (Ministry sections 3 and 4)

*Provide evidence that there are adequate resources available and committed to the revised program to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities, including for example: staff support, library, teaching and learning support, student support services, space, equipment, facilities, GA/TA*

The proposed changes to the Honours Physics degree program are minor. As such, there are currently adequate resources available to sustain the quality of scholarship within this program.

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

#### C.3 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed program revisions on existing resources from other campus units, including for example: existing courses, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.4 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the revisions to this program.*

A new undergraduate teaching laboratory is required. The new experimental physics 3900 and 3910 courses require a dedicated space. Experiments will be moved out of the dismal Essex Hall 182 into a custom redesigned laboratory in Essex Hall B83. This is a repurposed experimental physics research laboratory (formerly occupied by Professor McConkey, who is now retired and lives out of town) that is in very good shape and was recently upgraded with CFI funds obtained by McConkey. Currently no research is occurring in this space as these faculty are retired. This room will be renovated with Departmental resources. No addition resources are required from Central. The laboratory component of Optics 2250 will spread out and takeover all of Essex Hall 182, giving that space much more room.

#### C.5 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the revisions to this program. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

The required course GENG-2340 is being removed. This will result in cost-savings to the faculty as those physics students educated in the Faculty of Engineering require a tuition reimbursement to that Faculty. The reorganization of our teaching lab sections amongst the various courses will allow us to be more efficient with GA allocation for these labs which will assist with overall Faculty cost savings.

#### C.6 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to run the revised program.*

<b>Faculty:</b>	N/A
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	N/A

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to run the revised program, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	N/A
<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	A new upper year experimental physics laboratory, currently identified as EH B-83 will be developed and maintained.
<b>Equipment (and Maintenance):</b>	New experimental apparatus will be acquired and maintained in this new upper year experimental physics laboratory. None of this equipment consists

**PROGRAM DEVELOPMENT COMMITTEE  
MINOR PROGRAM CHANGES  
FORM C**

	of “big-ticket” equipment with expensive maintenance (like SEMs; confocal microscopes; etc.) It will consist of smaller table-top physics apparatus and experiments.
--	--

**University of Windsor  
Program Development Committee**

\*5.4: **School of the Environment – Minor Program Changes (Form C)**

Item for: **Approval**

**MOTION: That the degree requirements for the BSc Honours Environmental Science (with and without Thesis) be changed according to the program/course change form.^**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The proposal has been approved by the School of the Environment Council and the Faculty of Science Coordinating Council.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
MINOR PROGRAM CHANGES  
FORM C**

<b>TITLE OF PROGRAM(S)/CERTIFICATE(S):</b>	Honours Environmental Science with and without Thesis
<b>DEPARTMENT(S)/SCHOOL(S):</b>	School of the Environment
<b>FACULTY(IES):</b>	Science

<b>Proposed change(s) effective as of*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Spring 2021
--	-------------

**A.1 PROGRAM REQUIREMENT CHANGES**

*Please provide the current program requirements and the proposed new program requirements by cutting and pasting from the current undergraduate or graduate web calendar ([www.uwindsor.ca/secretariat/calendars](http://www.uwindsor.ca/secretariat/calendars)) and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Example: Degree requirements: WXYZ-1000, ~~WXYZ-1010~~, WXYZ-1100, WXYZ-2100, WXYZ-3100, WXYZ-4100, plus three additional courses at the **3000-level or** 4000-level.*

**BSc Honours Environmental Science (without thesis)**

Degree Requirements:

Total courses: forty

- (a) BIOL-2101, ESCI-1100, ESCI-1151, ESCI-2131, ESCI-2141, ESCI-2210, ESCI-2421, and ESCI-3735 or ESCI-3755.
- (b) twelve courses from: BIOL-2111, BIOL-3250, BIOL-3281, BIOL-4232, BIOL-4241, BIOL-4270, BIOL-4280, BIOL-4864, ESCI-1141, ESCI-2101, ESCI-2721, ESCI-2401, ESCI-2705, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3701, ESCI-3711, ESCI-3721, ESCI-3751, ESCI-4301, ESCI-4500, ESCI-4600, ESCI-4710, ESCI-4721.
- (c) BIOL-1111 **or BIOL-1013 (with School of the Environmental approval)**, ~~BIOL-1101~~, CHEM-1100, CHEM-1110, MATH-1720 (or MATH-1760), STAT-2910, ESCI-1111, ESCI-3801.
- (d) ~~Twelve~~ **Thirteen** additional courses. Minimum of ~~four~~ **five** courses from the Faculty of Science and a minimum of two courses from any area of study other than Science.

Courses used to calculate the major average are: courses listed under requirement (a) and (b), and any courses taken in the major area(s) of study.

**BSc Honours Environmental Science (with Thesis)**

Degree Requirements:

Total courses: forty

- a) BIOL-2101, ESCI-1100, ESCI-1151, ESCI-2131, ESCI-2141, ESCI-2210, ESCI-2421, ESCI-3735 or ESCI-3755, and ESCI-4900.
- (b) ten courses from: BIOL-2111, BIOL-3250, BIOL-3281, BIOL-4232, BIOL-4241, BIOL-4270, BIOL-4280, BIOL-4864, ESCI-1141, ESCI-2101, ESCI-2721, ESCI-2401, ESCI-2705, ESCI-3301, ESCI-3310, ESCI-3400, ESCI-3610, ESCI-3701, ESCI-3711, ESCI-3721, ESCI-3751, ESCI-4301, ESCI-4500, ESCI-4600, ESCI-4710, ESCI-4721.
- (c) BIOL-1111 **or BIOL-1013 (with School of the Environmental approval)**, ~~BIOL-1101~~, CHEM-1100, CHEM-1110, MATH-1720 (or MATH-1760), STAT-2910, ESCI-1111, ESCI-3801.
- (d) ~~Twelve~~ **Thirteen** additional courses. Minimum of ~~four~~ **five** courses from the Faculty of Science and a minimum of two courses from any area of study other than Science.

Courses used to calculate the major average are: courses listed under requirement (a) and (b), and any courses taken in the major area(s) of study.

**A.2 MINOR COURSE CHANGES REQUIRING ADDITIONAL RESOURCES OR AFFECTING DEGREE REQUIREMENTS**

*If this is a minor course and calendar change (usually noted on a Form E) requiring additional resources or affecting degree requirements, please provide the current course information and the proposed new course information by cutting and pasting from the current undergraduate or graduate web calendar and clearly marking deletions with*

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Examples of minor course changes include: deleting courses, course description changes, pre/anti/co- requisite changes, contact hour/lab requirement changes, course title changes, renumbering courses, and/or cross-listing courses. Minor course calendar changes, which do not require additional resources or do not affect degree requirements, should be submitted on a **Form E**.

N/A

#### B. RATIONALE

*Please provide a rationale for the proposed change(s).*

The original purpose of including BIOL-1101 as a required course in Honours Environmental Science was to satisfy one of the pre-requisites for BIOL-2101 (Ecology). The Department of Integrative Biology is removing BIOL-1101 as a pre-requisite for BIOL-2101 (Ecology) and allowing BIOL-1111 or **BIOL-1013** to count towards the remaining pre-requisites for BIOL-2101 (Ecology). Therefore, BIOL-1101 is being removed as a required course for the Honours Environmental Science and we are adding BIOL-1013 to the calendar as an option. To ensure students complete 40 courses, we added another elective course to the degree plan.

#### B.1 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In revising this program(s), how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

These minor program changes do not influence the delivery of indigenous content as part of the Honours Environmental Science. Indigenous content will continue to be included based upon the discretion of the instructor to provide a holistic review of the subject matter.

#### C. RESOURCES

##### C.1 Available Faculty Expertise and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty expertise and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the program change(s). Please do not name specific individuals.*

These minor program changes will not impact the availability of faculty expertise or staff resources. The program will continue to be offered by expertise faculty.

##### C.1.1 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the revised program.*

These minor program changes have no impact on the use of adjunct, limited-term, or sessional faculty.

##### C.1.2 Graduate Faculty Qualifications and Supervisory Loads (FOR GRADUATE PROGRAMS ONLY)

*Explain how supervisory loads will be distributed, and describe the qualifications and appointment status of faculty who will provide instruction and supervision in the revised program.*

N/A

##### C.1.3 Financial Assistance for Graduate Students (where appropriate) (FOR GRADUATE PROGRAMS ONLY)

*Where appropriate to the revised program, provide evidence that financial assistance for graduate students will be sufficient to ensure adequate quality and numbers of students.*

N/A

# PROGRAM DEVELOPMENT COMMITTEE

## MINOR PROGRAM CHANGES

### FORM C

#### C.2 Other Available Resources (Ministry sections 3 and 4)

*Provide evidence that there are adequate resources available and committed to the revised program to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities, including for example: staff support, library, teaching and learning support, student support services, space, equipment, facilities, GA/TA*

These minor program changes do not require any additional resources.

#### C.3 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed program revisions on existing resources from other campus units, including for example: existing courses, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

Integrative Biology has been consulted on the need for this course and timing of delivery so they are aware of the need to build its delivery into the regular teaching assignment processes.

#### C.4 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the revisions to this program.*

N/A

#### C.5 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the revisions to this program. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.6 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to run the revised program. If not applicable, write n/a.*

<b>Faculty:</b>	N/A
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	N/A

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to run the revised program, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance. If not applicable, write n/a.*

<b>Library Resources and Services:</b>	N/A
<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	N/A
<b>Equipment (and Maintenance):</b>	N/A

**University of Windsor  
Program Development Committee**

\*5.5: **Liberal Arts and Professional Studies – Minor Program Change (Form C)**

Item for: **Approval**

**MOTION: That the degree requirements for the Liberal Arts and Professional Studies program be changed in accordance with the program/course changes forms.^**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The proposal has been approved by the Faculty of Arts, Humanities, and Social Sciences Coordinating Council, and the Department of Economics Council. The change will allow students to obtain a Minor in Economics.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
MINOR PROGRAM CHANGES  
FORM C**

<b>TITLE OF PROGRAM(S)/CERTIFICATE(S):</b>	Liberal Arts and Professional Studies
<b>DEPARTMENT(S)/SCHOOL(S):</b>	FAHSS
<b>FACULTY(IES):</b>	FAHSS

<b>Proposed change(s) effective as of*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Spring 2021
--	-------------

**A.1 PROGRAM REQUIREMENT CHANGES**

*Please provide the current program requirements and the proposed new program requirements by cutting and pasting from the current undergraduate or graduate web calendar ([www.uwindsor.ca/secretariat/calendars](http://www.uwindsor.ca/secretariat/calendars)) and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Example: Degree requirements: 00-100, ~~00-101~~, 00-110, 00-210, 00-310, 00-410, plus three additional courses at the **300-level or** 400-level.*

Honours Liberal Arts and Professional Studies

***Degree Requirements:***

*Total courses:* forty, at least eight of which must be at the 3000 level or above, and a least two of these at the 400 level.

- (a) One of GART-1500, MGMT-1000, GENG-1190; and GART-1510
- (b) One Certificate chosen from the following list: Certificate in Applied Information Technology, Certificate in Public Administration, Certificate in Organizational Management and Certificate in Work and Employment Issues;
- (c) One Minor from any area of study within the Faculty of Arts, Humanities and Social Sciences **or the Department of Economics**, excluding the area of study selected under (b);
- (d) One Minor from any area of study, excluding the area of study selected under (b);
- (e) one Minor from any area of study, excluding the area of study selected under (b);
- (f) Two courses from Science unless this requirement is met in (b), (c), (d) or (e) above;
- (g) Additional courses from any area of study, to a total of forty courses.

***Standing Required for Continuation and Graduation***

Students must maintain a cumulative average of 60% or better. There is no major average requirement.

**A.2 MINOR COURSE CHANGES REQUIRING ADDITIONAL RESOURCES OR AFFECTING DEGREE REQUIREMENTS**

*If this is a minor course and calendar change (usually noted on a Form E) requiring additional resources or affecting degree requirements, please provide the current course information and the proposed new course information by cutting and pasting from the current undergraduate or graduate web calendar and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Examples of minor course changes include: deleting courses, course description changes, pre/anti/co- requisite changes, contact hour/lab requirement changes, course title changes, renumbering courses, and/or cross-listing courses. Minor course calendar changes, which do not require additional resources or do not affect degree requirements, should be submitted on a **Form E**.*

N/A

**B. RATIONALE**

*Please provide a rationale for the proposed change(s).*

Economics offers both a BA and BSc degree, however, the Minor in Economics cannot be used to satisfy requirement (c) above. Adding the Minor in Economics to requirement (c) fits with the purpose of the requirement and will make

**PROGRAM DEVELOPMENT COMMITTEE**  
**MINOR PROGRAM CHANGES**  
**FORM C**

it easier for those international students who find language-dense social science and humanities courses too difficult to complete the 4-year/ Honours LAPS program.

**B.1 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material**

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In revising this program(s), how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

FAHSS has recently introduced a minor in Indigenous Studies, which includes a variety of Indigenous-focused courses from across the faculty. LAPS students will be encouraged to consider this minor as part of their degree completion pathway.

**C. RESOURCES**

**C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the program change(s). Please do not name specific individuals.*

N/A

**C.1.1 Faculty Expertise in Support of the Revised Program**

*Provide an assessment of faculty expertise available and committed to actively support the revised program. Please do not name specific individuals.*

N/A

**C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program**

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the revised program.*

N/A

**C.1.3 Graduate Faculty Qualifications and Supervisory Loads (FOR GRADUATE PROGRAMS ONLY)**

*Explain how supervisory loads will be distributed, and describe the qualifications and appointment status of faculty who will provide instruction and supervision in the revised program.*

N/A

**C.1.4 Financial Assistance for Graduate Students (where appropriate) (FOR GRADUATE PROGRAMS ONLY)**

*Where appropriate to the revised program, provide evidence that financial assistance for graduate students will be sufficient to ensure adequate quality and numbers of students.*

N/A

**C.2 Other Available Resources (Ministry sections 3 and 4)**

*Provide evidence that there are adequate resources available and committed to the revised program to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities, including for example: staff support, library, teaching and learning support, student support services, space, equipment, facilities, GA/TA*

N/A

**PROGRAM DEVELOPMENT COMMITTEE  
MINOR PROGRAM CHANGES  
FORM C**

**C.3 Resource Implications for Other Campus Units (Ministry sections 3 and 4)**

*Describe the reliance of the proposed program revisions on existing resources from other campus units, including for example: existing courses, equipment or facilities outside the proposer’s control, external resources requiring maintenance or upgrading using external resources  
Provide relevant details.*

The number of students affected is very small.

**C.4 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the revisions to this program.*

N/A

**C.5 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the revisions to this program. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

**C.6 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to run the revised program.*

<b>Faculty:</b>	NA
<b>Staff:</b>	NA
<b>GA/TAs:</b>	NA

**C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments**

*Describe all **additional institutional resources and services** required by all affected areas or departments to run the revised program, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	N/A
<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	N/A
<b>Equipment (and Maintenance):</b>	N/A

University of Windsor  
Program Development Committee

\*5.6:        **Engineering (Graduate) – New Course Proposal (Form D)**

Item for:    **Approval**

**MOTION:    That the following course be approved:^**  
              **INDE-8450. Products Variety Management**

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The new course has been approved by the Department of Mechanical, Automotive, and Materials Engineering (MAME) Council, the Faculty of Engineering Coordinating Council, and the Graduate Studies Council.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>TITLE OF PROGRAM(S)/CERTIFICATE(S):</b>	Industrial Engineering
<b>DEPARTMENT(S)/SCHOOL(S):</b>	Mechanical, Automotive and Materials Engineering (MAME)
<b>FACULTY(IES):</b>	Engineering

<b>Proposed change(s) effective as of*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Spring 2021
--	-------------

**A. NEW COURSE PROFILE**

**Course # and Title:** INDE-8450 Products Variety Management

**A.1 Calendar Description**

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

Products variety types, sources and implications; design for variety (DFV); modularity; design structural matrices; products grouping, families and platforms; mass customization and personalization; and variety-oriented manufacturing systems. (3 lecture hours/week). (Pre-requisite: INDE-4310 or equivalent with instructor permission).

**A.2 Other Course Information**

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery <i>[please specify]</i>	Lecture	Lab/ Tutorial	Online	Co-op/ practicum/e xperiential learning
36	3	X				3	0		

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** <i>[provide old course number]</i>
INDE-4310 or equivalent with Instructor permission.				No	Special Topics INDE-8900-23

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

<b>Will students be able to obtain credit for the new course and the course(s) that it is replacing?</b>	<b>No</b>
--	-----------

The faculty of graduate studies has long requested that special topic courses be converted to regular numbered courses when they have been offered several times with good registration. This proposal is in keeping with the direction of Faculty of Graduate Studies.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

**B. RATIONALE**

**B.1 Course Goal(s)**

*Please provide a statement about the purpose of the course within the program of study or as an option.*

This course enhances the available regular industrial engineering graduate courses in the area of products design particularly given the proliferation of products variety to date. It discusses the breadth and depth of methodologies of products design for variety.

**B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material**

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

Principles of student-centered education are applied throughout the course with focus on the learners, learning outcomes and learning abilities. Every effort is made to create opportunities that promote student success including Indigenous students.

**B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)**

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Use library resources, on-line search engines and patents to identify relevant designs methods to manage product variety. Review scientific and engineering articles, synthesize and apply acquired knowledge to solve product variety management challenges.	A. the acquisition, application and integration of knowledge
B. Research and investigate product variety management issues, from design to planning and manufacturing, such as modularity, commonality, grouping, customization and personalization. Analyze customers' requirements and use quality function deployment methods. Apply engineering design methods such as Design Structure Matrix (DSM), axiomatic design, and design for assembly to reduce products complexity.	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Use design concepts generation and inventive problem-solving methods (e.g., TRIZ) and find innovative product designs. Analyze and re-design products to manage products variety.	C. critical thinking and problem-solving skills

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
D.	D. literacy and numeracy skills
E.	E. responsible behaviour to self, others and society
F. Communicate ideas and findings logically, clearly and effectively, both orally and in writing.	F. interpersonal and communications skills
G. Contribute productively and thoughtfully to team discussions and project tasks.	G. teamwork, and personal and group leadership skills
H. Apply industrial design and aesthetics principles in designing and re-designing products for variety.	H. creativity and aesthetic appreciation
I. Independently apply knowledge discovery methods in research.	I. the ability and desire for continuous learning

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	30	30	30	30	30

**B.4.1 Impact of New Course on Enrolment in Existing Courses**

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

There is a great need for more regular graduate courses in the industrial engineering program. This course addresses this need.

**B.5 Student Workload**

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

<b>Average number of hours per week that the student will be expected to devote to:</b>	
3	Lectures
	Tutorials
	Labs
	Practical experience
	Independent Study
2-3	Reading for the course
2	Work for assessment (essays, papers, projects, laboratory work)
	Meeting with others for group work/project assignments
1	Studying for tests/examinations
	Other: <i>[specify]</i>

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	This workload is typical for graduate courses in MAME.
---	--

**C. RESOURCES**

**C.1 Available Faculty Expertise and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe all faculty expertise and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course. Please do not name specific individuals.*

Faculty expertise: Teaching / research expertise in mechanical engineering design and manufacturing systems.

**C.1.1 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program**

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

Graduate courses in industrial engineering are normally offered by regular faculty members. This course is no exception.

**C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)**

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example: faculty teaching, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

None.

**C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

None.

**C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

**C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course. If not applicable, write n/a.*

<b>Faculty:</b>	N/A
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	N/A

**C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments**

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance. If not applicable, write n/a.*

<b>Library Resources and Services:</b>	N/A
--	-----

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	N/A
<b>Equipment (and Maintenance):</b>	N/A

**D.1 Form History** *(Leave blank if there have been no changes. Changes can also be noted directly in the Workflow)*

<b>Date of Modification</b>	<b>Approval Body Modifying</b>	<b>Reason for Modification</b>

**University of Windsor  
Program Development Committee**

**\*5.7 Physics – New Course Proposals (Form D)**

Item for: **Approval**

**MOTION:** That the following courses be approved:^

- PHYS-2210. Modern Physics
- PHYS-3600. Computational Physics
- PHYS-3610. The Mathematics of Physics
- PHYS-3900. Techniques in Experimental Physics I
- PHYS-3910. Techniques in Experimental Physics II
- PHYS-4720. Magnetic Resonance Imaging
- PHYS-4730. Radiobiology

*^Subject to approval of the expenditures required.*

**Rationale/Approvals:**

- The new course proposals have been approved by the Department of Physics Council and the Faculty of Science Coordinating Council.
- *See attached.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>TITLE OF PROGRAM(S)/CERTIFICATE(S):</b>	All programs offered in the Department of Physics, including joint and combined programs
<b>DEPARTMENT(S)/SCHOOL(S):</b>	Physics
<b>FACULTY(IES):</b>	Science

<b>Proposed change(s) effective as of*</b> [Fall, Winter, Spring]: <i>*(subject to timely and clear submission)</i>	Fall 2021
--	-----------

**A. NEW COURSE PROFILE**

**Course # and Title: PHYS-2210. Modern Physics**

**A.1 Calendar Description**

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

A calculus-based physics course with an emphasis on physical models of phenomena at subatomic length scales and high velocities. The course includes an introduction to the special theory of relativity, quantum mechanics, nuclear physics, particle physics, and standard model physics. The technological applications of these phenomena will be discussed. (Prerequisite: PHYS-1410 or equivalent.) (3 lecture hours per week.)

**A.2 Other Course Information**

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X				3			

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-1410				Yes	

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

<b>Will students be able to obtain credit for the new course and the course(s) that it is replacing?</b>	N/A
--	-----

**B. RATIONALE**

**B.1 Course Goal(s)**

*Please provide a statement about the purpose of the course within the program of study or as an option.*

Responding to (i) student requests, (ii) the needs/demands of the marketplace which employs physics students after graduation, (iii) the needs of current research faculty in the Department of Physics, (iv) the input / opinions of external IQAP reviewers from similarly sized universities and (v) the input of three new faculty members, the Department of

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

Physics is attempting to significantly rearrange the scheduling and the level of many offerings in the physics curriculum.

It is intended that this will open up more flexible pathways to graduation (by not adding any more specific courses) while also assisting student performance in upper year courses. To that end we are stream-lining our quantum mechanics sequence from three courses to two courses that are more focused on the content by eliminating what had been the first (lowest level) course in that sequence. We are moving some of the introductory content that is being eliminated in that lowest level course into the proposed new course.

The proposed new course will constitute a fourth and final course in a four-course sequence of introductory physics: PHYS-1400 (fall first year), PHYS-1410 (winter first year), PHYS-2200 (fall second year), PHYS-2210 (winter second year). These four courses will present a structured introduction of physics from classical, approximate, models of physics, to what is known as 'modern physics' which contains fewer approximations. Through the first two years, the student will be able to build up mathematical expertise and experience, while handling more advanced conceptual ideas in physics.

This course will replace PHYS-2250 as a required course in the second year and take that course's place as a required course in the Physics Minor.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university's Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies, and examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

**PROGRAM DEVELOPMENT COMMITTEE**  
**NEW COURSE PROPOSALS**  
**FORM D**

<b>Course Learning Outcomes PHYS-2210 Modern Physics</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>A. Summarize the fundamental laws and theories of physics related to the theory of relativity, quantum mechanics, nuclear physics, and particle physics.</p> <p>Recognize classical physics as an approximation to the theory of relativity and quantum mechanics, and apply the limit of approximations when appropriate.</p> <p>Organize the fundamental particles and interactions in physics according to the Standard Model of Physics.</p>	<p>A. the acquisition, application and integration of knowledge</p>
<p>B. Retrieve information from a variety of primary sources (such as books and websites) and summarize the information retrieved succinctly.</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Formulate physical problems into appropriate mathematical problems involving calculus, differential equations, and linear algebra, implement analytical or numerical methods to solve the resulting equations, and evaluate if the solutions are reasonable.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Solve mathematical equations that represent physical phenomena algebraically or numerically, as appropriate.</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate conceptual problems and their qualitative and quantitative solutions clearly in writing.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A.</p>	<p>I. the ability and desire for continuous learning</p>

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	25	25	25	25	25

**B.4.1 Impact of New Course on Enrolment in Existing Courses**

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is a required course and is not expected to impact enrolment in other courses.

**B.5 Student Workload**

*Provide information on the expected workload per week of a student enrolled in this course. NOTE: Student workload should be consistent with the credit weight assigned to the course.*

Average number of hours per week that the student will be expected to devote to:	
3	Lectures
0	Tutorials
	Labs
	Practical experience
1	Independent Study
1-2	Reading for the course
2-3	Work for assessment (essays, papers, projects, laboratory work)
1	Meeting with others for group work/project assignments
1	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a second-year non-lab science course.

**C. RESOURCES**

**C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. Current faculty members have expertise that are central to the subject area.

**C.1.1 Faculty Expertise in Support of the Revised Program**

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by faculty who have expertise in the subject matter. Most faculty members in the Department have the expertise to teach this course.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

#### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example:*

- *faculty teaching,*
- *equipment or facilities outside the proposer's control,*
- *external resources requiring maintenance or upgrading using external resources*

*Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources needed to support this course.

#### C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	None
<b>Staff:</b>	None
<b>GA/TAs:</b>	None

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	None
<b>Teaching and Learning Support:</b>	None
<b>Student Support Services:</b>	None
<b>Space and Facilities:</b>	None
<b>Equipment (and Maintenance):</b>	None

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

Course # and Title: **PHYS-3600. Computational Physics**

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

An introduction to computational methods in physics, with an emphasis on applications to problems in Classical Mechanics, Electromagnetism and Quantum Mechanics. Best practices for scientific computing, data analysis and visualization will be emphasized. Specific topics to be discussed may include numerical integration, differentiation, and optimization; linear and non-linear equations; techniques for initial and boundary value problems for ordinary and partial differential equations; fast Fourier transforms; eigenvalue problems; numerical linear algebra; and an introduction to Monte Carlo methods. (Prerequisites: PHYS-3200, PHYS-3500, and PHYS-3100.) (3 lecture hours and 1 tutorial hour per week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	48	X				3	1		

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-3500, PHYS-3200, PHYS-3100				No	PHYS-4600 Special Topics in Physics – Computational Physics

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?** No

#### B. RATIONALE

Responding to (i) student requests, (ii) the needs/demands of the marketplace which employs physics students after graduation, (iii) the needs of current research faculty in the Department of Physics, and (iv) the input / opinions of external IQAP reviewers from similarly sized universities, the Department of Physics is attempting to significantly increase the computational content of the current physics curriculum.

This computational content is not merely concentrated in this course, but is being spread amongst many courses at many levels of the curriculum (*e.g.*, first year PHYS-1500; second year PHYS-2500; fourth-year PHYS-4710, etc.) to give students multiple exposure to this important skill prior to graduation. Regardless, there are enough special techniques, strategies, and best practices that exist in this very well-recognized sub-field of physics to warrant having its own course. The pre-requisites for this course have been chosen such that students will have a sufficient

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

background in Mechanics (3500), Quantum Mechanics (3100) and Electricity and Magnetism (3200) to allow the application of techniques taught in this class to problems in those fields. But those pre-requisites are not the final courses in those sequences, allowing this course to be taken prior to the student's final year or semester. A new suggested course sequence is being prepared which will assist the students in planning to take this course at the appropriate time.

This course was previously taught as a "special topics" course in the Fall of 2019 (PHYS-4600 Special Topics in Physics – Computational Physics). To reduce the reliance on "special topics" courses, this course is now being made a permanent course and will be regularly offered. Eventually it is our intention to make this a required course in the curriculum. This course is one of our "3+1" courses, meaning 3 lecture hours and 1 tutorial hour (similar to 1500, 2500) where the students and instructor work together on practical applications of lecture material.

#### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

The goal of this course will provide a comprehensive introduction to the use of computational methods in physics. This will extend the basic computation tools introduced in lower-level courses (PHYS-1500, PHYS-2500), building on the greater mathematical and physical knowledge of the students. Intended to eventually be offered as a required third-year course, the methods introduced here will provide a computational base that can be utilized in more advanced fourth-year courses. Further, it will provide a baseline literacy in the language and techniques of scientific computing and data analysis and visualization – skills that are valuable in wide variety of disciplines and careers. This course is intended to play an important role in future program development to expand the computational content of course offerings within the Department of Physics.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university's Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Course Learning Outcomes PHYS-3600. Computational Physics</b>	<b>Characteristics of a University of Windsor Graduate</b>
<p><i>This is a sentence completion exercise.</i></p> <p>At the end of this course, the successful student will know and be able to:</p>	<p><u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>A. Integrate knowledge of physics pertaining to quantum mechanics, classical mechanics and electricity and magnetism into computationally-intensive problems in those subject areas.</p> <p>Apply computational and numerical techniques to new classes of problems that are unsolvable by other methods.</p>	<p>A. the acquisition, application and integration of knowledge</p>
<p>B. Record observations, analyze data, and report findings in an appropriate scientific style.</p> <p>Write and document computer code according to best practices in scientific computing. (Also relevant to F.)</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Deconstruct complex problems into their building blocks.</p> <p>Translate physical problems into appropriate mathematical language – particularly, calculus, differential equations, and linear algebra – and formulate and implement computational methods to analyze and solve the resulting equations.</p> <p>Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. N/A</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate physical, mathematical and computational concepts in writing and in computer code.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A</p>	<p>I. the ability and desire for continuous learning</p>

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	10	10	10	10	10

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### B.4.1 Impact of New Course on Enrolment in Existing Courses

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is a new course within the Honours Physics and Honours Physics (Medical Physics) degree program and is not expected to impact enrolment in other courses.

#### B.5 Student Workload

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

Average number of hours per week that the student will be expected to devote to:	
3	Lectures
1	Tutorials
	Labs
	Practical experience
1	Independent Study
1-2	Reading for the course
2-3	Work for assessment (essays, papers, projects, laboratory work)
1	Meeting with others for group work/project assignments
1	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third-year science course requiring coding work (which is similar to lab work.)

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. Current faculty members have expertise that are central to the subject area. A new faculty member has recently joined the Department and this course will comprise part of that teaching assignment.

##### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by any one of the faculty members who have expertise in the subject matter. Initially and for the foreseeable future the course will be taught preferentially by the faculty member who develops it, but the course does not depend on any one person.

##### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

**C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)**

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example:*

- *faculty teaching,*
- *equipment or facilities outside the proposer’s control,*
- *external resources requiring maintenance or upgrading using external resources*

*Provide relevant details.*

There is no anticipated reliance on other campus resources. Students will use their own computers to write and run programs in this course, and will not require additional use of university servers or computer resources.

**C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources originating from the area committed to the course.

**C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

**C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	None
<b>Staff:</b>	None
<b>GA/TAs:</b>	None

**C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments**

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	None
<b>Teaching and Learning Support:</b>	None
<b>Student Support Services:</b>	None
<b>Space and Facilities:</b>	None
<b>Equipment (and Maintenance):</b>	None

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

**Course # and Title: PHYS-3610. The Mathematics of Physics**

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

Mathematical topics/methods ubiquitous in physics, to give accelerated access to upper-level physics courses by providing the essential background in mathematics: central differential equations of physics and their solutions (e.g. Bessel functions, spherical harmonics, orthogonal polynomials); vector/function spaces, Fourier series/orthogonal function expansions; calculus of complex variables, residue theorem; Schwartz distributions; Green's functions; with time permitting, selected topics of current interest in mathematical/theoretical physics. (Prerequisites: MATH-2780 and MATH-2790, or equivalent. Recommended: PHYS-1500.) (3 lecture hours per week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X				3			

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
MATH-2780 MATH-2790				N	PHYS-4600 Special Topics in Physics – Mathematical Physics

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?** No

#### B. RATIONALE

Responding to (i) student requests and (ii) the need for specialized mathematical knowledge that is required in more advanced upper year classes and in faculty research labs, the Department of Physics wishes to create its own mathematical physics class to augment mathematical knowledge provided through the Department of Mathematics and Statistics. The course content will be specifically informed by required knowledge in subsequent upper year classes. This course has been offered twice in the recent past, both times as a "special topics" course. To reduce the reliance on "special topics" courses, this course is now being made a permanent course, most likely to be offered every other year.

Initially this course will be an optional course used to satisfy the "any PHYS-3000/4000" requirement, but we have plans to eventually make it a required course.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

The Department of Mathematics and Statistics was consulted (November 2020) and has no concerns with the course as proposed. Although there is some slight overlap of topics with the (currently required for all physics majors) MATH-3550, the emphasis in the proposed class is extremely different, being on the application of these mathematical tools in real physical systems and how those mathematics arise from naturally occurring physical phenomena. In addition, from the draft syllabus attached below, it is clear there are a sufficient number of new topics (Green's functions; complex variables/analysis) that are essential for upper year physics majors to necessitate this class.

#### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

The goal of this course is to provide students with some expertise in certain mathematical topics/methods that are ubiquitous in physics. This will give them accelerated access to upper-level courses and help to improve their chances of success in these courses by providing the essential background in mathematics. As well, certain numbers of physics students go on to graduate studies in theoretical physics and these students need to be prepared as thoroughly as possible to prepare them for success in those programs.

Many students struggle with upper-level physics courses because they do not have the proper mathematical background. [Often times, students are learning the mathematics (to describe the system/physics) as they are learning the physics.] This course is intended to expose students to the mathematics ubiquitous in upper-level physics courses (and, more generally, in physics) before they are exposed to the fundamental physics ideas – this will ease students' struggles in the upper-level physics courses, as they will already have the mathematical tools to handle the topics (and they can focus on learning the physics).

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university's Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<p><b>Course Learning Outcomes PHYS-3610. The Mathematics of Physics</b> <i>This is a sentence completion exercise.</i></p> <p><u>At the end of this course, the successful student will know and be able to:</u></p>	<p style="text-align: center;"><b>Characteristics of a University of Windsor Graduate</b></p> <p><u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>A. Integrate previous knowledge in mathematics (and physics) with new mathematical knowledge to solve new physical problems.</p> <p>Apply newly acquired mathematical tools/techniques to classes of physical problems that are unsolvable otherwise.</p>	<p>B. the acquisition, application and integration of knowledge</p>
<p>B. Record observations, analyze data, and report findings in an appropriate scientific style. (Also relevant to F.)</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Deconstruct complex problems into their building blocks.</p> <p>Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools – particularly, calculus, differential equations, linear algebra – to analyze and solve the resulting equations.</p> <p>Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. N/A</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate physical and mathematical concepts in writing.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A</p>	<p>I. the ability and desire for continuous learning</p>

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

<p>Projected enrolment levels for the first 5 years of the new course.</p>	<p>Year 1</p>	<p>Year 2</p>	<p>Year 3</p>	<p>Year 4</p>	<p>Year 5</p>
	<p>10-15</p>	<p>10-15</p>	<p>10-15</p>	<p>10-15</p>	<p>10-15</p>

**B.4.1 Impact of New Course on Enrolment in Existing Courses**

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

This is an optional course and may lower the enrolment in other optional Physics 3000/4000 courses. However, typically these courses are not all offered in the same semester, so it is not expected to impact enrollment in all other courses, only one or two Physics courses offered in the same term. Typically physics students need all the optional courses offered.

#### B.5 Student Workload

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

<b>Average number of hours per week that the student will be expected to devote to:</b>	
3	Lectures
0	Tutorials
	Labs
	Practical experience
	Independent Study
1	Reading for the course
5	Work for assessment (essays, papers, projects, laboratory work)
	Meeting with others for group work/project assignments
1	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third -year science course.

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course as evidenced by our offering of the special topics course in years past. Current faculty members have expertise that are central to the subject area.

##### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by faculty who have expertise in the subject matter. Initially and for the foreseeable future the course will be taught preferentially by the faculty member who develops it, but the course does not depend on any one person.

##### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

##### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example:*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

- *faculty teaching,*
  - *equipment or facilities outside the proposer’s control,*
  - *external resources requiring maintenance or upgrading using external resources*
- Provide relevant details.*

There is no anticipated reliance on other campus resources.

**C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)**

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources needed to support this course.

**C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)**

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

**C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)**

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	None
<b>Staff:</b>	None
<b>GA/TAs:</b>	None

**C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments**

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	None
<b>Teaching and Learning Support:</b>	None
<b>Student Support Services:</b>	None
<b>Space and Facilities:</b>	None
<b>Equipment (and Maintenance):</b>	None

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

Course # and Title: PHYS-3900. Techniques in Experimental Physics I

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

All physics hypotheses, models, and theories need to be tested and verified through experiments to ensure their validity in representing the observable universe. This course will emphasize the concepts of experimental design and techniques needed for making these observations. The student will design and construct experiments that test theories presented in upper-year physics courses, with an emphasis on electromagnetism and quantum mechanics. Topics may include error analysis, circuit design and analysis, microwave radiation, fibre optics, and spectroscopy. (Prerequisites: PHYS-2210 and one of MATH-3550 or PHYS-3610.) (1.5 hours of laboratory and 1.5 hours of tutorial per week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X					1.5/1.5		

Comment on breakdown of contact hours. These are “average” values. Some weeks will have 3 hours of only lab work. Some weeks will have one hour of tutorial discussion then two hours of lab work. Some weeks might be all tutorial discussion. This will depend on the topic. Regardless the class will consist of one three-hour meeting time per week.

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-2210 and MATH-3550 or PHYS-3610				Yes	Lab components of PHYS-3210, PHYS-3100, and PHYS-3110

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?** Yes.

Yes, as only the lab portion of those courses’ content is moving to PHYS-3900. And even then, the experiments are all changing. So a student on an old calendar, who received credit for PHYS-3110 and PHYS-3210, may choose to take the new PHYS-3900 as an optional 3\*\*\* level credit and this would not repeat any learning objectives or content of any other course.

#### B. RATIONALE

The Department of Physics is in the process of significantly renewing/revamping its programs and curricula. This renewal/updating has been based on extensive student input garnered both before, during and after the recent IQAP

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

process; based on IQAP external examiners; and based on the opinions and experience of three newly appointed faculty members and their experiences at other comparable Canadian institutions. As part of this, the 3-hour per week experimental lab component of three upper year courses (PHYS-3100, PHYS-3110, PHYS-3210) is being taken away from those courses (allowing those courses to focus more clearly on their core learning objectives) and put into a new “lab-only” course. This will allow for an experimental physics course that is more efficiently delivered, greatly improved, and more closely related to actual skills that physics graduates would be expected to possess in the marketplace or in graduate physics programs. As well, only one of PHYS-3100 and PHYS-3110 will be required under the new calendar (PHYS-3110 is being deleted from the required courses) so all the experimental content of the two remaining required courses (PHYS-3100 and PHYS-3210) can be moved to two new experimental physics courses, PHYS-3900 and PHYS-3910. PHYS-3900 will be required, PHYS-3910 will be an option. Experimental physicists may choose to take the optional course – theoretical physicists may choose to take a mathematical physics course. This will help them tailor their degree to their eventual careers or interests.

#### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

As stated above, the goal of this course is three-fold: (1) to allow us to more efficiently teach highly-important experimental physics skills (required for post degree-success and also for increasing student productivity in the Department’s research labs), (2) to allow the upper year theoretical physics courses to more efficiently provide their content without having to be constrained by an unrelated laboratory component, and (3) to provide much greater flexibility to our students in scheduling and in content on their path to graduation. Student learning that occurs in a laboratory hands-on environment will be more accurately represented on their transcripts by having a specific course enumerated, and this course will allow student to tailor their degree to their eventual careers or interests. Experimental physicists may choose to take the follow-on optional experimental physics course and theoretical physicists may choose to take an optional mathematical physics course we have developed.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university’s Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in “To Greater Heights” by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

*learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of this course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Design experiments that test fundamental aspects of physics. Build electrical, mechanical, and optical devices that can automate data acquisition and ensure reproducible results. Use readily accessible equipment to generate and receive analog, digital, and optical signals.	C. the acquisition, application and integration of knowledge
B. Use appropriate computer programming skills to record, retrieve and analyze large datasets. Create code to interpret and analyze data, including proper error analysis	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Deconstruct complex theoretical models to basic parts to find which parts are testable.	C. critical thinking and problem-solving skills
D. Write technical reports that summarize their experimental development, their approach and methodologies, and draw conclusions.	D. literacy and numeracy skills
E. Ensure that their results are reproducible, developing experiments that can verify previous findings as reported in literature, and comply with academic integrity.	E. responsible behaviour to self, others and society
F. N/A	F. interpersonal and communications skills
G. Work in small teams, delegating duties so that tasks will be completed on time, and properly allocating responsibilities among team members based on their skills and expertise.	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	15	15	15	15	15

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### B.4.1 Impact of New Course on Enrolment in Existing Courses

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is a new required course within the Honours Physics and Honours Physics (Medical Physics) degree program and is not expected to impact enrollment in other courses.

#### B.5 Student Workload

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

Average number of hours per week that the student will be expected to devote to:			
	Lectures		
0-2	Tutorials		
4-6	Labs		
	Practical experience		
	Independent Study		
1-2	Reading for the course		
2	Work for assessment (essays, papers, projects, laboratory work)		
	Meeting with others for group work/project assignments		
	Studying for tests/examinations		
	Other: <i>[specify]</i>		
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top; padding-right: 10px;"> <b>How does the student workload for this course compare with other similar courses in the department/program area?</b> </td> <td style="vertical-align: top;">                     The estimated workload associated with this course is consistent with a third-year science course.                 </td> </tr> </table>		<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third-year science course.
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third-year science course.		

The course is scheduled to meet three hours per week. It is anticipated that the load for the course is “consistent with a third year course” that being 8-10 hours per week of course-work. But rather than doing book-based homework at home, it is expected that students will spend some hours in the lab outside of scheduled class time. Actual class activities may include discussions/tutorials, experiments, or a mixture of the two. These weekly numbers by breakdown are “average” quantities for the term, not literal weekly breakdowns.

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. Current faculty members have expertise that are central to the subject area. The Department of Physics has one full time staff member in the position of “laboratory coordinator.” This staff member is responsible for assisting any assigned faculty member in the development, maintenance, and delivery of this course.

##### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by faculty who have expertise in the subject matter. In this case, this will specifically be a faculty member devoted to experimental physics. By departmental plan, this is typically 2/3 of the departmental faculty complement.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

#### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example: faculty teaching, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources, Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources originating from the area committed to the course.

#### C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	N/A
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	N/A

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	N/A
<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	A research lab in the Dept of Physics will be repurposed to host this experimental physics course.
<b>Equipment (and Maintenance):</b>	N/A.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

Course # and Title: **PHYS-3910. Techniques in Experimental Physics II**

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

All physics hypotheses, models, and theories need to be tested and verified through experiments to ensure their validity in representing the observable universe. This course is a continuation of PHYS-3900, with an emphasis on experimental design, modelling, simulation, and construction. Topics may include design and fabrication of apparatus, microprocessor programming, sources of noise, and noise reduction in measurements. (Prerequisites: PHYS-3900 or consent of instructor.) (1.5 hours of laboratory and 1.5 hours of tutorial per week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X					1.5/1.5		

Comment on breakdown of contact hours. These are "average" values. Some weeks will have 3 hours of only lab work. Some weeks will have one hour of tutorial discussion then two hours of lab work. Some weeks might be all tutorial discussion. This will depend on the topic. Regardless the class will consist of one three-hour meeting time per week. (Prerequisite: PHYS-3900 or consent of instructor.)

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-3900 or consent of instructor				No.	Lab components of PHYS-3210, PHYS-3100, and PHYS-3110

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?** Yes.

Yes, as only the lab portion of those courses' content is moving to PHYS-3910. And even then, the experiments are all changing. So a student on an old calendar, who received credit for PHYS-3110 and PHYS-3210, may choose to take the new PHYS-3910 as an optional 3\*\*\* level credit and this would not repeat any learning objectives or content of any other course.

#### B. RATIONALE

The Department of Physics is in the process of significantly renewing/revamping its programs and curricula. This renewal/updating has been based on extensive student input garnered both before, during and after the recent IQAP process; based on IQAP external examiners; and based on the opinions and experience of three newly appointed faculty members and their experiences at other comparable Canadian institutions. As part of this, the 3-hour per

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

week experimental lab component of three upper year courses (PHYS-3100, PHYS-3110, PHYS-3210) is being taken away from those courses (allowing those courses to focus more clearly on their core learning objectives) and put into a new “lab-only” course. This will allow for an experimental physics course that is more efficiently delivered, greatly improved, and more closely related to actual skills that physics graduates would be expected to possess in the marketplace or in graduate physics programs. As well, only one of PHYS-3100 and PHYS-3110 will be required under the new calendar (PHYS-3110 is being deleted from the required courses) so all the experimental content of the two remaining required courses (PHYS-3100 and PHYS-3210) can be moved to two new experimental physics courses, PHYS-3900 and PHYS-3910. PHYS-3900 will be required, PHYS-3910 will be an option. Experimental physicists may choose to take the optional course – theoretical physicists may choose to take a mathematical physics course. This will help them tailor their degree to their eventual careers or interests.

#### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

As stated above, the goal of this course is three-fold: (1) to allow us to more efficiently teach highly-important experimental physics skills (required for post degree-success and also for increasing student productivity in the Department’s research labs), (2) to allow the upper year theoretical physics courses to more efficiently provide their content without having to be constrained by an unrelated laboratory component, and (3) to provide much greater flexibility to our students in scheduling and in content on their path to graduation. Student learning that occurs in a laboratory hands-on environment will be more accurately represented on their transcripts by having a specific course enumerated, and this course will allow student to tailor their degree to their eventual careers or interests. Experimental physicists may choose to take the follow-on optional experimental physics course and theoretical physicists may choose to take an optional mathematical physics course we have developed.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university’s Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in “To Greater Heights” by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of this course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Utilize prior knowledge of experimental physics to design sophisticated experiments. Build electrical, mechanical, and optical devices that can automate data acquisition and ensure reproducible results. Utilize complex custom-fabricated apparatuses in experiments to generate and receive analog, digital, and optical signals. Perform computerized analysis on experimentally acquired data.	D. the acquisition, application and integration of knowledge
B. Find descriptions of current experimentally implemented physics apparatus in peer-reviewed literature and evaluate or implement such apparatus into an experiment.	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Identify potential experimental research obstacles and adapt experimental approaches to circumvent these obstacles. Model and simulate scientific apparatus that can achieve desired goals within the allotted time and with the desired accuracy.	C. critical thinking and problem-solving skills
D. Write technical reports that summarize their experimental development, their approach and methodologies, and draw conclusions.	D. literacy and numeracy skills
E. Ensure that their results are reproducible, develop experiments that can verify previous findings as reported in literature, and comply with academic integrity.	E. responsible behaviour to self, others and society
F. N/A	F. interpersonal and communications skills
G. Work in small teams, delegating duties so that tasks will be completed on time, and properly allocating responsibilities among team members based on their skills and expertise.	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**B.4 Demand for Course**

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	8	8	8	8	8

**B.4.1 Impact of New Course on Enrolment in Existing Courses**

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is a new required course within the Honours Physics and Honours Physics (Medical Physics) degree program and is not expected to impact enrollment in other courses.

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

**B.5 Student Workload**

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

<b>Average number of hours per week that the student will be expected to devote to:</b>	
	Lectures
0-2	Tutorials
4-6	Labs
	Practical experience
	Independent Study
1-2	Reading for the course
2	Work for assessment (essays, papers, projects, laboratory work)
	Meeting with others for group work/project assignments
	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third-year science course.

The course is scheduled to meet three hours per week. It is anticipated that the load for the course is “consistent with a third year course” that being 8-10 hours per week of course-work. But rather than doing book-based homework at home, it is expected that students will spend some hours in the lab outside of scheduled class time. Actual class activities may included discussions/tutorials, experiments, or a mixture of the two. These weekly numbers by breakdown are “average” quantities for the term, not literal weekly breakdowns.

**C. RESOURCES**

**C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)**

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. Current faculty members have expertise that are central to the subject area. The Department of Physics has one full time staff member in the position of “laboratory coordinator.” This staff member is responsible for assisting any assigned faculty member in the development, maintenance, and delivery of this course.

**C.1.1 Faculty Expertise in Support of the Revised Program**

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by faculty who have expertise in the subject matter. In this case, this will specifically be a faculty member devoted to experimental physics. By departmental plan, this is typically 2/3 of the departmental faculty complement.

**C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program**

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example: faculty teaching, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources originating from the area committed to the course.

#### C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	N/A
<b>Staff:</b>	N/A
<b>GA/TAs:</b>	N/A

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	N/A
<b>Teaching and Learning Support:</b>	N/A
<b>Student Support Services:</b>	N/A
<b>Space and Facilities:</b>	A research lab in the Dept of Physics will be repurposed to host this experimental physics course.
<b>Equipment (and Maintenance):</b>	The Department of Physics will develop all the experiments and equipment apparatus need to run this experimental physics course.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

**Course # and Title:** PHYS-4720. Magnetic Resonance Imaging

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

This course will present the physics and mathematics of magnetic resonance imaging with an emphasis on signal generation and detection, spatial encoding, and image reconstruction. Advanced topics in current MRI research (pulse sequence design, constrained image reconstruction, other topics) will also be presented. (Prerequisites: PHYS-3700.) (3 lecture hours a week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X				3			

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-3700				No	Special Techniques in Health Physics - MRI

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?**    No

#### B. RATIONALE

Expanding on its very popular medical physics stream, the Dept. of Physics is adding a permanent optional 4000 level medical physics course. The Department has recently hired a magnetic resonance imaging expert who has in the past offered this course as a “special topics” course (03-64-464 Special Techniques in Health Physics, last offered in the fall of 2018.) To reduce the reliance on “special topics” courses, this course is now being made a permanent course, most likely to be offered every other year.

Initially this course will be an optional course used to satisfy the “any PHYS 3000/4000” requirement in our programs. It will be of primary interest to the medical physics students, but will be open to students in any stream with the prerequisite course, which is offered every year.

##### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

This course complements but does not duplicate the existing PHYS-4710 Introduction to Medical Imaging course which covers a much greater breadth of imaging modalities. The proposed course will provide a much greater in-depth knowledge of magnetic resonance imaging (MRI) fundamentals which will be of interest to many of our medical physics majors who go on to careers involving MRI. Advanced computational methods and state-of-art MRI research topics will be introduced, and these computational methods fit into the Department’s broader goal of increasing the computational content of the current physics curriculum. This course also provides students an opportunity for the development of their research ability and interpersonal skills, including literature review, scientific writing, peer reviewing and oral presentation. Developing these “softer skills” is also an important goal of this course.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university’s Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nation-wide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in “To Greater Heights” by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

<b>Course Learning Outcomes PHYS-4720. Magnetic Resonance Imaging</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Explain to persons with a general public understanding the principles behind the use of magnetic resonance imaging (MRI) in modern healthcare, as well as enumerate the reasons for when and why MRI is required and used.  Apply the principles and theories of MRI to describe how clinical or research imaging systems operate.  Summarize the relevant advantages and disadvantages of MRI.	E. the acquisition, application and integration of knowledge

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<p><b>Course Learning Outcomes PHYS-4720. Magnetic Resonance Imaging</b> <i>This is a sentence completion exercise.</i></p> <p><u>At the end of this course, the successful student will know and be able to:</u></p>	<p style="text-align: center;"><b>Characteristics of a University of Windsor Graduate</b></p> <p><u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>Apply and relate the fundamental ideas, theories, and practices of generic signal processing and image reconstruction to the specific examples of MRI systems.</p>	
<p>B. Analyze data and report findings in an appropriate scientific style.</p> <p>Perform a literature review to identify the state-of-art developments of research areas related to MRI. (Also relevant to D and F.)</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Deconstruct complex problems into their building blocks.</p> <p>Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools which may include algebra, calculus, linear algebra, and differential equations to analyze and solve the resulting equations.</p> <p>Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques. (Also relevant to D and F.)</p> <p>Analyze experimentally obtained data and interpret the data.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Develop mathematical descriptions of physical systems; formulate solutions to the resulting equations analytically or numerically as appropriate.</p> <p>Utilize information about a physical system, formulating it into mathematical equations (to obtain a quantitative understanding of the system).</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A.</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate physical and mathematical concepts in writing and in oral presentations.</p> <p>Provide feedback on their peers' writing and oral presentations with regards to clarity, quality, and effectiveness to improve critical reading skills and critical listening skills.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A.</p>	<p>I. the ability and desire for continuous learning</p>

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### B.4 Demand for Course

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	12		12		12

#### B.4.1 Impact of New Course on Enrolment in Existing Courses

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is an optional course and may lower the enrolment in other optional Physics 3000/4000 courses. However, typically these courses are not all offered in the same semester, so it is not expected to impact enrollment in all other courses, only one or two Physics courses offered in the same term. Typically physics students need all the optional courses offered.

#### B.5 Student Workload

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

Average number of hours per week that the student will be expected to devote to:	
3	Lectures
0	Tutorials
	Labs
	Practical experience
1	Independent Study
1-2	Reading for the course
2-3	Work for assessment (essays, papers, projects, laboratory work)
1	Meeting with others for group work/project assignments
1	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a fourth-year physics elective course.

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. At least one current faculty member has expertise that is central to the subject area and operates a research laboratory devoted to magnetic resonance imaging which can be leveraged in support of the class.

##### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by a faculty member who has expertise in the subject matter. Initially and for the foreseeable future the course will be taught preferentially by that faculty member who develops it. As graduate

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

students are produced from this faculty member's laboratory, greater expertise will exist in the Department and opportunities for teaching this course may be provided for them.

#### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty. As graduate students are produced from this faculty member's laboratory, greater expertise will exist in the Department and opportunities for teaching this course may be provided for them. This is not a reliance on sessional faculty, but there may be opportunities for them.

#### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example: faculty teaching, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources needed to support this course.

#### C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	None
<b>Staff:</b>	None
<b>GA/TAs:</b>	None

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	None
<b>Teaching and Learning Support:</b>	None
<b>Student Support Services:</b>	None
<b>Space and Facilities:</b>	None
<b>Equipment (and Maintenance):</b>	None

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### A. NEW COURSE PROFILE

Course # and Title: **PHYS-4730. Radiobiology**

##### A.1 Calendar Description

*Calendar descriptions should be written in the third person and should provide a general outline of the course material. Where appropriate, examples of topics or themes, which might be covered in the course, should also be provided.*

Radiobiology is the study of the action of ionizing radiation on living things. A thorough understanding of the benefits and risks to humans associated with exposure to all forms of ionizing radiation is essential for any medical physicist. This course will review all the forms of ionizing radiation as well as the physics and chemistry of radiation absorption and interactions in the cells of the body. Students will be introduced to the events which have led to our current understanding of the field of radiobiology including in vitro cellular experiments, in vivo animal model experiments, clinical trials on human patients, and nuclear accident/bomb victim exposures. Ultimately, all of the current understanding of radiobiology will be used to explain why the current practice of clinical radiation therapy is practiced as it is by clinical medical physicists and radiation oncologists and how this knowledge can inform future developments in the field. (Prerequisites: PHYS-4700 or consent of instructor.) (3 lecture hours per week.)

##### A.2 Other Course Information

*Please complete the following tables.*

Credit weight	Total contact hours	Delivery format				Breakdown of contact hours/week			
		In-class	e-learning	Distance	Other flexible learning delivery [please specify]	Lecture	Lab/Tutorial	Online	Co-op/practicum/experiential learning
3.0	36	X				3			

Pre-requisites	Co-requisites	Anti-requisites	Cross-listed with:	Required course?	Replacing old course*** [provide old course number]
PHYS-4700 or consent of instructor				N	03-64-464 Special Techniques in Health Physics - Radiobiology

**\*\*\*Replacing Old Course: this does not mean that the former course will be deleted from the calendar. If it is to be deleted, a Form E must be completed.**

**Will students be able to obtain credit for the new course and the course(s) that it is replacing?**    No

#### B. RATIONALE

Expanding on its very popular medical physics stream, the Dept. of Physics is adding a few permanent optional 4000 level medical physics courses. This proposed course PHYS-4730 will appeal to medical physicists who intend to specialize in radiotherapy or radiation oncology.

This course will be an optional course used to satisfy the “any PHYS 3\*\*\*/4\*\*\*” requirement for physics or medical physics majors. It will be of primary interest to the medical physics students, but will be open to students in any

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

stream with the pre-requisites. Some students from outside the medical physics stream (particularly those interested in radiation oncology) may be interested in this course.

This course has been offered in the past as a “0364-464. Special Techniques in Health Physics” course. In order to reduce the reliance on “Special Topics” courses, the Department is attempting to make all such courses that are offered regularly or semi-regularly into permanent courses, as requested by the Dean. This course has been offered three times in the past few years and going forward be offered bi-annually or tri-annually.

#### B.1 Course Goal(s)

*Please provide a statement about the purpose of the course within the program of study or as an option.*

Over one-half of the students graduating from the medical physics stream have entered careers to become practicing clinical medical physicists. For these students, this topic/course is essential knowledge that is required in their graduate preparation. Providing fourth year undergraduates with this knowledge will serve to even further prepare these students for graduate education in medical physics and will make our graduating students even more competitive when they apply to graduate programs. The goal of this course then is to ultimately enhance student outcomes after graduation.

#### B.2 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In developing this course, how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

There is currently no indigenous content or material relevant to this course. The AAU will continue conversations with members of the university’s Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nation-wide conversation when possible.

#### B.3 LEARNING OUTCOMES (QAF section 2.1.1, 2.1.3, and 2.1.6)

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in “To Greater Heights” by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Information on learning outcomes is appended to this form (Appendix A). Proposers are also strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes.*

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>  <u>At the end of this course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b>  <u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>A. Explain to persons with a general public understanding the principles behind the use of ionizing radiation for the treatment of cancers.</p> <p>List and describe the dominant physical effects of ionizing radiation on the human body as well as their symptoms, including the dosages required to cause such effects.</p> <p>Integrate ideas and concepts from cellular biology with ideas from physics to construct a more complete understanding of the effects of ionizing radiation on living systems from the cellular level up through the organ level up to the whole-body level.</p> <p>Integrate theoretical knowledge of radiotherapy with practical examples of cancer radiotherapy as performed in a clinical environment.</p>	<p>F. the acquisition, application and integration of knowledge</p>
<p>B. Read and comprehend descriptions of previously performed radiobiology research experiments to evaluate their relevance to actual clinical treatment practice.</p> <p>Identify and define the problems and limitations of previously performed radiobiology research experiments.</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. N/A</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Critically read and assess descriptions of new biological or medical information and express themselves confidently in the language utilized in those fields. (Also relevant to F.)</p>	<p>D. literacy and numeracy skills</p>
<p>E. Explain the principle of ALARA (as low as reasonably achievable) and its importance in clinical and radiation safety practice.</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate their knowledge of the field of radiobiology comfortably using the language of physics, cellular biology, and medicine simultaneously and be able to tailor their description of that knowledge as needed for particular audiences from those fields.</p>	<p>F. interpersonal and communications skills</p>
<p>G.</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H.</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I.</p>	<p>I. the ability and desire for continuous learning</p>

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### B.4 Demand for Course

*Please provide as much information on projected enrolment as possible.*

Projected enrolment levels for the first 5 years of the new course.	Year 1	Year 2	Year 3	Year 4	Year 5
	10	0	0	10	0

The course will not be offered every year. Every other year at most. Perhaps every three years to let demand build up such that the enrolment is at least 10 students.

#### B.4.1 Impact of New Course on Enrolment in Existing Courses

*What will be the impact of offering the new course on enrolments in existing courses in the program or Department?*

This is an optional course and may lower the enrolment in other optional Physics 3000/4000 courses. However, typically these courses are not all offered in the same semester, so it is not expected to impact enrollment in all other courses, only one or two Physics courses offered in the same term. Typically physics students need all the optional courses offered by the Department.

#### B.5 Student Workload

*Provide information on the expected workload per week of a student enrolled in this course.  
NOTE: Student workload should be consistent with the credit weight assigned to the course.*

Average number of hours per week that the student will be expected to devote to:	
3	Lectures
	Tutorials
	Labs
	Practical experience
	Independent Study
5	Reading for the course
1-2	Work for assessment (essays, papers, projects, laboratory work)
	Meeting with others for group work/project assignments
1-2	Studying for tests/examinations
	Other: <i>[specify]</i>
<b>How does the student workload for this course compare with other similar courses in the department/program area?</b>	The estimated workload associated with this course is consistent with a third-year science course. However, the course is reading/discussion intensive (unlike most third-year physics courses), so students will spend significantly more time engaged in critical reading, integration, and reflection (and then discussing those readings) than in other physics courses.

#### C. RESOURCES

##### C.1 Available Faculty and Staff Resources (QAF sections 2.1.7, 2.1.8, 2.1.9 and 2.1.10)

*Describe, in general terms, all faculty and staff resources (e.g., administrative, teaching, supervision) from all affected areas/departments currently available and actively committed to support the new course). Please do not name specific individuals.*

The Department of Physics is committed to supporting this new course. At least one current faculty member in the Department of Physics has expertise that is central to the subject area. In addition, a very similar course has been offered in the Department of Biomedical Sciences in the past. Ultimately such a course may be or could be co-offered with that AAU for the mutual benefit of Biomedical Sciences and Physics students.

# PROGRAM DEVELOPMENT COMMITTEE

## NEW COURSE PROPOSALS

### FORM D

#### C.1.1 Faculty Expertise in Support of the Revised Program

*Provide an assessment of faculty expertise available and committed to actively support the new course. Please do not name specific individuals.*

This course will be taught by a faculty member who has expertise in the subject matter. Initially and for the foreseeable future the course will be taught preferentially by that faculty member who develops it. As discussed in C.1, this course may be co-offered with Biomedical Sciences to benefit pre-med students and medical physics students.

#### C.1.2 Extent of Reliance on Adjunct, Limited-term, and Sessional Faculty in Delivering the Revised Program

*Describe the area's expected reliance on, and the role of adjunct, limited-term, and sessional faculty in delivering the new course.*

This course will be taught regularly by a full-time faculty member. There is no expected reliance on adjunct, limited-term, or sessional faculty.

#### C.2 Resource Implications for Other Campus Units (Ministry sections 3 and 4)

*Describe the reliance of the proposed new course on existing resources from other campus units, including for example: faculty teaching, equipment or facilities outside the proposer's control, external resources requiring maintenance or upgrading using external resources. Provide relevant details.*

There is no anticipated reliance on other campus resources.

#### C.3 Anticipated New Resources (QAF sections 2.1.7, 2.1.8 and 2.1.9; Ministry section 4)

*List all **anticipated new resources** originating from within the area, department or faculty (external grants, donations, government grants, etc.) and committed to supporting the new course.*

There are no anticipated new resources needed to support this course.

#### C.4 Planned Reallocation of Resources and Cost-Savings (QAF section 2.1.7 and 2.1.9; Ministry section 4)

*Describe all opportunities for internal reallocation of resources and cost savings identified and pursued by the area/department in support of the new course. (e.g., streamlining existing programs and courses, deleting courses, etc.).*

N/A

#### C.5 Additional Resources Required – Resources Requested (QAF section 2.1.7 and 2.1.9)

*Describe all **additional faculty, staff and GA/TA resources** (in all affected areas and departments) required to offer the new course.*

<b>Faculty:</b>	None
<b>Staff:</b>	None
<b>GA/TAs:</b>	None

#### C.6.1 Additional Institutional Resources and Services Required by all Affected Areas or Departments

*Describe all **additional institutional resources and services** required by all affected areas or departments to offer the new course, including library, teaching and learning support services, student support services, space and facilities, and equipment and its maintenance.*

<b>Library Resources and Services:</b>	None
<b>Teaching and Learning Support:</b>	None
<b>Student Support Services:</b>	None

**PROGRAM DEVELOPMENT COMMITTEE  
NEW COURSE PROPOSALS  
FORM D**

<b>Space and Facilities:</b>	None
<b>Equipment (and Maintenance):</b>	None

University of Windsor  
Program Development Committee

\*5.8: **Physics - Summary of Minor Course and Calendar Changes (Form E)**

Item for: **Information**

Forwarded by: **Faculty of Science**

**Form History** (Leave blank if there have been no changes. Changes can also be noted directly in the Workflow)

Date of Modification	Approval Body Modifying	Reason for Modification

**INSTRUCTIONS ARE PROVIDED IN SHADED AREAS. DO NOT WRITE IN SHADED AREAS.**

ALL SECTIONS OF THIS FORM **MUST** BE COMPLETED. **LEARNING OUTCOMES MUST BE PROVIDED FOR LISTED COURSES WHERE:**

I. THERE ARE **NO OFFICIAL LEARNING OUTCOMES FOR THE COURSE** IN THE PDC/SENATE RECORD (check the CuMA database at <https://ctl2.uwindsor.ca/cuma/public/>)

OR

II. THERE ARE **CHANGES TO THE COURSE LEARNING OUTCOMES**

OR

III. IT HAS **BEEN 5 YEARS SINCE LEARNING OUTCOMES FOR THE COURSE WERE LAST SUBMITTED TO PDC/SENATE** (check the CuMA database for the date of last submission at <https://ctl2.uwindsor.ca/cuma/public/>)

**Confirmation of Consultation with AAUs That Will Be Affected, in Major Ways, by the Changes**

AAU Consulted	AAU Head/Directors	Date Consulted	Supportive	
			Yes	No
Engineering	Dean Bowers	09/15/2020	X	

Please specify to which calendar [Undergraduate or Graduate] the changes will be made. Include the effective date\* [Fall, Winter, Spring, 20XX].

\*(subject to timely and clear submission) These changes require no new resources.

Undergraduate  
Fall 2021-Winter 2024 (See notations on the courses)

**A. Proposed Course Calendar Revisions**

Please provide the current and the proposed new course information by cutting and pasting from the current undergraduate or graduate online calendar ([www.uwindsor.ca/secretariat/calendars](http://www.uwindsor.ca/secretariat/calendars)) and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. For contact hour/laboratory requirement changes which do not always appear in the calendar, please type in the current information and clearly mark deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Example: CHEM-1001. University Senates ~~—Role and Power—~~This course explores the history, role, and power of Senates in Canadian universities. (~~Also offered as BIOC 1001.~~) (Prerequisite: CHEM-1000.) ~~2 lecture hours and 1 tutorial hour per week~~ **3 lecture hours/week**

**Fall 2021**

PHYS-1300. Introductory Physics for Life Sciences I

This is an algebra-based course intended for students interested in the biological or health sciences, or related disciplines. The topics covered include the basic mechanical concepts of force, work and energy, properties of matter, and heat, with examples and applications drawn from the modeling of biological systems. (Prerequisites: one 4 "U" or OAC mathematics course or equivalent.) (3 lecture hours a week, ~~2~~ **3** laboratory hours ~~and 1 tutorial hour every~~ **per** week) (Anti-requisites: PHYS-1305, PHYS-1400.) (Open to students in Human Kinetics, Forensic Science, Bachelor

# PROGRAM DEVELOPMENT COMMITTEE

## SUMMARY OF MINOR COURSE AND CALENDAR CHANGES

### FORM E

of Arts and Science, and all programs within in the Faculty of Science; exceptions only with the permission of the Head or designate.)

#### PHYS-1310. Introductory Physics for Life Sciences II

This course is a continuation of PHYS-1305 intended for students interested in the biological or health sciences, or related disciplines. The topics covered include wave motion, sound, electricity and magnetism, light, and an introduction to topics in modern physics involving the life sciences such as the quantum nature of radiation and its interaction with biomolecules, high energy radiation and radioactivity, and the statistical treatment of data. (Prerequisite: PHYS-1300 or PHYS-1400.) (3 lecture hours per week, ~~1 tutorial hour and 2~~ 3 laboratory hours ~~every~~ per week.) (Antirequisites: PHYS-1410.) (Open to students in Human Kinetics, Forensic Science, Bachelor of Arts and Science, and all programs within in the Faculty of Science; exceptions only with the permission of the Head or designate.)

#### PHYS-1400. Introductory Physics I

**First semester in a four-semester sequence in calculus-based introductory physics with an emphasis on mechanics.** ~~Mechanics; properties of matter and heat. A calculus-based course.~~ (Prerequisites: Grade 12“U” Advanced Functions and Introductory Calculus or equivalent.) Recommended co-requisite: MATH-1720.) (3 lecture hours ~~a~~ per week, ~~2~~ 3 laboratory hours per week, ~~and 1 tutorial hour every week~~). Open to students in Human Kinetics, Forensic Science, Bachelor of Arts and Science, and all programs within in the Faculty of Science; exceptions only with the permission of the Head or designate. (Antirequisites: PHYS-1300, PHYS-1305.)

#### PHYS-1410. Introductory Physics II

**Second semester in a four-semester sequence in calculus-based introductory physics with an emphasis on electricity and magnetism.** ~~Wave motion, sound, electricity and magnetism, light, and modern physics.~~ (Prerequisite: PHYS-1400 or GENG-1110. **Recommended co-requisite: MATH-1730.**) (3 lecture hours ~~a~~ per week, ~~2~~ 3 laboratory hours per week, ~~and 1 tutorial hour every week~~). (Antirequisites: PHYS-1310) (Open to students in Engineering, Human Kinetics, Forensic Science, Bachelor of Arts and Science, and all programs within in the Faculty of Science; exceptions only with the permission of the Head or designate.)

#### PHYS-2500. ~~Intermediate Mechanics~~ **Intermediate Classical Mechanics**

Classical mechanics at the intermediate (second-year) level: Newton's Laws and consequences – Galilean invariance, conservation theorems, applications to rectilinear motion and motion in two/three dimensions; introduction to noninertial reference frames, particularly in rectilinear motion; driven oscillators with damping; central forces, the Kepler problem; dynamics of rigid bodies – planar motion; special relativity – Lorentz transformations, relativistic kinematics and dynamics. (Prerequisites: PHYS-1410 and MATH-1730, or equivalent; Recommended: PHYS-1500.) (3 lecture hours and 1 tutorial hour per week.)

#### PHYS-3500. ~~Classical Mechanics~~ **Advanced Classical Mechanics**

Classical mechanics, focusing on further developments of formalism and more complex systems: calculus of variations; Lagrangian formalism and an introduction to the Hamiltonian formalism; systems of particles; noninertial reference frames – rotating coordinate systems, centrifugal and Coriolis forces; three-dimensional rigid body motion – inertia tensor, Euler angles, equations of motion; coupled oscillations; continuum mechanics. (Prerequisites: PHYS-2500, MATH-2780, and MATH-2790 or equivalents.) (3 lecture hours and 1 tutorial hour per week.)

#### PHYS-3700. Introduction to Medical Physics

Physical principles and experimental techniques applied to medicine and biology. Applications of x-rays and gamma rays in medical diagnosis and therapy. Physical principles of lasers, ultrasound, and magnetic fields in mapping structures. Physical techniques for the diagnosis and therapy of the human body. This course is intended to be of interest to students in Biology and Chemistry/Biochemistry, as well as Physics. (Prerequisite: PHYS-1400 and PHYS-1410, or the consent of the instructor.) (3 lecture hours ~~a~~ per week)

# PROGRAM DEVELOPMENT COMMITTEE

## SUMMARY OF MINOR COURSE AND CALENDAR CHANGES

### FORM E

PHYS-4160. Condensed-Matter Physics

Elements of crystallography, crystal diffraction, reciprocal lattices, lattice dynamics and thermal properties of solids, phonons, solution of Schroedinger equation in periodic potential, band theory, Fermi surfaces of metals and semiconductors, optical properties of dielectrics. (Prerequisite: PHYS-3105-3100 or consent of instructor.) (3 lecture hours aper week.)

PHYS-4710. ~~Introduction to Medical Imaging~~ **Medical Imaging**

The course will cover a broad range of modern imaging techniques and their theoretical foundations, such as ultrasound, planar x-ray imaging, computer tomography (CT) imaging, magnetic resonance imaging (MRI), positron emission tomography (PET), and radionuclide molecular imaging. The course will include practical laboratory experience at the University of Windsor, and at the Windsor Regional Cancer Centre. (Prerequisite: PHYS-3700, or the consent of the instructor.) (3 lecture hours and, 3 laboratory hours aper week.)

#### Spring 2022

PHYS-2200. ~~EM Fields and Photons~~ **Oscillations, Waves, and Electromagnetism**

**Third semester in a four-semester sequence in calculus-based introductory physics with an emphasis on wave phenomena, oscillations, and electromagnetism.** Electrostatic fields and potentials. Charges and capacitance. Currents and conduction in solids. Magnetic fields; induction; introduction to Maxwell equations, electromagnetic waves, and photons; the photoelectric effect. (Prerequisite: PHYS-1410 or equivalent.) (3 lecture hours and, 3 laboratory hours aper week.)

#### Spring 2023

PHYS-3100. ~~Quantum Physics and Chemistry~~ **Quantum Mechanics I**

~~Classical and quantum physics, relativistic physics, black body radiation, photoelectric effect, Compton scattering, atomic structure, Schroedinger equation, particle in a box, harmonic oscillator, conduction in solids; semiconductor and superconductor devices.~~ **An introduction to quantum mechanics. Topics to be covered may include: mathematical formalism, solutions to Schroedinger's equation, Dirac notation, eigenvalue problems, hydrogen and helium atoms, spin, two-particle systems, atomic and molecular spectroscopy, perturbation theory.** (Prerequisites: PHYS-2210, PHYS-2500, MATH-3550 or PHYS-3610, MATH-2780 and MATH-2790 or equivalents.) (3 lecture, 3 laboratory hours aper week.)

PHYS-3105. Quantum Physics and Chemistry

(Same as PHYS-3100 without the laboratory.) Classical and quantum physics, black body radiation, photoelectric effect, Compton scattering, atomic structure, Schroedinger equation, particle in a box, harmonic oscillator, conduction in solids; semiconductor and superconductor devices. (Prerequisites: MATH-2780 and MATH-2790 or equivalents.) (3 lecture hours a week.)

PHYS-4100. ~~Quantum Mechanics I~~ **Quantum Mechanics II**

~~Probability amplitudes and transformations; operators and physical observables; symmetries and conservation theorems; time development operator and Dyson expansion; two-state systems, density matrices; perturbation theory and the variational method; identical particles, spin, the Thomas-Fermi atom.~~ **An introduction to more advanced topics in quantum mechanics. Topics to be covered may include: operators and physical observables, postulates on measurements, representation and change of basis, two-state systems, quantum entanglement, degeneracy, generalized uncertainty principle, operator method for simple harmonic oscillator, Hamiltonian as a generator of translations in time, momentum as a generator of spatial translations, angular momentum as a generator of spatial rotations, symmetries and conservation laws, Zeeman effect, density matrices, the variational method.** (Prerequisites: PHYS-3100 or PHYS-3115, and PHYS-3500, and MATH-3550 or consent of instructor.) (3 lecture hours aper week.)

PHYS-3200. Electromagnetic Theory **Electromagnetism: Statics**

# PROGRAM DEVELOPMENT COMMITTEE

## SUMMARY OF MINOR COURSE AND CALENDAR CHANGES

### FORM E

~~Classical electrodynamics, electromagnetism focusing on stationary phenomena: Topics to be covered may include electrostatics in vacuum, and electric potential, conductors; magnetostatics in vacuum; potential theory, multipole expansion; electrostatics and magnetostatics in ponderable media; boundary value problems; electromagnetic induction.~~ **Classical electromagnetism focusing on stationary phenomena. Topics to be covered may include: electrostatics in vacuum, electric potential, conductors; magnetostatics in vacuum, currents, vector potential; electro- and magnetostatics in matter; techniques for Laplace's equation, multipole expansion; electromagnetic induction.** (Prerequisites: MATH-2780, PHYS-2200 **PHYS-2210, PHYS-2500, and MATH-3550 or PHYS-3610.** Corequisite: MATH-2790.) (3 lecture hours per week.)

#### PHYS-3210. Electromagnetic Waves-**Electromagnetism: Dynamics**

~~Classical electrodynamics, focusing on dynamic phenomena: Maxwell's equations and the potential formulation; electromagnetic waves — free space, waves in matter, interfaces, guided waves; Lienard Wiechert potentials; electromagnetic radiation; electrodynamics and special relativity.~~ **Classical electrodynamics focussing on the significance of the unification of electricity and magnetism in Maxwell's equations. Topics to be covered may include: electromagnetic waves in free space, in matter, at interfaces, and in wave guides; potential formulation, gauge transformations, and Liénard-Wiechert potentials; radiation; electrodynamics and special relativity.** (Prerequisites: PHYS-3200 and MATH-3550 **or PHYS-3610.**) (3 lecture hours and 3 laboratory/tutorial hours per week.)

#### PHYS-4130. Introduction to Statistical Mechanics

Thermal equilibrium, diffusive equilibrium; Boltzmann and Gibbs distributions, canonical and grand canonical partition functions; thermodynamics from statistical mechanics, entropy, work, heat; Helmholtz free energy, Gibbs free energy, enthalpy, Gibbs-Duhem relation, equations of state, Maxwell relations, response functions; Planck distribution and thermal radiation, Fermi-Dirac distribution and the Fermi gas, Bose-Einstein distribution and the Bose gas, ideal gas; chemical reactions; binary mixtures; phase transitions; elementary kinetic theory. (Prerequisites: CHEM-2400, **and** PHYS-3100, **or consent of instructor** or PHYS-3105, PHYS-3110 or PHYS-3115, and CHEM-3400 (for Chemistry students only). **(3 lecture hours per week.)**

#### PHYS-2250. **PHYS-3250** Optics

~~Geometrical optics: review of laws of reflection and refraction; lenses and mirrors (matrix optics); stops, optical systems, aberrations. Introduction to wave optics; interferometry, diffraction, polarization, Fresnel equations, elements of dispersion theory.~~ (Prerequisites: PHYS-1410 **PHYS-2200** and MATH-1730 **MATH-2780.**) (3 lecture, **hours and** 3 laboratory hours a **per** week.)

#### PHYS-4250. Design and Application of Lasers

Stimulated emission, rate equation approach to amplification and output power calculations; Gaussian beams, stable and unstable resonators, Q-switching, mode-locking and cavity dumping, ruby, Nd:YAG and other solid-state lasers, semi-conductor, gas and dye lasers. (Prerequisites: ~~PHYS-3110 or PHYS-2200,~~ **PHYS-3100** and PHYS-2250, or three years of Electrical Engineering or Engineering Materials, or equivalent.) (3 lecture hours a **per** week.)

#### **Winter 2024**

#### PHYS-3110. Atomic and Molecular Spectra

~~Introduction to atomic and molecular spectroscopy, hydrogen and helium atoms, perturbation theory, isotopes; introduction to nuclear physics.~~ (Prerequisites: PHYS-3100 ~~or~~ **PHYS-3105**, MATH-2780, and MATH-2790, or equivalents.) (3 lecture, ~~3 laboratory~~ hours a week.)

#### PHYS-3115. Atomic and Molecular Spectra

~~(Same as PHYS-3110 without the laboratory.) Introduction to atomic and molecular spectroscopy, hydrogen and helium atoms, perturbation theory, isotopes; introduction to nuclear physics~~ (Prerequisites: PHYS-3100 or PHYS-3105, MATH-2780, and MATH-2790 or equivalents.) (3 lecture hours a week.)

# PROGRAM DEVELOPMENT COMMITTEE

## SUMMARY OF MINOR COURSE AND CALENDAR CHANGES

### FORM E

#### A.1 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In revising this/these course(s), how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

The AAU will continue conversations with members of the university's Aboriginal Education Council to create a knowledge base applicable to physics courses at all levels concerning appropriate content/curriculum changes or recommendations that could be made in the future. These changes could include integration of real-world examples that are more relevant to modern Indigenous societies and also examples drawn from historical Indigenous knowledge of the natural world and the cosmos, where applicable. Examples will first be discussed with the AEC prior to integration into a curriculum. Importantly, the AAU members regularly consult with other members of the Canadian Association of Physicists, including representatives of the Outreach Committee (which is tasked with promoting the inclusion of all under-represented groups in Canadian Physics,) to insure that efforts undertaken at UWindsor both to alter curriculum content and increase the participation of members of all underrepresented groups (which includes Indigenous (First Nations, Métis, or Inuit) peoples) are consistent with and following the best-practices of similar efforts being undertaken nationwide. The AAU members will work with this body to increase the level of the nationwide conversation when possible. Additionally, the AAU is adding a new course based on the History of Astronomy into which significant Indigenous content will be placed. That course will come into effect before most of these changes are made.

#### B. Learning Outcomes for the Courses Listed Above

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Proposers are strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes. **Where there are changes to the learning outcomes, please clearly mark deletions with strikethrough (~~strikethrough~~) and additions/new information with bolding and underlining.***

**COPY AND PASTE THE FOLLOWING ROW and TABLE, AND COMPLETE THEM FOR EACH COURSE LISTED ABOVE.**

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-3100. <u>Quantum Mechanics I</u> <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	____ Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )
---	---

**LEARNING OUTCOMES TABLE PHYS-3100. Quantum Mechanics I**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Translate a physical description of an introductory or intermediate quantum mechanical problem to a mathematical equation necessary to solve it.  Explain the physical meaning of the formal and/or mathematical formulation of and/or solution to a quantum mechanical problem.  Identify and explain important conceptual differences between the classical and quantum worlds.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Comprehend the entire scope of a quantum mechanical problem and construct several potential approaches (including evaluating potential starting points) to arrive at an acceptable solution.  Critically assess and evaluate the potential approaches so constructed to select an optimal approach to a solution. (Also applies to B.)  Mathematically process, work through, or solve a quantum mechanical problem using the selected approach and evaluate the final solution for logical and physical consistency.	C. critical thinking and problem-solving skills
D. N/A	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Justify and explain their thinking and/or approach to solving a quantum mechanical problem in either written or oral form.	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
I.	I. the ability and desire for continuous learning

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-4100 Quantum Mechanics II</b> <i>(Note: Learning outcomes were Last Revised March 16, 2020)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input checked="" type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: <b>March 16, 2020</b> _____ (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3110. Atomic and Molecular Spectra</b> <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<p>IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.</p>	<p>_____ Learning outcomes need not be submitted.          PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a>)</p>
--	---

**LEARNING OUTCOMES TABLE PHYS-3110. Atomic and Molecular Spectra**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Translate a physical description of an introductory or intermediate quantum mechanical problem to a mathematical equation necessary to solve it.  Explain the physical meaning of the formal and/or mathematical formulation of and/or solution to a quantum mechanical problem.  Identify and explain important conceptual differences between the classical and quantum worlds.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Comprehend the entire scope of a quantum mechanical problem and construct several potential approaches (including evaluating potential starting points) to arrive at an acceptable solution.  Critically assess and evaluate the potential approaches so constructed to select an optimal approach to a solution. (Also applies to B.)  Mathematically process, work through, or solve a quantum mechanical problem using the selected approach; evaluate their final solution for logical and physical consistency.	C. critical thinking and problem-solving skills
D. N/A	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Justify and explain their thinking and/or approach to solving a quantum mechanical problem in either written or oral form.	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
At the end of the course, the successful student will know and be able to:	A U of Windsor graduate will have the ability to demonstrate:
I.	I. the ability and desire for continuous learning

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3200. Electricity and Magnetism I</b> <i>(Note: Learning outcomes were Last Revised May 14, 2018)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input checked="" type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: <b>May 14, 2018</b> (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3210. Electricity and Magnetism II</b> <i>(Note: Learning outcomes were Last Revised May 14, 2018)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<p>IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.</p>	<p>_____ Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: _____          (check CUMA database at: <a href="https://ct12.uwindsor.ca/cuma/public/">https://ct12.uwindsor.ca/cuma/public/</a>)</p>
--	---

**LEARNING OUTCOMES TABLE PHYS-3210. Electricity and Magnetism II**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>A.            Apply Maxwell's equations to analyze electric and magnetic phenomena (in vacuum and in media), focusing on dynamic phenomena, namely electromagnetic waves and, more generally, electromagnetic radiation.</p> <p>Utilize appropriate mathematical tools to analyze and solve the equations.</p> <p><del>Apply principles of qualitative and quantitative analysis to interpret physical data.</del></p>	<p>A. the acquisition, application and integration of knowledge</p>
<p><del>B.            Record observations, analyze data, and report findings in an appropriate scientific style. (Also relevant to F.)</del></p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C.            Deconstruct complex problems into their building blocks. (Also relevant to I.)</p> <p>Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools – vector calculus, differential equations, and linear algebra – to analyze and solve the resulting equations. (Also relevant to D and I.)</p> <p>Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques. (Also relevant to F and I.)</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. N/A</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F.            Communicate physical and mathematical concepts in writing.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> At the end of the course, the successful student will know and be able to:	<b>Characteristics of a University of Windsor Graduate</b> A U of Windsor graduate will have the ability to demonstrate:
H. N/A	H. creativity and aesthetic appreciation
I. Utilize ideas/techniques from previous Physics and Mathematics courses – Maxwell’s equations; vector calculus, differential equations, linear algebra – to understand (dynamics) electromagnetic phenomena. (Also relevant to A, B, C, D.)	I. the ability and desire for continuous learning

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION “A” ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-2500. <u>Classical Mechanics I</u></b> <i>(Note: Learning outcomes were Last Revised May 14, 2018)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input checked="" type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: <b>May 14, 2018</b> (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION “A” ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3500. <u>Classical Mechanics II</u></b> <i>(Note: Learning outcomes were Last Revised May 14, 2018)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	___ Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input checked="" type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: <b>May 14, 2018</b> (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.**

<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-4710. <u>Medical Imaging</u></b> <i>(Note: These are new Learning Outcomes)</i>	
<b>SELECT ONE OF THE FOLLOWING:</b>		
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/>	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	___	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	___	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	___	Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: _____ (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE PHYS-4710. Medical Imaging**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Explain to persons with a general public understanding the principles behind the medical imaging modalities of ultrasound, x-ray CT, MRI, and nuclear medicine as well as the reasons for when and why such modalities are required.  Apply the principles and theories of the four main imaging modalities to real clinical or research imaging systems.  List the relevant advantages and disadvantages of the various medical imaging modalities.	A. the acquisition, application and integration of knowledge

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>Relate the fundamental ideas and theories of signal processing and imaging to the specific examples of medical imaging systems.</p> <p>Integrate knowledge of medical imaging systems with practical examples of imaging obtained in a laboratory environment.</p>	
<p>B. Record observations, analyze data, and report findings in an appropriate scientific style. (Also relevant to F.)</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Deconstruct complex problems into their building blocks. (Also relevant to I.)</p> <p>Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools which may include algebra, calculus, linear algebra, and differential equations to analyze and solve the resulting equations.</p> <p>Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques. (Also relevant to D and F.)</p> <p>Collect and analyze experimentally obtained data and then assemble reports by interpreting the data.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Develop mathematical descriptions of physical systems; formulate solutions to the resulting equations analytically or numerically as appropriate.</p> <p>Utilize information about a physical system, formulating it into mathematical equations (to obtain a quantitative understanding of the system).</p> <p>Effectively describe physical experiments related to medical imaging, report the outcomes of those experiments, and interpret the significance of those outcomes in a written document. (Also relevant to F.)</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A.</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate physical and mathematical concepts in writing.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A.</p>	<p>G. teamwork, and personal and group leadership skills</p>

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> At the end of the course, the successful student will know and be able to:	<b>Characteristics of a University of Windsor Graduate</b> A U of Windsor graduate will have the ability to demonstrate:
H. N/A.	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

S

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-2200. <u>Waves and Oscillations</u> <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-2200. Waves and Oscillations

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Summarize the fundamental laws and theories of physics related to waves and periodic motion, geometric optics, and thermodynamics and formulate these laws mathematically.  Construct, recognize, and solve problems both mathematical and conceptual concerning those fundamental laws and theories of physics using the methods of differential and integral calculus to solve such mathematical problems when necessary. Perform laboratory experiments that illustrate the laws and theories of physics related to waves and periodic motion, geometric optics, and thermodynamics.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>  <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b>  <u>A U of Windsor graduate will have the ability to demonstrate:</u>
C. Analyze and evaluate novel technical problems, retrieve the information needed to solve them, then find appropriate mathematical methods of solution which may require differential and/or integral calculus and distinguish whether those achieved solutions are reasonable.  Critically assess the results of laboratory experiments to determine if they make physical sense and are reasonable.	C. critical thinking and problem-solving skills
D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.  Critically read and interpret laboratory manuals to extract key information and make accurate and efficient measurements.	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.  Write concise accurate answers to questions posed in a laboratory setting (by discussing such answers with laboratory group members and instructors.)	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.**

<b>COURSE NUMBER AND TITLE:</b>	PHYS-1400. Introductory Physics I <i>(Note: These are new Learning Outcomes)</i>	
<b>SELECT ONE OF THE FOLLOWING:</b>		
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.	

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

II. There are changes to the course learning outcomes	_____ Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	_____ Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	_____ Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-1400. Introductory Physics I

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Summarize the fundamental laws and theories of physics related to kinematics (forces and vectors), energy, momentum, and rotational motion and formulate these laws mathematically.  Construct, recognize, and solve problems both mathematical and conceptual concerning those fundamental laws and theories of physics using the methods of differential and integral calculus to solve such mathematical problems when necessary.  Apply physical principles and physical insight to the various natural phenomena and processes experienced in daily life.  Perform laboratory experiments that illustrate the laws and theories of physics related to kinematics (forces and vectors), energy, momentum, and rotational motion.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Analyze and evaluate novel technical problems, retrieve the information needed to solve them, then find appropriate mathematical methods of solution which may require differential and/or integral calculus and distinguish whether those achieved solutions are reasonable. Critically assess the results of laboratory experiments to determine if they make physical sense and are reasonable (within a calculated uncertainty).	C. critical thinking and problem-solving skills

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.  Critically read and interpret laboratory manuals to extract key information to make accurate and efficient measurements.	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.  Write concise accurate answers to questions posed in a laboratory setting (by discussing such answers with laboratory group members and instructors.)	F. interpersonal and communications skills
G. N/A.	G. teamwork, and personal and group leadership skills
H. N/A.	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

<b>COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.</b>	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-1410. Introductory Physics II <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course:

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

	(check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )
--	---

**LEARNING OUTCOMES TABLE** PHYS-1410. Introductory Physics II

<b>Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Summarize the fundamental laws and theories of physics related to electricity and magnetism and formulate these laws mathematically.  Construct, recognize, and solve problems both mathematical and conceptual concerning those fundamental laws and theories of physics using the methods of differential and integral calculus to solve such mathematical problems when necessary.  Perform laboratory experiments that illustrate the laws and theories of physics related to related to electricity and magnetism, waves and periodic motion, and geometric optics.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Analyze and evaluate novel technical problems, retrieve the information needed to solve them, then find appropriate mathematical methods of solution which may require differential and/or integral calculus and distinguish whether those achieved solutions are reasonable.  Critically assess the results of laboratory experiments to determine if they make physical sense and are reasonable (within a calculated uncertainty).	C. critical thinking and problem-solving skills
D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.  Critically read and interpret laboratory manuals to extract key information to make accurate and efficient measurements.	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.  Write concise accurate answers to questions posed in a laboratory setting (by discussing such answers with laboratory group members and instructors.)	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-1300.Introductory Physics for Life Sciences I <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-1300.Introductory Physics for Life Sciences I

Learning Outcomes <i>This is a sentence completion exercise.</i>	Characteristics of a University of Windsor Graduate
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Summarize the fundamental laws and theories of physics related to kinematics (forces and vectors), energy, momentum, and rotational motion and formulate these laws mathematically. Construct, recognize, and solve problems both mathematical and conceptual concerning those fundamental laws and theories of	B. the acquisition, application and integration of knowledge

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<p>At the end of this course, the successful student will know and be able to:</p>	<p>A U of Windsor graduate will have the ability to demonstrate:</p>
<p>physics using algebra to solve such mathematical problems when necessary.</p> <p>Perform laboratory experiments that illustrate the laws and theories of physics related to kinematics (forces and vectors), energy, momentum, and rotational motion.</p>	
<p>B. N/A</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Analyze and evaluate novel technical problems, retrieve the information needed to solve them, then find appropriate mathematical methods of solution which may require the utilization of algebra and distinguish whether those achieved solutions are reasonable.</p> <p>Critically assess the results of laboratory experiments to determine if they make physical sense and are reasonable (within a calculated uncertainty).</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.</p> <p>Critically read and interpret laboratory manuals to extract key information enabling the student to make accurate and efficient measurements.</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.</p> <p>Write concise accurate answers to questions posed in a laboratory setting (by discussing such answers with laboratory group members and instructors.)</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A</p>	<p>I. the ability and desire for continuous learning</p>

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-1310.Introductory Physics for Life Sciences II <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-1310.Introductory Physics for Life Sciences II

Learning Outcomes <i>This is a sentence completion exercise.</i>	Characteristics of a University of Windsor Graduate
<u>At the end of this course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
A. Summarize the fundamental laws and theories of physics related to electricity and magnetism, waves and periodic motion, and geometric optics and formulate these laws mathematically.  Construct, recognize, and solve problems both mathematical and conceptual concerning those fundamental laws and theories of physics using algebra to solve such mathematical problems when necessary.  Perform laboratory experiments that illustrate the laws and theories of physics related to related to electricity and magnetism, waves and periodic motion, and geometric optics.	C. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Analyze and evaluate novel technical problems, retrieve the information needed to solve them, then find appropriate	C. critical thinking and problem-solving skills

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<p>At the end of this course, the successful student will know and be able to:</p>	<p>A U of Windsor graduate will have the ability to demonstrate:</p>
<p>mathematical methods of solution which may require the utilization of algebra and distinguish whether those achieved solutions are reasonable.</p> <p>Use experimental scientific apparatus to conduct experiments in a physics laboratory environment and then assess whether the results of those experiments make physical sense and are reasonable.</p>	
<p>D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.</p> <p>Critically read and interpret laboratory manuals to extract key information enabling the student to make accurate and efficient measurements.</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.</p> <p>Discuss questions posed in the laboratories with group members/instructors and write concise accurate answers.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. Pursue further studies in other areas of Physics (including subsequent Physics classes) and more advanced studies in electricity and magnetism as well as optics.</p>	<p>I. the ability and desire for continuous learning</p>

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-3700. Introduction to Medical Physics <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-3700. Introduction to Medical Physics

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>A. Describe the main medical imaging modalities currently in use.</p> <p>Compare and contrast all of the main medical imaging modalities currently in use, explaining the relative advantages and disadvantages of each.</p> <p>Describe the primary methods whereby medical physics techniques are used in the treatment of disease, particularly cancer.</p> <p>Explain the uses of ionizing radiation in medical physics treatments, including how such radiation is generated and quantified and also how the interactions of the radiation with the body are modeled and described.</p> <p>Express how radioactivity / radiation can pose a risk to biological systems and to quantify that risk mathematically, specifically in light of its use in the treatment and diagnosis of disease.</p>	<p>A. the acquisition, application and integration of knowledge</p>

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
Integrate knowledge of the effects of ionizing radiation on the human body with knowledge of cellular biological processes to explain how and why current cancer treatment radiotherapies are performed.	
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Deconstruct complex problems into their building blocks. (Also relevant to I.)  Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools which may include algebra, calculus, linear algebra, and differential equations to analyze and solve the resulting equations.  Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques. (Also relevant to D and F.)	C. critical thinking and problem-solving skills
D. Develop mathematical descriptions of physical systems; formulate solutions to the resulting equations analytically or numerically as appropriate.  Utilize information about a physical system, formulating it into mathematical equations (to obtain a quantitative understanding of the system).	D. literacy and numeracy skills
E. Explain the principle of ALARA (as low as reasonably achievable) and its importance in clinical and radiation safety practice.	E. responsible behaviour to self, others and society
F. Communicate physical and mathematical concepts in writing.	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.**

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>COURSE NUMBER AND TITLE:</b>	PHYS-4130. Introduction to Statistical Mechanics <i>(Note: These are new Learning Outcomes)</i>	
<b>SELECT ONE OF THE FOLLOWING:</b>		
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/>	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/>	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/>	Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/>	Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE** PHYS-4130. Introduction to Statistical Mechanics

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
At the end of the course, the successful student will know and be able to:	A U of Windsor graduate will have the ability to demonstrate:
A. Apply the principles of statistical mechanics to analyze the physics of systems in thermodynamic equilibrium.  Use appropriate mathematical tools and techniques to determine statistical expectations and thermodynamic quantities.  Explain the connections between statistical mechanics and thermodynamics and identify their limits of application.  Apply principles of qualitative and quantitative analysis to interpret physical data from systems in thermodynamic equilibrium.	A. the acquisition, application and integration of knowledge
B. N/A.	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Deconstruct complex problems in statistical physics or thermodynamics into their building blocks.  Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools – particularly, calculus, differential equations, linear algebra, and probability and statistics – to analyze and evaluate the resulting expressions.	C. critical thinking and problem-solving skills

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i>	<b>Characteristics of a University of Windsor Graduate</b>
<u>At the end of the course, the successful student will know and be able to:</u>	<u>A U of Windsor graduate will have the ability to demonstrate:</u>
Process, interpret, and present scientific data using appropriate graphical, numeric, and computational techniques.	
D. N/A	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Communicate physical and mathematical concepts in writing.	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. Utilize ideas/techniques such as thermodynamics, electromagnetism, quantum mechanics, classical mechanics, probability and statistics, vector calculus, differential equations, to understand the statistical mechanics of systems in thermodynamic equilibrium.	I. the ability and desire for continuous learning

**COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.**

<b>COURSE NUMBER AND TITLE:</b>	PHYS-4160. Condensed-Matter Physics <i>(Note: Learning outcomes were Last Revised March 16, 2020)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input checked="" type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: <b>March 16, 2020</b> (check CUMA database.

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	PHYS-4250. Design and Application of Lasers <i>(Note: These are new Learning Outcomes)</i>
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE PHYS-4250. Design and Application of Lasers**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> At the end of the course, the successful student will know and be able to:	<b>Characteristics of a University of Windsor Graduate</b>
A. Integrate previous knowledge in physics and mathematics with new material related to electromagnetic fields in resonators and laser light propagation to be able to describe the theory, operation, and construction of a laser.	A. the acquisition, application and integration of knowledge
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. Analyze and evaluate theoretical and technical problems related to the construction of laser resonators and the propagation of laser radiation.  Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools, and may include calculus, differential equations, linear algebra, and probability and statistics – to analyze and evaluate the resulting expressions.	C. critical thinking and problem-solving skills
D. Develop mathematical descriptions of physical systems; formulate solutions to the resulting equations analytically or numerically as appropriate.  Utilize information about a physical system, formulating it into mathematical equations (to obtain a quantitative understanding of the system).	D. literacy and numeracy skills

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> At the end of the course, the successful student will know and be able to:	<b>Characteristics of a University of Windsor Graduate</b> A U of Windsor graduate will have the ability to demonstrate:
Develop algorithms to visualize data.	
E. N/A	E. responsible behaviour to self, others and society
F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions to those problems clearly. Communicate physical and mathematical concepts in writing.	F. interpersonal and communications skills
G. N/A	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.**

<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3250. Optics</b> ( <i>Renumbered from PHYS-2250</i> ) ( <i>Note: These are new Learning Outcomes</i> )
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**LEARNING OUTCOMES TABLE PHYS-3250. Optics** (*Renumbered from PHYS-2250*)

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> At the end of the course, the successful student will know and be able to:	<b>Characteristics of a University of Windsor Graduate</b> A U of Windsor graduate will have the ability to demonstrate:
A. Apply the theories of geometric and physical optics to physical systems in order to model, describe, and characterize their design, construction and operation. Apply sophisticated mathematical tools to describe the underlying nature of light and its interaction with matter.	A. the acquisition, application and integration of knowledge

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

<b>Course Learning Outcomes</b> <i>This is a sentence completion exercise.</i> <u>At the end of the course, the successful student will know and be able to:</u>	<b>Characteristics of a University of Windsor Graduate</b> <u>A U of Windsor graduate will have the ability to demonstrate:</u>
<p>Apply the physics of wave phenomena to describe light propagation and behavior.</p> <p>Describe and internalize the dual (wave/particle) nature of light and how this is manifested in a variety of waves in physical experiments.</p> <p>Perform laboratory experiments that illustrate the laws and theories of physics related to related to waves and periodic motion, geometric optics, and thermodynamics.</p>	
B. N/A	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
<p>C. Analyze and evaluate technical problems in optics, retrieve the information needed to solve them, then find appropriate mathematical methods of solution which may require differential and/or integral calculus and distinguish whether those achieved solutions are reasonable.</p> <p>Assess the outcome of experiments conducted in an optics / fiber-optics laboratory environment for accuracy repeatability. Assess whether the results those experiments make physical sense and are reasonable.</p>	C. critical thinking and problem-solving skills
<p>D. Formulate problems presented in various formats into a mathematical form, and be able to solve these equations algebraically or numerically, as appropriate.</p> <p>Critically read and interpret laboratory manuals to extract key information enabling the student to make accurate and efficient measurements.</p>	D. literacy and numeracy skills
E. N/A	E. responsible behaviour to self, others and society
F. Communicate mathematical and conceptual problems and qualitative and quantitative solutions clearly.	F. interpersonal and communications skills
G. Work in teams to successfully complete experiments in optics / fiber optics that can then be assessed for accuracy and completeness.	G. teamwork, and personal and group leadership skills
H. N/A	H. creativity and aesthetic appreciation
I. N/A	I. the ability and desire for continuous learning

**PROGRAM DEVELOPMENT COMMITTEE  
SUMMARY OF MINOR COURSE AND CALENDAR CHANGES  
FORM E**

<b>COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.</b>	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3105 Quantum Physics and Chemistry</b> (Note: This course is being deleted. There are no learning outcomes in the CUMA.)
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

<b>COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.</b>	
<b>COURSE NUMBER AND TITLE:</b>	<b>PHYS-3115 Atomic and Molecular Spectra</b> (Note: This course is being deleted. There are no learning outcomes in the CUMA.)
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**University of Windsor  
Program Development Committee**

\*5.9: **Integrative Biology - Summary of Minor Course and Calendar Changes (Form E)**

Item for: **Information**

Forwarded by: **Faculty of Science**

**Form History** (Leave blank if there have been no changes. Changes can also be noted directly in the Workflow)

Date of Modification	Approval Body Modifying	Reason for Modification

ALL SECTIONS OF THIS FORM **MUST** BE COMPLETED. **LEARNING OUTCOMES MUST BE PROVIDED FOR LISTED COURSES WHERE:**

I. THERE ARE **NO OFFICIAL LEARNING OUTCOMES FOR THE COURSE** IN THE PDC/SENATE RECORD (check the CuMA database at <https://ctl2.uwindsor.ca/cuma/public/>)

OR

II. THERE ARE **CHANGES TO THE COURSE LEARNING OUTCOMES**

OR

III. IT HAS **BEEN 5 YEARS SINCE LEARNING OUTCOMES FOR THE COURSE WERE LAST SUBMITTED TO PDC/SENATE** (check the CuMA database for the date of last submission at <https://ctl2.uwindsor.ca/cuma/public/>)

**Confirmation of Consultation with AAUs That Will Be Affected, in Major Ways, by the Changes**

AAU Consulted	AAU Head/Directors	Date Consulted	Supportive	
			Yes	No
<b>Integrative Biology</b>	Isabelle Barrette-Ng	December 10, 2020	X	

**Please specify to which calendar [Undergraduate or Graduate] the changes will be made. Include the effective date\* [Fall, Winter, Spring, 20XX].**  
 \*(subject to timely and clear submission) **These changes require no new resources.**

Undergraduate  
Spring 2021

**A. Proposed Course Calendar Revisions**

**Please provide the current and the proposed new course information by cutting and pasting from the current undergraduate or graduate online calendar ([www.uwindsor.ca/secretariat/calendars](http://www.uwindsor.ca/secretariat/calendars)) and clearly marking deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. For contact hour/laboratory requirement changes which do not always appear in the calendar, please type in the current information and clearly mark deletions with strikethrough (~~strikethrough~~) and additions/new information with **bolding and underlining**. Example: CHEM-1001. University Senates — ~~Role and Power~~—This course explores the history, role, and power of Senates in Canadian universities. (Also offered as BIOC 1001.) (Prerequisite: CHEM-1000.) ~~2 lecture hours and 1 tutorial hour per week~~ **3 lecture hours/week****

# PROGRAM DEVELOPMENT COMMITTEE

## SUMMARY OF MINOR COURSE AND CALENDAR CHANGES

### FORM E

BIOL-2101.Ecology

Introduction to the fundamental concepts of ecology including factors affecting species distribution, reproductive strategies, population growth and regulation, species interactions, and community level organization and energetics. (Prerequisites: BIOL-1111, ~~and BIOL-1101~~ or BIOL-1013 with instructor approval) (3 lecture, 3 laboratory/discussion hours a week.)

#### A.1 Indigenous (First Nations, Métis, or Inuit) Content, Perspectives, or Material

*The University of Windsor is committed to building stronger, more meaningful partnerships with Indigenous students, scholars and communities. In revising this/these course(s), how has consideration been given to incorporating Indigenous (First Nations, Métis, or Inuit) content, perspectives, or material into the curriculum?*

This minor course change does not influence the delivery of indigenous content as part of the course. Indigenous content will continue to be included based upon the discretion of the instructor to provide a holistic review of the subject matter.

#### B. Learning Outcomes for the Courses Listed Above

*Please complete the following table. State the specific learning outcomes that make up the goal of the course (what will students know and be able to do at the end of this course?) and link the learning outcomes to the Characteristics of a University of Windsor Graduate outlined in "To Greater Heights" by listing them in the appropriate rows. Please note that a learning outcome may link to more than one of the specified Characteristics of a University of Windsor Graduate, and that a single course might not touch on each of the Characteristics. **If a specific learning outcome is not applicable for the course, please enter N/A or not applicable.** Proposers are strongly encouraged to contact the Centre for Teaching and Learning for assistance with the articulation of learning outcomes. **Where there are changes to the learning outcomes, please clearly mark deletions with strikethrough (~~strikethrough~~) and additions/new information with bolding and underlining.** COPY AND PASTE THE FOLLOWING ROW and TABLE, AND COMPLETE THEM FOR EACH COURSE LISTED ABOVE.*

COMPLETE THIS TABLE FOR EACH COURSE LISTED IN SECTION "A" ABOVE.	
<b>COURSE NUMBER AND TITLE:</b>	BIOL-2101.Ecology (Note: These are new learning outcomes)
<b>SELECT ONE OF THE FOLLOWING:</b>	
I. There are no official learning outcomes for the course in the PDC/Senate record. (check the CuMA database at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input checked="" type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
II. There are changes to the course learning outcomes	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
III. It has been 5 years since learning outcomes for the course were last submitted to PDC/Senate. (check the CuMA database for the date of last submission at <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )	<input type="checkbox"/> Provide learning outcomes for the course by completing the Learning Outcomes Table below.
IV. Learning Outcomes have been reviewed in the past 5 years and no revisions are being proposed.	<input type="checkbox"/> Learning outcomes need not be submitted. PROVIDE DATE LAST REVIEWED BY PDC/SENATE then go to the next course: _____ (check CUMA database at: <a href="https://ctl2.uwindsor.ca/cuma/public/">https://ctl2.uwindsor.ca/cuma/public/</a> )

**PROGRAM DEVELOPMENT COMMITTEE**  
**SUMMARY OF MINOR COURSE AND CALENDAR CHANGES**  
**FORM E**

**BIOL-2101.Ecology**

<p><b>Course Learning Outcomes BIOL-2101.Ecology</b>  <i>This is a sentence completion exercise.</i>  <u>At the end of the course, the successful student will know and be able to:</u></p>	<p><b>Characteristics of a University of Windsor Graduate</b>  <u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>A.  <u>List and describe</u> the core concepts of ecology, including concepts of niches, ecosystems, energy transfer, nutrient cycles, trophic levels, food webs, populations, animal behaviour, life histories, communities, succession, biodiversity, natural resources, and conservation.</p> <p><u>Compare and contrast</u> the different branches of the field of ecology, including ecological energetics, population ecology, behavioural ecology, physiological ecology, community ecology, landscape ecology, and conservation biology</p>	<p>A. the acquisition, application and integration of knowledge</p>
<p>B.            Read, interpret and summarize information from peer reviewed journal articles. (also applies to D)</p> <p>Gather ecological data, organize and interpret those data, and communicate the patterns in those data to others in creative ways. (also applies to D and H)</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C.            Apply and evaluate assumptions of ecology theory as they relate to real-world communities and conservation efforts.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D.</p>	<p>D. literacy and numeracy skills</p>
<p>E. Recognize and evaluate examples of human impact on the natural world.</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate ecological concepts to others through written and oral communication.</p>	<p>F. interpersonal and communications skills</p>
<p>G. Describe the interplay of individual and team-based ecological studies.</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H.</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. Compare present knowledge in ecology with areas of future study that remain to be answered.</p>	<p>I. the ability and desire for continuous learning</p>

University of Windsor  
Program Development Committee

\*5.10: **Physics (Graduate) Course Learning Outcomes**

Item for: **Information**

Forwarded by: **Faculty of Graduate Studies**

This document contains the following course learning outcomes:

PHYS-8100. Advanced Quantum Theory I

PHYS-8250. Design and Application of Lasers

**PHYS-8100. Advanced Quantum Theory I**

<p><b>Learning Outcomes</b>  <i>This is a sentence completion exercise.</i>  <u>At the end of this course, the successful student will know and be able to:</u></p>	<p><b>Characteristics of a University of Windsor Graduate</b>  <u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>A. Express physical problems in the mathematical formalisms of quantum mechanics.</p> <p>Summarize the postulates of quantum mechanics and apply them in finding the solutions to physics problems.</p> <p>Apply key concepts such as parity and symmetry to achieve solutions and insights into physics problems.</p>	<p>A. the acquisition, application and integration of knowledge</p>
<p>B. N/A</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Apply the general principles of quantum mechanics and utilize appropriate mathematical tools at a very high level to solve a wide variety of physical problems.</p> <p>Set-up a problem utilizing both the Schroedinger representation and the Heisenberg representation and work that problem to completion using either formalism.</p> <p>Utilize approximation methods to obtain solutions to ill-defined problems.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. N/A</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. N/A</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A</p>	<p>I. the ability and desire for continuous learning</p>

**PHYS-8250. Design and Application of Lasers**

<p><b>Learning Outcomes</b>  <i>This is a sentence completion exercise.</i></p> <p><u>At the end of this course, the successful student will know and be able to:</u></p>	<p><b>Characteristics of a University of Windsor Graduate</b></p> <p><u>A U of Windsor graduate will have the ability to demonstrate:</u></p>
<p>A. Integrate previous knowledge in Physics and Mathematics with new material related to electromagnetic fields in resonators and laser light propagation.</p>	<p>B. the acquisition, application and integration of knowledge</p>
<p>B. Retrieve, synthesize, and apply contemporary scientific literature on lasers and applications.</p>	<p>B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)</p>
<p>C. Analyze and evaluate theoretical and technical problems related to the construction of laser resonators and the propagation of laser radiation at a graduate level as demonstrated by mathematical and computational sophistication and accuracy.</p> <p>Translate physical problems into appropriate mathematical language and apply appropriate mathematical tools - including calculus, differential equations, linear algebra, and probability and statistics – to analyze and evaluate the resulting expressions.</p>	<p>C. critical thinking and problem-solving skills</p>
<p>D. Develop graduate level mathematical descriptions of physical systems and formulate solutions to the resulting equations analytically or numerically as appropriate.</p> <p>Develop algorithms to visualize data.</p> <p>Develop algorithms to simulate physical processes.</p>	<p>D. literacy and numeracy skills</p>
<p>E. N/A.</p>	<p>E. responsible behaviour to self, others and society</p>
<p>F. Communicate physical and mathematical concepts and problems and their qualitative and quantitative solutions clearly, both orally and in writing.</p>	<p>F. interpersonal and communications skills</p>
<p>G. N/A</p>	<p>G. teamwork, and personal and group leadership skills</p>
<p>H. N/A</p>	<p>H. creativity and aesthetic appreciation</p>
<p>I. N/A</p>	<p>I. the ability and desire for continuous learning</p>

**University of Windsor  
Program Development Committee**

**7.1: Report of PDC Calendar Subcommittee**

Item for: **Information**

- At the September PDC meeting, a small Subcommittee was established to review the content listed in the University of Windsor's Undergraduate and Graduate calendars with a view to creating standardization.
- Some of the challenges have included the following: 1) some policies embedded in the calendar differ from overall Senate policy; 2) language is inconsistent and dated; 3) there is too much language outlining faculty or departmental process (which change frequently); and, 4) the majority of students do not refer to the calendar to determine their degree requirements.
- The University Calendars are the official academic documents that outline the academic and program regulations, categories of registration, university-college agreements, and degree requirements.
- The format of the current web calendar will be moved to an accessible PDF "book" format in 2021 to ensure that it complies with all Accessibility for Ontarians with Disabilities Act (AODA) requirements.
- The Subcommittee focussed on providing clarity and standardization in outlining program requirements among and between programs and departments and with the UWinsite Academic Advisement module.
- Draft proposals for the new layouts are attached. The new layout is in the form of a checklist. With the calendars moving to a PDF format, students will be able to save or print their specific degree requirements and check-off the requirements once they have been met.
- The Subcommittee is proposing the following template:
  - Course requirements be put into a checklist format
  - The course number and title be included in the program requirements
  - List additional program regulations
  - Suggested course sequencing, where applicable.
- *See attached*

Subcommittee Membership: Linden Crain, Dr. Philip Dutton, Dr. Kevin Milne, Dr. Shelagh Towson, Dr. Patti Weir (Chair), Renée Wintermute, Alison Zilli. Consultation with: Lorraine Grondin, Acting Registrar.

**EXAMPLE:**

Bachelor of Science (General Science)

***Degree Requirements***

Total courses: thirty.

(a) two sets of six courses from two different Departments or School as listed. Courses specified as (\*) must be from among the courses listed to calculate the major average for a degree program in the Department or School:

Biological Sciences:

BIOL-1101 Cell Biology

BIOL-1111 Biological Diversity

and \*four BIOL-XXXX or BIOM-XXXX courses at the 2000 level or above

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

Chemistry and Biochemistry:

CHEM-1100 General Chemistry I

CHEM-1110 General Chemistry II

and \*four CHEM-XXXX or BIOC-XXXX courses at the 2000 level or above

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

Computer Science:

COMP-1400 Introduction to Algorithms and Programming I

COMP-1410 Introduction to Algorithms and Programming II

and \*four COMP-XXXX courses at the 2000 level or above

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

School of the Environment:

ESCI-1100 Environmental Systems - An Introduction to Environmental Science

ESCI-1111 Introduction to Earth Science

and \*four ESCI-XXXX courses at the 2000 level or above

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

Economics:

ECON-1100 Introduction to Economics I

ECON-1110 Introduction to Economics II

and \*four ECON-XXXX courses at the 2000 level or above

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

\_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

Mathematics and Statistics:

MATH-1720 Differential Calculus (or MATH-1760 Functions and Differential Calculus)

MATH-1730 Integral Calculus

and \*four MATH-XXXX or STAT-XXXX courses at the 2000 level or above

- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- Physics:
  - PHYS-1400 Introductory Physics I
  - PHYS-1410 Introductory Physics II
  - and \*four PHYS-XXXX courses at the 2000 level or above
  - \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
  - \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
  - \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
  - \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

(b) one set of two courses from a third Department or School as listed:

- Biological Sciences:
  - BIOL-1101 Cell Biology
  - BIOL-1111 Biological Diversity
- Chemistry and Biochemistry:
  - CHEM-1100 General Chemistry I
  - CHEM-1110 General Chemistry II
- Computer Science:
  - COMP-1400 Introduction to Algorithms and Programming I
  - COMP-1410 Introduction to Algorithms and Programming II
  - or
  - COMP-1047 Computer Concepts for End-Users
  - COMP-2057 Introduction to the Internet
  - or
  - COMP-2057 Introduction to the Internet
  - COMP-2067 Programming for Beginners
- School of the Environment:
  - ESCI-1100 Environmental Systems - An Introduction to Environmental Science
  - ESCI-1111 Introduction to Earth Science
- Economics:
  - ECON-1100 Introduction to Economics I
  - ECON-1110 Introduction to Economics II
- Mathematics and Statistics:
  - MATH-1760 Functions and Differential Calculus (or MATH-1720 Differential Calculus)
  - MATH-2910 Statistics for the Sciences
  - or
  - MATH-1760 Functions and Differential Calculus (or MATH-1720 Differential Calculus)
  - MATH-1730 Integral Calculus
- Physics:
  - PHYS-1400 Introductory Physics I
  - PHYS-1410 Introductory Physics II
  - or
  - PHYS-1300 Introductory Physics for Life Sciences I
  - PHYS-1310 Introductory Physics for Life Sciences II

(c) four Science courses at the 3000 level or above which are from the courses listed to calculate the major average for a degree program of the Department or School in the Faculty of Science that offers the courses.

- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_
- \_\_\_\_\_ - \_\_\_\_\_ \_\_\_\_\_

(d) four courses from Arts/Languages and Social Sciences, with at least one from each

<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____

(e) eight courses from any area of study excluding BIOL-1003, BIOL-1013, CHEM-1000, BIOC-1303, CHEM-2003, MATH-1280, MATH-1780, MATH-1980, ESCI-1000 and ESCI-1010.

<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____
<input type="checkbox"/>	_____ - _____	_____

Courses used to calculate the major average: All Science courses, excluding the grades obtained in the following courses: ECON-2000, ECON-2010, BIOL-1003, BIOL-1013, BIOL-2093, CHEM-1000, BIOC-1303, CHEM-2003, CHEM-2305, BIOC-2015, COMP-2077, COMP-2097, COMP-2707, COMP-3057, COMP-3077, ESCI-1000, ESCI-1010, ESCI-2300, ESCI-2010, ESCI-2630, MATH-1280, MATH-1780, MATH-1980, PHYS-1000, PHYS-1010, PHYS-2050, PHYS-2060 and ESCI-2000.

Note: COMP-1047 or COMP-2067 and COMP-2057 count as a 'science pair' (see requirement (b) above) and will be included in the calculation of the major average.

## BA Honours History

**Total Courses:** Forty

### **TAKE ALL OF FIVE:**

- HIST-1030. Past to Present: Understanding History
- HIST-2030. Making History: Methods and Practices
- HIST-3030. Schools of Historical Thought
- GART-1500. Effective Writing I
- GART-1510. Effective Writing II

### **TAKE FIFTEEN COURSES FROM HISTORY:\***

- HIST-1\_\_ or HIST-2\_\_
- HIST-1\_\_ or HIST-2\_\_
- HIST-1\_\_ or HIST-2\_\_
- HIST-2\_\_
- HIST-2\_\_
- HIST-2\_\_
- HIST-2\_\_
- HIST-2\_\_
- HIST-3\_\_ or HIST-4\_\_
- HIST-3\_\_ or HIST-4\_\_
- HIST-3\_\_ or HIST-4\_\_
- HIST-3\_\_ or HIST-4\_\_
- HIST-4\_\_
- HIST-4\_\_
- HIST-4\_\_

\*The fifteen History courses must include at least one of:

- HIST-1130. Europe Encounters the World: Facing Islam, 8<sup>th</sup>-15<sup>th</sup> Century
- HIST-1140. Europe Encounters the World: The Age of Discovery, 15<sup>th</sup>-18<sup>th</sup> Century
- HIST-2010. Early Modern Europe
- HIST-2070. Early Modern England, 1485-1714
- HIST-2460. Aboriginal Peoples in Canadian History: Beginnings to Mid-Nineteenth Century
- HIST-2490. Women in Canada and the United States, 1600-1870

\*The fifteen History courses must include at least one of:

- HIST-2100. Islamic History: Formative Period 600-1000
- HIST-2110. Islamic History: Consolidation, Expansion and Empire 1000 - 1800
- HIST-2120. Modern Islamic History 1800-Present: The Rise of Secular Nationalism and Political Islam
- HIST-2200. History of Africa, 700-1800
- HIST-3100. Gender in Islamic History
- HIST-3200. Africa and the Atlantic System
- HIST-3210. Colonialism in Africa, 1830s-1960s

\*The fifteen History courses may include up to four of the following courses. (Please note, instructor's permission may be required):

- GRHS-2100. Greek History I: To the End of the Classical Period
- GRHS-2101. Greek History II: To the End of the Hellenistic Period
- GRHS-2200. Roman History I: To the End of the Republic
- GRHS-2201. Roman History II: To the End of the Empire
- DRAM-1300. Theatre History I
- DRAM-2300. Theatre History II

CMAF-2400. Cinema History I (Pre-War)

CMAF-2410. Cinema History II (Post-War)

KINE-2400. Historical Perspectives on Physical Activity and Sport in Western Civilization

**TAKE TWO ARTS COURSES:**

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

**TAKE TWO LANGUAGE COURSES OR FACULTY OF SCIENCE COURSES, OR ONE OF EACH**

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

**TAKE TWO COURSES FROM ANY AREA OF STUDY, EXCLUDING SOCIAL SCIENCES**

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

**TAKE SIX COURSES FROM ANY AREA OF STUDY, INCLUDING HISTORY**

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

**TAKE EIGHT COURSES FROM ANY AREA OF STUDY, EXCLUDING HISTORY**

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

\_\_\_\_ - \_\_\_\_

Courses used to calculate the major average: any courses taken in the major area(s) of study.

**Suggested Summary Course Sequence:**

**1<sup>st</sup> Year:** ten courses including HIST-1030, GART-1500, GART-1510

**2<sup>nd</sup> Year:** ten courses including HIST-2030

**3<sup>rd</sup> Year:** ten courses including HIST-3030

**4<sup>th</sup> Year:** ten courses