Faculty of Arts & Science
Major Modification to Program Form

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<th>Program Title (POSt Code)</th>
<th>Actuarial Science Specialist</th>
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<td>Proposed major modification</td>
<td>Adding a mandatory professional experience (PE) component</td>
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<tr>
<td>Department/Unit</td>
<td>Department of Statistical Sciences</td>
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<tr>
<td>Dean's Office contact</td>
<td>Nicholas Rule, Acting Vice-Dean, Undergraduate</td>
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<tr>
<td>Proponent</td>
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</tr>
<tr>
<td>Version date</td>
<td>January 20, 2020</td>
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<tr>
<td>Effective date</td>
<td>March 1, 2020</td>
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**Brief Description of the Proposed Changes**

*Using bullet points, briefly summarize the main aspects of the changes (e.g. addition of required courses, restructuring higher-year course option, introduction of Streams, etc.). Specify changes to program description, requirements, and program learning outcomes.*

We propose to add a mandatory work-integrated learning requirement to the Actuarial Science Specialist. This is comprised of a professional experience (PE) course (ACT390H1, a mandatory, non-academic half-credit with zero credit weight), designed to prepare students for the work-integrated learning opportunity, and a work-integrated learning component, experienced as a full-time work placement (a mandatory, non-academic half-credit with zero credit weight).

The PE course will be offered annually in the Fall term. All specialist students will take the PE course and complete the work term in their third year of study. However, fourth-year students who may have declared Specialist at the end of their third year will also have access. Students will then complete the work term in the winter or summer semester of the same academic year. Students who cannot secure a work term in their third year will have an opportunity to complete it in their fourth year.

ACT390H1 will include the following components:

- Invited speaker series: we will have speakers from every major field of actuarial science who will introduce students to the professional lives in their respective fields
- Professional skill workshops on StrengthsQuest, career planning, project management, professional writing, networking skills, resume and cover letter writing, interview skills, ethics, professionalism, workplace health and safety, workplace etiquette and hierarchies, etc. We will utilize existing UofT resources as much as possible, including supports from the FAS Experiential Learning and Outreach Support Office.
- Industry and alumni networking events
- Meetings between students and faculty advisor
- Multiple assignments and a final report/presentation.

The work-integrated learning component will be fulfilled with a work term related to actuarial science (comprising at least 420 hours and 12 weeks). Should a student fail to secure a work term, students should discuss alternative options with the internship coordinator and associate chair of undergraduate studies. Two alternative plans have been discussed and approved internally by the actuarial science program: (1) Students can take one additional fourth-year practice-oriented course chosen from this list: ACT470H1 (pension practicum), ACT471H1 (property & casualty insurance practicum), ACT473H1 (professional case studies and
communications), ACT475H1 (life insurance and annuity practicum). All those courses are taught by seasoned professionals and have a significant experiential learning component by engaging students in real-world projects; (2) students may complete a research project with a faculty advisor, after receiving approval from the advisor.

Wherever possible, the expectation is that the student will be paid based on industry standards for the duration of the work term.

It is expected that students will take the lead and be ultimately responsible for finding a relevant work term, with support from the Department and preparation provided in ACT390H1. Effective support strategies may include professional skills training, recruiter/networking event, a brochure with students’ resume to be sent to industry contacts, mock interviews, one-on-one meetings, etc.

**Program information (Calendar copy)**

**Description**

This program is designed to prepare a student for professional work as an actuary, and more generally in the financial risk management industry.

**Enrolment Requirements**

This is a limited enrolment program. All students who request the program and obtain at least the specified mark(s) in the required course(s) will be eligible to enroll. Courses required in either the major or specialist programs in actuarial science may not be taken as CR/NCR.

In order to enroll into the Actuarial Science Specialist program, the following courses must be completed:

- MAT137Y1 with a final mark of at least 63% or MAT157Y1 with a final mark of at least 60%, and
- ACT240H1 and ACT245H1 and ACT247H1 with a final mark of at least 70% in each course.

Students will usually enroll into the Actuarial Science Major program after completion of MAT137Y1/MAT157Y1, and then they will enroll into the Specialist program after the completion of ACT240H1, ACT245H1 and ACT247H1. Once these requirements are met, the student will be eligible to enroll in the Actuarial Science Specialist Program.

Note that the Mathematics Department enforces MAT223H1/MAT240H1 as a prerequisite for MAT237Y1.

**Completion Requirements**

(13 FCE)

First Year:

- MAT137Y1 (63%)/MAT157Y1 (60%)
- MAT223H1/MAT240H1 (should be taken in first year, enforced as a prereq for MAT237Y1)
- ECO101H1, ECO102H1

To be completed before the end of Second Year:

- STA130H1 (students are strongly recommended to complete this course in their first year, due to priority enrollment policies)
- CSC108H1/CSC120H1/CSC148H1
Second Year:
- ACT240H1 (70%), ACT245H1 (70%), ACT247H1 (70%)
- MAT237Y1/ MAT257Y1
- STA257H1, STA261H1
- MGT201H1

Higher Years:
- A set of mandatory courses (3.5 FCEs): ACT348H1, ACT370H1, ACT451H1, ACT452H1, STA302H1, STA314H1, ACT350H1
- 2 FCE to be selected from lists 1 and 2 (students can only use at a maximum 1.0 FCE from list (2), the practice oriented courses, to fulfill program requirements):
  - (1) ACT349H1, ACT371H1, ACT455H1, ACT460H1, ACT466H1, STA457H1, STA414H1, and
  - (2) ACT372H1, ACT470H1, ACT471H1, ACT473H1, ACT475H1.
- Professional Experience Course ACT390H1: students are strongly recommended to complete this course in the Fall semester of the third year.

NOTES:
- In order to enroll in ANY 300- or 400-level ACT course, the minimum grade of C must be obtained in each of ACT240H1, ACT245H1 and ACT247H1. The enrolment requirements and the prerequisites for all ACT courses will be strictly enforced.
- Students who have an interest in pursuing studies in mathematical finance should consider taking MAT244H1, MAT336H1/ MAT337H1 and APM346H1. Students in the Actuarial Science Specialist Program who have successfully completed ACT348H1 and ACT349H1 may request to enroll in the following RSM courses (provided the appropriate prerequisites and corequisites are met): RSM430H1, RSM433H1, RSM437H1. MAT246H1 is recommended (not required) for students in the Actuarial Science Specialist Program.
- Wherever possible, the expectation is that the student will be paid based on industry standards for the duration of the work term.

Proposal Questions – General

Answers to all questions in this section are required. Even a brief answer will assist in reviewing changes when they are heard in governance. These answers will be entered on CM under the same field titles.

Rationale

The PE component is the last piece in our three-year effort to revamp the actuarial undergraduate curriculum. We have completed the academic curriculum redesign during 2017-18 academic year (a major modification). With a PE component, our students will be well-rounded and better prepared for the insurance practices and research. A large proportion of our students are also international, which compounds the challenge of professional experiential learning. Increasingly, the industry and employers require more flexible timing for work terms (i.e. often during the academic year). There are visa restrictions that prevent international students from taking on meaningful internship and professional opportunities during their academic year. A PE program that is mandatory and embedded in the program of study will help them acquire those professional opportunities.
The PE program is consistent with the experiential learning initiatives strongly promoted by the Faculty of Arts and Science. It is also in line with FAS and university-wide initiative to support and provide better learning experiences for students, especially considering the high percentage of international students in our program.

**Academic Context**

There is a very strong, even urgent need for professional experience (PE) in the actuarial Specialist program. The Specialist program has always been an academically rigorous program. In the past few years we have also worked closely with seasoned actuarial professionals to develop and implement case study and project-based practice-oriented courses, including a series of three courses in property and casualty insurance, a course on pension, a course on actuarial case studies and professional communication skills, and a course incorporating the most widely used industry software. Our upper-year students are well-prepared academically and practically to enter the workforce. However, despite all our efforts, what the program is desperately lacking is a work experience component. Our students have been facing extremely fierce competition from graduates from other university programs (e.g. University of Waterloo actuarial science co-op program) for years. The insurance industry has long been trained to expect internship/co-op experiences from new hires recently graduated from universities. As a result, our graduates have not been as successful as we hoped they would be in their job-seeking efforts (at least in the Canadian market), despite the high-quality education they have received at UofT.

**Impact**

We do not expect any significant impact on other programs.

We expect that students will warmly welcome the new PE component. For many years actuarial science students at UofT – through office hour conversations and emails - have asked for a PE program with an internship component. We have recently met with the executives from the actuarial science club (all actuarial students are automatically club members) and they have again expressed their strong support for this upcoming PE component.

A large proportion of our students are also international, which compounds the challenge of professional experiential learning. There are visa restrictions that prevent international students from taking on meaningful internship and professional opportunities during their academic year. A PE program that is mandatory and embedded in our program of study will help them acquire those professional opportunities.

There are various course planning routes that can ensure the students to graduate within four years including the new PE component. We present the following as *sample* pathways. We will communicate (in emails as well as other forms such as information session/townhall and office hours) those course planning pathways to all actuarial science Major students to facilitate their planning should they choose to enter actuarial science Specialist program after they become eligible (the first entry point is at the end of their second year).

**Scenario 1: Work term is in the winter term of third year:**

1. Complete all required first and second year courses by the end of the second year.
2. Fall term of the third year: ACT348H1, STA314H1, ACT350H1, 0.5FCE from list 1 or 2 (potential courses: ACT349H1, ACT371H1), and the new PE course.
3. Winter term of the third year: work term
4. Summer term of the third year: ACT370H1 and STA302H1. To avoid a summer term, students can also take ACT370H1 in the winter of their fourth year and take STA302H1 in the fall of their third or fourth year.
(5) In the fourth year: ACT451H1 in the Fall (note this course can be taken in the fall of the third year, if they so choose) and ACT452H1 in the Winter. Students will then take 1.5 FCE from list 1 or 2 in either fall or winter of the fourth year to complete the program.

**Scenario 2: Work term is in the summer term of third year:**
In this scenario, there is no interruption of course work compared to the existing calendar. No special planning is required.

**Scenario 3: Work term is in the Fall term of fourth year:**
1. Complete all required first and second year courses by the end of the second year.
2. Fall term of the third year: ACT348H1, ACT451H1, STA314H1, ACT350H1, and the new PE course.
3. Winter term of the third year: ACT370H1, ACT452H1, STA302H1, 0.5FCE from list 1 or 2 (potential courses: ACT466H1, STA414H1, ACT470H1, ACT473H1, ACT475H1)
4. Summer term of the third year: make up for courses they need for program completion only if needed (e.g. if they did not have space to take STA302H1 in the winter, they could do that in the summer)
5. Fall of the fourth year: work term.
6. Winter of the fourth year: 1.5FCE from list 1 or 2 to complete the program requirements (potential courses: ACT455H1, ACT466H1, STA457H1, ACT470H1, ACT473H1, ACT475H1).

**Scenario 4: Work term is in the Winter term of fourth year:**
1. Complete all required first and second year courses by the end of the second year.
2. Fall of the third year: ACT348H1, ACT451H1, STA314H1, ACT350H1, and the new PE course.
3. Winter of the third year: ACT370H1, ACT452H1, STA302H1, 0.5FCE from list 1 or 2 (potential courses: ACT466H1, STA414H1, ACT470H1, ACT473H1, ACT475H1)
4. Summer term of the third year: make up for courses they need for program completion if needed (e.g. if they did not have space to take STA302H1 in the winter, they could do that in the summer)
5. Fall of the fourth year: 1.5FCE from list 1 or 2 to complete the program course requirements (potential courses: ACT349H1, ACT371H1, ACT460H1, STA457H1, STA414H1).
6. Winter of the fourth year: work term.

**Scenario 5: Enter the PE course in the fourth year:**
Students entering the PE course in their fourth year may risk delaying graduation. It is still possible to graduate in four years in this scenario, if they completed the set of higher year mandatory courses (3.5FCE) in year 3 (as shown in scenario 3 and 4 above). They can then complete the 2FCE from list 1 and 2 (potential courses: ACT349H1, ACT371H1, ACT460H1, STA457H1, STA414H1) and PE course in the Fall of year 4. They will do an internship in the Winter of year 4, or he can complete his course requirements in Fall and Winter of year 4, and do an internship in the summer of Year 4.

Note: To complete the work term in students’ third year (Winter or Summer) will best ensure their graduation in four years. For students who cannot secure an internship by the summer of their third year, we will have individual conversations with them to find accommodations such as an extra fourth-year practice-oriented course or an individual research project with a faculty member.

**Consultation**

Internal consultation with faculty members, students, and the Department Chair began in the 2017-2018 academic year and there was internal consensus with establishing the PE requirements. External consultation began in February 2018 with the Office of the Dean in Arts & Science (Acting Vice-Dean Mary Pugh and Associate Dean Alana Boland), to review the need and urgency and proposed PE program, and develop the concept of the proposal. The proposal was developed in consultation with the Office of the Dean (Vice-Dean...
Pamela Klassen) Office of the Faculty Registrar and Office of Experiential Learning and Outreach Support, with respect to implementation of the internship component (including effective date, impacts on international students, and fee structures).

Current Actuarial Science Students have been consulted extensively about the proposed changes. For many years, actuarial science students at UofT – through office hour conversations and emails - have asked for a professional experience program with an internship component to prepare themselves for eventual work in the field and gain experience in a placement setting. For two years previous, the department has also met with students in the first-year learning community (FLC) to hear about their goals and interests regarding the Actuarial Science program, and a professional experience component is consistently their high priority. The department also met with the executives from the actuarial science club (all actuarial students are automatically club members) and they have again expressed their strong support for program changes.

Resource Implications

Department of Statistical Sciences has hired a full-time internship and mentorship coordinator (Megan Whitehead). Megan will be working closely with the associate chair of undergraduate studies in actuarial science to establish the PE program in the actuarial Specialist program. Prof. Vicki Zhang will be teaching the professional experience course in the pilot year, with assistance from Megan. In the past year, we have reached out to a long list of employers and industry practitioners (through our industry advisory board, professionals serving as instructors, alumni networking) and have built a database for work term placement that Megan will continue to expand and maintain.

An ancillary fee will be assessed for the skills development course that students will take in preparation for the work-integrated learning opportunity. This will cover costs associated with the course.

We do not expect other significant resource implications, as the actuarial science specialist program is small in size (about 25 students currently and in the past few years).

Learning Outcomes

The addition of the professional experience component improves existing outcomes, by offering a work-integrated learning opportunity.

UofT’s Actuarial Science Specialist program is recognized as one of the most rigorous academic program in Canada. The most recent modifications to the Specialist were designed to achieve balance between long-term and short-term coverages (property and casualty), and require students to establish a better statistical foundation and understand how to work with data. The existing program ensures that students acquire knowledge in data science and modern statistical methods to be able to analyze and solve problems valuable in their future careers as actuaries and insurance professionals, specifically in either long-term (life, annuity, pension) or short-term (property & casualty, health) actuarial data.

The addition of a work-integrated learning component is an extension of the previous program modification, which articulated “practice courses” as a separate elective list category in the higher years, and are designed to help students connect theories with applications in the real world. The proposed change builds on this requirement by requiring work-integrated learning in addition to the “practice” course electives. By combining this with a work experience, students will be able to put into context their theoretical knowledge, tackle real-world actuarial, financial and business problems, and understand insurance functions beyond the actuarial division. They will also be exposed daily to the Canadian work environment, culture and etiquette which will better position them for future careers in the field.
Faculty and TA Support
The proposed modifications will be supported with existing faculty and TA resources (see resource implications).

Diversity
How does the proposed program or modification support diversity? E.g through curriculum design supporting different learners, accommodation, etc.

International students (of which, many are from racialized communities) will have better access to work terms and experiential learning opportunities in general through this program.

Depth of Knowledge
The achievement of several of a set of learning outcomes that contribute to mastery of an area through intensive study. Explain how particular courses allow students to achieve depth of knowledge, relating to the proposed change.

Students will be able to apply the theoretical knowledge and skills they have gained during academic learning to real-world working projects, with supervision from seasoned industry professionals, which is likely to significantly deepen their understanding of the theory and practices. Students will also have exposure to the larger actuarial function chain, and likely also the insurance functions beyond actuarial division, while working as an actuarial intern, which will improve their breadth of knowledge.

Competencies
For these five categories, describe how each competency is developed within the modified program to the degree relevant to the area/discipline. If the program does not address a particular competency, explain why that competency is not relevant to your area/discipline and how students in your program are expected to attain that competency within their overall degree program.

Critical and Creative Thinking
The purposeful and reflective examination of knowledge and ideas beyond memory and recall, whereby students can make informed judgments, synthesize what they have learned, and apply their ideas in novel ways.

Practice courses included in the proposed elective list for higher years encourage critical thinking through case-study, project-based pedagogy. Real-world projects require students to engage in creative thinking as solutions are rarely black and white as in an academic setting.

Communication
The ability to express ideas, arguments, and facts to convey an intended message in a manner that is cogent and effective.

Communication competency: students will report and present their projects both in their professional work setting (in front of their employers) and as part of the PE program, which will serve as a good learning exercise to improve communication skills. They will also practice reading, writing, and oral communications in a professional setting on a daily basis during the internship. Current “practice courses” in the elective list for the higher years are taught by seasoned professionals from the industry, which help students connect theories with applications in the real world. They provide hands-on knowledge in modeling as well as business and communication skills.
Information Literacy
The ability to effectively find, evaluate, create, use and present knowledge, data and critical analyses for scholarly and other purposes.

Students will do frequent presentations and reporting of their critical analysis of data in a work setting, and contribute to real-world knowledge distribution.

Quantitative Reasoning
The ability to reason with basic mathematical, numerical and statistical concepts in order to enhance understanding of an area of study and to help navigate a data-driven world.

The actuarial science specialist is a highly quantitative program including in-depth courses in mathematical statistics, probability theory, life contingency models, financial mathematics, loss model and credibility theory, stochastic processing, data science and machine learning, etc. Much of the work involved in an actuarial intern’s daily practice will be quantitative in nature and further helps students connect theory and practices.

Social and Ethical Responsibility
The ability to engage in critical reflection upon questions of responsibility to oneself and society and to develop values of academic and personal integrity.

Students will understand actuarial professional ethics in a real-world setting. Ethics will also be a major component in the PE course, through topics such as microinsurance, solvency standards, ethical algorithms, etc.

Integrative, Inquiry-based Activity
Activity that involves substantial investigation, synthesis of knowledge, and communication of results of the inquiry.

The work-integrated learning component of the PE program offers students superb opportunities to engage in integrative and inquiry-based learning. Practice courses included in the proposed elective list for higher years encourage case-study, project-based learning, which integrate knowledge from foundational courses.

Governance Path

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<td>Dean’s Office approval</td>
<td>December 11, 2019</td>
</tr>
<tr>
<td>Undergraduate Curriculum Committee</td>
<td>January 29, 2020</td>
</tr>
<tr>
<td>Arts &amp; Science Council</td>
<td>February 12, 2020</td>
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<td>AP &amp; P (for information)</td>
<td>May, 2020</td>
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Implementation of Change in 2020-21

Program modifications approved in the 2019-20 cycle will be published in the 2020-21 Calendar. To allow students time to plan their course and program choices for 2020-21, by default, program modifications will be in effect for students starting with the 2021 enrolment period. The Governance Unit and the Office of the Faculty Registrar can work with you to prepare for implementation and communicate the change to students.

Use this space to identify any planning concerns/considerations you may have that are associated with this change (for example, adding newly created courses to requirements, preparing for changes to enrolment requirements, messaging to students about the changes, etc).
To allow students to take advantage of this opportunity as soon as possible, this modification is proposed to take effect for March 1, 2020, which will allow the program to respond to strong student interest for the work-integrated learning opportunity. Based on our consultation with students, it is anticipated that there will be wide interest in pursuing placements. In particular, this timeline will facilitate international students’ ability to obtain the necessary work permits for a placement, a process that will need to be initiated several months in advance.