# LA&PS Honours Bachelor of Science- Financial Technologies

New Program Proposal

YORK U

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# YORK UNIVERSITY

## New Undergraduate and Graduate Degree Program Proposal Template

The development of new undergraduate and graduate degree programs follows the protocol for new degree approvals as outlined in the York University Quality Assurance Process and complies with the Quality Council's Quality Assurance Framework.

The Program Brief for new degree programs that require full approval includes two components for undergraduate programs and three components for graduate programs, as follows:

- program proposal, including letters of consultation/support and other relevant appendices
- curricula vitae of the faculty, including, for graduate programs, program-specific appointment criteria

To ensure that all evaluation criteria are addressed in the proposal under development, program proponents are required to submit the New Program Brief in the following format.

Note: additional criteria for Joint Degree Programs or Dual Credentials, comprised of wholly new programs are listed at the end of this document.

# York University

# New Program Proposal

## of the

## Honours Bachelor of Science in Financial Technologies

# 1. Introduction

## 1.1. Brief Statement

*Provide a brief statement of the degree program(s) being proposed, including commentary on the appropriateness and consistency of the degree designation(s) and program name with current usage in the discipline or area of study.*

This is a proposal to establish a 120-credit Bachelor of Science (BSc) in Financial Technologies for York University, Markham. The term "Financial Technologies" or "FinTech," is broadly used today to describe a wide variety of technological innovations emerging in the finance sector over the past decades. Drawing on this growing field, this program will combine computing and information technology training with economics and finance education to prepare graduates for a career in technology-intensive roles within financial institutions as well as service providers and technology developers within the financial sector.

Given that the program is highly technical in nature, with an aim at developing strong programming and mathematical skills, the designation of Bachelor of Science (BSc) is deemed appropriate. The program consists of four major groups of courses: mathematics, computing, finance and integrative/specialized courses on financial technologies. The program is distinct from a computer science (CS) program in that it focuses exclusively on computing and mathematics courses that specifically target Financial Technologies applications, it includes a substantial number of finance and economics courses, and offers integrative and specialized FinTech courses that require finance background.

The program is being proposed by and housed within the School of Information Technology until the need or opportunity emerges to propose a new academic unit, e.g., the School of Financial Technologies, to govern and administer the program. A potential proposal to establish a new academic unit will come forward under separate cover and will follow York University policy and procedure pertaining to the creation of new academic units. Likewise, the program intends to use the course rubric FINT for the core and major courses it originates to serve the Financial Technologies program. The proposal to establish the new rubric will also come forward under separate cover and according to policy and procedure pertaining to the creation of novel course rubrics.

## 1.2. Proposal Development

*Provide a brief description of the method used of the development and preparation of the New Program Brief, including faculty and student input and involvement.*

From the fall of 2020 through to the summer 2021, extensive consultation from experts from five (5) different departments within York was sought for the development of this program including experts from the School of Administrative Studies, Economics, Mathematics, Information Technology, Computer

Science and Schulich. An iterative approach was followed whereby the initial curriculum was refined and abstracted to meet recommendations and pragmatic constraints.

Related literature as well information posted by professional associations and organizations related to finance and financial technologies were consulted to understand market trends and future outlook of the industry and inform the learning outcomes of the proposed program.

Consultations with industry are planned during the course and internship development stages of the program.

## 1.3.    Home Faculty

*Indicate the Faculty/unit in which the program will be housed.*

The program will be housed in the Faculty of Liberal Arts and Professional Studies, at first within the School of Information Technology and, when the need emerges, within a new unit. This new unit can grow in a way that it can offer a variety of different future majors and minors whose central focus is the application of information and computational technologies to the study of financial and economic phenomena, such as, computational economics or financial engineering.

## 1.4.    Location

*Indicate the location/campus of the new program.*

The program will be located at the Markham Campus.

# 2. General Objectives of the Program

## 2.1. Brief Description

*Provide a brief description of the general objectives of the program.*

The program aims to prepare students for a technology-related career in the financial sector. Graduates will have a strong grasp of information and computational technologies that are relevant to the financial domain as well as a strong familiarity with financial concepts. Combined, these knowledges and skills will allow graduates to understand the context and objectives of the technologies they will be able to build for and with the financial sector.

The curriculum combines courses that can be found in a computing or information technology program, with an emphasis on AI, data analytics, cybersecurity, high-assurance enterprise systems development and distributed systems, with courses found in Finance BA/BSc. The program will have a strong professional orientation and will feature an internship component. The program will also be part-time student friendly, targeting both local first-degree students and professionals in the Markham area interested in entering the Financial Technology field.

Learning in the program will be strongly technology-enhanced and promoting blended learning, experiential hands-on and flipped classroom as the principal instructional strategies.

## 2.2. Objectives vis-à-vis University and Faculty missions and academic plans.

*Describe how the general objectives of the program align with University and Faculty missions and academic plans.*

The program supports UAP 20-25 as follows:

- The program is highly innovative (Priority 1 / Objective 2) as few comparative programs exist in Ontario [see also section 3.1].
- It demonstrates true and meaningfully interdisciplinary education given that it draws from Mathematics, Finance, Business and Information Technology (Priority 1 / Objective 2 and 4)
- It is EE-enabled through its internship component (Priority 3 / Objective 1, Priority 6 / Objective 1) and other EE learning strategies that are enhanced through technology (Priority 3 / Objective 2).
- Topics taught in the program very strongly relate to the UN's Sustainable Development Goals, including climate and environmental sustainability (#13), poverty (#1), economic growth (#8), and reduced inequalities (#10). Graduates will have the technical proficiency to appreciate how and when proposed financial technology applications enhance or impede fulfillment of such goals. This way, the program paves the way for future programs and streams strongly focusing on the impact of financial technologies in economies and societies.

Despite its technical orientation, the program is a natural part of the Faculty of Liberal Arts and Professional Studies, considering the societal, political, and economic phenomena that both motivate and are impacted by Financial Technologies. The program supports the principles of the Faculty of Liberal Arts & Professional Studies Academic Plan, 2021-26 as follows:

- The program engages in a sustained effort to enhance the academic experience of LA&PS students to build up students' skills in critical thinking, effective communication, digital fluencies, information literacies, and evidence-based scholarly inquiry [Principle 1a].
- By being offered at the Markham Campus, the program promotes collaborations with York Region (including Markham) to make a positive local impact on the communities LA&PS serves [Principle 2c].
- The program's hiring plan includes the recruitment of several full-time faculty members to join the existing in the demonstration of strong research agendas in areas that are relevant to the Financial Technologies learning outcomes. By advancing their research agendas in LA&PS, they will "promote research, knowledge mobilization, and dissemination that responds to emerging issues and changing needs in society, including opportunities to collaborate with community, industry, government, and other public and private partners" [Principle 3c].
- By creating an internship and other experiential learning opportunities for students in the program, Financial Technologies promotes and supports curricular and pedagogical innovation

across all units with particular attention to experiential learning opportunities for students in all programs [Principle 4b].

- A broad educational offering on Financial Technologies includes a study of how such technologies impact societies, economies and the environment. A fundamental understanding of such impacts is part of the program's outcomes (LO6) and the offered content. Future "sister" programs or streams with a stronger social sciences orientation can draw the necessary technical foundation (e.g., introductory, practical, or survey courses) from the capabilities and resources developed within this program. The program's embedding into LA&PS is, therefore, highly advantageous in that it allows for easier maintenance of connections with economics, social sciences, politics, public policy and management, which all constitute focal points of such future program expansions. See also Section 4.1.

The program supports the objectives of SMA3 as follows:

- The program targets sizable and rich sector of the Toronto economy (see above). Cutting edge technology training offered through the program (AI, cybersecurity, blockchain) allows for alternative careers in tech outside financial domain [Metrics: *Graduate Employment Rates (#1) and Earnings (#9)*]
- The program features a strong experiential education (EE) component through case studies, the capstone project and the internship [Metric: *Experiential Learning (#7)*].

The program also aligns with the core Markham theme of *"technology […] as applied in different contexts and professional fields"* by meeting the need for innovative, job-ready, and technology intensive content and skills that will meet the demands of the 21st century.

## 2.3. Degree Nomenclature

*Describe the appropriateness of the degree nomenclature. Note: Degree types are approved by Senate and require two meetings for approval: an initial notice of motion and then the motion to establish the new degree type.*

The proposed program has sufficiently strong focus on technical and mathematical education to fit under the Bachelor of Science category. Furthermore, the curricular structure meets the Bachelor of Science requirements as set by York University including general education (30 credits including the 27 credits as stipulated by the BSc Matrix legislation), science credits outside major (24 credits) and upper-level requirements.

No new degree type is proposed.

# 3. Need and Demand

## 3.1. Similar Programs

*Identify similar programs offered at York and/or by other Ontario universities, with special attention paid to any innovative and distinguishing aspects of the proposed program.*

Financial technology is a rapidly expanding industry. Because of this, it is also a rapidly growing field for education. In Ontario, there are relevant *credentials* available to post-secondary students at a number of institutions as well as *aspects* of programs related to FinTech; but there are no specific programs devoted to Financial Technologies. The credentials and programs available across Ontario include:

- Certificate: Fintech Boot Camp (part-time, 24 weeks, online only), University of Toronto Continuing Studies, Toronto
- Certificate: Financial Technology Essentials (part-time, online), Lambton College, Toronto
- Ontario College Graduate Certificate (2 semesters, part-time or full-time, blended), Seneca College, Toronto
- Ontario College Graduate Certificate: (2 semesters), Loyalist College, Belleville
- Bachelor of Computing and Financial Management: (co-op), University of Waterloo, Kitchener-Waterloo
- Master of Financial Innovation and Technology: Queen's University, Kingston
- Master of Finance (MFin) (which includes a FinTech component): Rotman School of Management, University of Toronto

A number of Ontario Colleges (such as Centennial) also offer introductory courses in financial technologies but do not offer a credential. While some American universities, such as Cornell University, offer undergraduate degrees in financial technologies, these are only available to complete fully online.

An environmental scan shows that there are still relatively few options for prospective students to earn a university undergraduate degree in this field in Canada, especially on a new and innovative campus such as the Markham campus; therefore, there is little existing competition for York and the field is open for a new and innovative degree program.

Currently, the only university competitor at the undergraduate level is Waterloo. Compared, the proposed program has a relatively stronger technical and mathematical orientation and a focus on financial technologies with several purpose-built courses and EE opportunities. Nevertheless, the Waterloo program is indicative of the level of demand for education in the FinTech domain. That program screens its applicants on the basis of participation in math competitions such as the Canadian Senior Mathematics Contest. To be considered for financial aid from one of the departments which hosts the degree, students are required to participate in one of these contests. These additional criteria suggest that there is unmet demand for this program. For example, students who may be strong in math but did not compete in any of these contests because of, e.g., demanding work schedules, would still be welcome in the proposed program.

Finally, there are also a number of non-degree credentials in southern Ontario, such as the Ontario College Graduate Certificates at Seneca and Loyalist, which create a pathway from college for students who want to earn a degree. On the other hand, graduate programs in financial technologies are also emerging—for example, the Master of Financial Innovation and Technology to be offered at Queen's

starting in fall 2021—which means that students who graduate from York University with a degree in financial technologies will also be well situated to pursue advanced degrees in this field if they choose.

In summary, the proposed program will be one of the first comprehensive FinTech programs in Ontario, offering a BSc option, a cohesive purpose-made set of courses and strong EE opportunities. With these advantages in mind combined with its strategic location, the program can be expected to attract substantial interest from qualified students from within and outside the GTA.

## 3.2 Description and Need

*Provide brief description of the need and demand for the proposed program, focusing as appropriate on student interest, social need, potential employment opportunities for graduates, and/or needs expressed by professional associations, government agencies or policy bodies.*

Major professional associations in the financial domain indicate in various ways the importance of financial technologies in the sector. The CFA (Chartered Financial Analysts) Institute for example[1] recognizes the current and future impact of financial technologies in the asset management industry and has consequently included topics such as AI, machine learning, algorithmic trading, data science, blockchain, and robo-advising in its CFA Program curriculum.

The Canadian Bankers Association (CBA) also characterize FinTech as a tremendous opportunity for Canada's financial industry,[2] listing a wealth of IT projects Canadian banks engage in, including AI, payments, planning tools, security strategies, mobile and digital ID, that could use professionals with the knowledge of economics and the skill in technological design. CBA lists Canadian banks as incubators for innovation in the area.

Meanwhile, Payments Canada[3] promotes a program for payments and settlement modernization through such initiatives as the Real-Time Rail (for real-time payments with finality and irrevocability), and Lynx (a high-value payments system). Moreover, a sizeable ecosystem of start-ups, often sponsored by or partnering with established institutions is also emerging.

The above indicate that the on-going and future technology development projects undertaken by financial institutions and start-ups alike will require a substantial workforce and innovative leaders who are not only technologically qualified but also has a broad understanding of the financial domain. This is interpreted to an ability to not only translate across the two domains (technological and financial), but also independently innovate in the intersection of the domains.

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[1] Chartered Financial Analysts (CFA) Institute. https://www.cfainstitute.org/en/research/fintech
[2] Canadian Bankers Association. https://cba.ca/technology-innovation-banking
[3] Payments Canada. https://www.payments.ca/

This will be especially important for students in and around the GTA, such as our Markham students, as the GTA is one of the central stages where innovation in FinTech can be expected to take place globally. For example:

- According to the Toronto Finance International (TFI), Toronto is the largest financial center in North America and the third largest globally after Luxemburg and Singapore, in terms of financial services employment.[4] Based on bankers' annual rankings of international finance, both TFI and Investment Canada consider Toronto to be North America's second-largest financial hub behind New York.[5] Further, the financial services sector is the largest private sector contributor to Toronto's GDP, the second largest in Ontario, and the third largest in Canada.[6]
- According to Statistics Canada, more than 11% of salaried workforce in Ontario is employed within the Finance and Insurance domain,[7] three quarters of which is in Toronto.[8] More than 37% of Canada's Finance and Insurance jobs are in Toronto.
- Investment in financial technology innovation has been substantial over the last three years. According to KPMG, for example, a total of $2.9B was invested in the FinTech sector in Canada in 2019.[9]
- Invest Ontario reports over 600 FinTech firms, 12,000 financial services firms, and nearly 380,000 financial services professionals located across Ontario.[10]

The above evidence suggests that job opportunities in the financial sector in the GTA are substantial and a good part of these positions are technology-intensive. The evidence also points to the ample space for partnerships between York and employers for the mutual benefit of students and the industry, thus paving the way for deeper research-based academia-industry engagement and student experience. These factors are bound to attract highly qualified students who can both count on relevant industry-informed education and a smooth transition to a successful career thereafter, and ensure a rich career upon graduation.

While the ideal career for the graduates of the proposed program is the financial industry, its graduates would have sufficient computing skills to also be employed in the wider IT sector, which is also in substantial need for talent. For example, according to an ICTC[11] report, a total of 216,000 new ICT jobs across Canada were predicted in 2021 alone, 88,000 of which are projected for Ontario.

# 4. Program Curriculum

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[4] Toronto Finance International. https://tfi.ca/policy-research/the-impact-of-torontos-financial-sector
[5] Invest Ontario. Financial Services. https://www.investontario.ca/financial-services
[6] Toronto Finance International. https://tfi.ca/policy-research/the-impact-of-torontos-financial-sector
[7] Statistics Canada. Employment by industry, annual. https://doi.org/10.25318/1410020201-eng
[8] City of Toronto. Industry Sector Support: Financial Services. https://www.toronto.ca/business-economy/industry-sector-support/financial-services/
[9] KPMG. Pulse of FintechH2 2019. https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/02/pulse-of-fintech-h2-2019.pdf
[10] Invest Ontario. Spotlights: 12 Fintech companies to watch in 2021. https://www.investontario.ca/spotlights/fintech-flourishes-ontario
[11] ICTC. The next talent wave: Navigating the Digital Shift – Outlook 2021. https://www.ictc-ctic.ca/wp-content/uploads/2017/07/ICTC_Outlook-2021-ENG-Final.pdf

## 4.1 Program Requirements and unique curriculum and program innovations

*Describe the program requirements and the ways in which the curriculum addresses the current state of the discipline or area of study. Identify any unique curriculum or program innovations or creative components.*

The proposed program combines:

- A set of core technology courses for building competence in software development and data analytics / AI.
- A set of mathematics courses for developing skills necessary for comprehending advanced concepts in finance and machine learning.
- A set of accounting, finance, and economics courses for developing understanding of financial phenomena, tools and instruments.
- A set of integrative courses that integrate technology with finance to (a) show how computing and information technologies can be applied to the financial domain (b) invite students to devise novel and innovating technological solutions to problems within the financial domain, and (c) critically explore financial technologies and their impact to society, including social justice, inclusion and diversity, and environmental sustainability.

These courses will be organized progressively so that students develop their technological skills, to which economic, accounting, and financial theory will be added, and then introduced to a series of integrative experiences that combine these fields.

*Table 1. Program Overview*

| | Technology | Mathematics | Economics, Accounting & Finance | Fintech Integrative & Entrepreneurship |
|---|---|---|---|---|
| 1st yr. | - Introduction to Programming (Coding through Mechatronics) | - Applied Calculus I & II- Statistics | - Microeconomics<br>- Macroeconomics | |
| 2nd yr. | - Object-Oriented Programming<br>- Data Structures | - Elementary Probability<br>- Introduction to Statistics II | - Financial Accounting<br>- Theory of Interest<br>- Models of Financial Economics | - Introduction to Financial Technologies |
| 3rd yr. | - Networks & Distributed Systems<br>- Computer and Network Security<br>- Machine Learning for Finance<br>- Data and Knowledge Management<br>Electives:<br>- Web and Mobile Programming<br>- Introduction to Cloud Computing<br>- Network Security | | - Quantitative Finance<br>- Financial Intermediation and Banking | - Cases in Financial Technologies |
| 4th yr. | - Engineering Financial Software<br>- Software Quality Assurance<br>Electives:<br>- Advanced Topics in Machine Learning | | - Financial Decision Making<br>- Investment Management<br>- Capital Markets and Trading | - Financial Cryptography and Blockchain<br>- Payment Systems and Cryptocurrencies<br>- Capstone Project |

The program includes 30 credits of foundations, including 15 credits non-science GenEds, 6 science labs, 6 mathematics and 1 computing requirement, in compliance with York's BSc Matrix and the LA&PS general education requirements. The required core credits are 78, the additional credits are 12 credits dedicated for electives outside of major. This is illustrated below:

*Table 2. Credits Overview*

| Program: | Financial Technologies |
|---|---|
| Degree Type: | BSc |
| | |
| | 120 Honours |
| Gen Eds/Foundations | 30 |
| CORE CREDITS required | 78 |
| ELECTIVES | 12 |
| | |
| | 120 |

The knowledge, skills, and experience that needs to be acquired during the course of study in the proposed program is substantial. Therefore, we have developed a schedule of recommended courses, by term, that will aid students in their progression through the major. As a student progresses in the program, they will be able to choose certain courses, and the order of courses, that best serve their interest and skill. Note that we hope to expand and develop these choices as the program grows. Further, these Markham students will also be encouraged to take courses that will be part of the shared Markham curriculum (the outside the major courses) for greater growth and well-roundedness for future endeavors.

*Table 3. Course Overview By Offering Unit*

| | Financial Technologies | | |
|---|---|---|---|
| | **Fall** | | **Winter** |
| **Year 1** | Introduction to Microeconomics | ECON1000 | Applied Calculus II | MATH1014 |
| | Gen. Ed. 1 | | " | |
| | Applied Calculus I | MATH1013 | Introduction to Statistics I | MATH1131 |
| | Science Lab | | " | |
| | Introduction to Programming through Finan | FINT1210 | Introduction to Macroeconomics | ECON1010 |
| **Year 2** | Gen. Ed. 2 | | Gen. Ed. 2 | |
| | Elementary Probability | MATH2030 | | |
| | Intermediate Programming for Financial Tec | FINT2210 | Models of Financial Economics | MATH2281 |
| | Financial Accounting | ADMS2500 | Introduction to Financial Technologies | FINT2010 |
| | Theory of Interest (Fixed Income) | MATH2280 | Data Structures | ITEC2622 |
| **Year 3** | OUTSIDE MAJOR | ... | | |
| | *Choice:* Finance | ADMS3530 | Intro to Security Threats | CSSD2221 |
| | *Choice:* Quantitative Finance | MATH3285 | Cases in Financial Technologies | FINT3010 |
| | Networks and Distributed Systems | FINT3410 | Financial Intermediation and Banking | FINT3620 |
| | Data and Knowledge Management | FINT3310 | Machine Learning for Finance | FINT3320 |
| | ELECTIVE | ... | ELECTIVE | ... |
| **Year 4** | OUTSIDE MAJOR | ... | OUTSIDE MAJOR | ... |
| | Financial Decision Making | FINT4610 | Capstone Project in FinTech | FINT4000 |
| | Engineering Financial Software | FINT4220 | Financial Cryptography and Blockchain | FINT4730 |
| | Payment Systems and Cryptocurrencies | FINT4720 | Software Quality Assurance | FINT4230 |
| | ELECTIVE | ... | ELECTIVE | ... |

| **ELECTIVES** | | | Unit Coding | |
|---|---|---|---|---|
| | Advanced Topics in Machine Learning | FINT4350 | Mathematics | |
| | Data Visualization | ITEC3310 | Admin Studies | |
| | Network Security | CSSD3221 | Information Technology | |
| | Introduction to Cloud Computing | CSSD2211 | Economics | |
| | Web and Mobile Programming | CSSD3xxx | Computer Science and Electrical Engineering | |
| | Technology Entrepreneurship | ENTP4945 | Financial Technologies (ITEC) | |
| | Investment Management | FINT3630 | | |
| | Capital Markets and Trading | FINT4620 | | |

As seen in the above map:

- The core technology component is offered by a number of course to be developed by the School of Information Technology (ITEC) under the proposed "FINT" rubric and the Department of Computer Science and Engineering (EECS) under the rubric of the proposed Computer Science for Software Development at Markham ("CSSD") program.

- The mathematics component is offered by service courses from the Department of Mathematics.

- With regards to the finance component, to honor its overall technical orientation as a BSc and capitalize on the deep mathematical background of the first years, the program is designed to emphasize on mathematical aspects of finance, through courses such as *Models of Financial Economics* and *Quantitative Finance*. Hence the Department of Mathematics is offering the foundation with additional courses with a more practical and information-technology based orientation added on top, such as *Financial Intermediation and Banking*, *Financial Decision Making* and *Investment Management*. Nevertheless, for students who prefer a more applied and less mathematical approach to finance, the corresponding course of the School of Administrative Studies is offered (*Finance*) as an alternative to the Mathematics offering (*Quantitative Finance*).

- The program is consciously designed to leave ample space for extensions and parallel offerings on the same general area of Financial Technologies but with a different orientation. Its placement within LA&PS is highly advantageous for building and maintaining a spectrum of offerings. For example:
    - A much less technical and more applied and management- and entrepreneurship-oriented FinTech-related program, also with a practical approach to its finance courses (e.g. the ADMS offerings), can be envisioned in the form of a future BCom stream for Keele or Markham.
    - A BA minor/stream or certificate exclusively studying the societal, economic, policy, and cultural impact of Financial Technologies can be initiated by Social Science, Politics, Public Policy and Administration, Science and Technology Studies or Economics.

  Such future initiatives, taken by colleagues and LA&PS departments with the corresponding expertise, would complement the present BSc proposal, offering a wider spectrum of choices and perspectives and consolidating York's leadership in the area.

- Such future offerings could allow partial access to the students of this BSc proposal, in a fashion similar to the one adopted for accessing courses in the proposed BCom in Entrepreneurship and Innovation and the streams of Bachelor of Applied Science in Computer Science for Software Development. The embedding of this BSc in LA&PS will make such integrations easier to co-ordinate and maintain.

## Electives and Non-Major Credits - Recommendations

As seen in Table 3, in addition to a set of core required credits, students of the program select 12.0 credits from a list of *electives* (light grey in the Table) and 9.0 credits as free choices outside of the major (*non-major credits* – dark grey in the Table). While students are free to make the choices they want with those credits, we propose three specific coherent *pathways* that allow them to explore an additional area or deepen one of the areas already served by the program. Students can specifically use combinations of electives and non-major credits to incorporate more *Entrepreneurship*, *Cloud Computing*, and *Cybersecurity* education in their studies, through taking more Administrative Studies and Computer Science courses. We provide details below.

### *Entrepreneurship*

The proposed program can integrate with the Bachelor of Commerce in Entrepreneurship and Innovation, proposed for the Markham campus in parallel to this program. One of the courses proposed for that program, *ENTP4945 – Technical Entrepreneurship*, is already present as an elective in this proposal (Table 3). Before taking this elective, students must use 6.0 out of their 9.0 non-major credits to take the following prerequisites of *ENTP4945*:

*ENTP2920 – Innovation and Creativity*

*ADMS3920 – New Venture and Small Business Management*

FinTech students strongly interested in entrepreneurship can dedicate the remaining 3.0 non-major credits to any of the following courses in the program:

*ENTP3990 – Hackathon I*

*ENTP3950 – Social entrepreneurship*

*ENTP3995 – Independent study in entrepreneurship*

*ENTP4960 – Principles of entrepreneurship: field project*

*ENTP4599 – Entrepreneurial Finance*

## Cloud Computing

The proposed program can also more deeply integrate with the Bachelor of Applied Science in Computer Science proposed for the Markham campus in parallel to this program.

By taking CSSD2221 as elective, students fulfill the prerequisite to study cloud computing more deeply by dedicating their non-major credits for taking any or all of:

*CSSD3111 – Fundamentals of Cloud Systems*

*CSSD2111 – Software Development for Cloud Computing*

*CSSD4211 – Orchestration and DevOps for Cloud Computing*

## Cybersecurity

By taking *CSSD3221 – Network Security* as elective, students fulfill the prerequisite to study cybersecurity more deeply by dedicating 6.0 of their non-major credits for taking any or both:

*CSSD3121 – Information Systems Forensics*

*CSSD4221 – Vulnerability Detection*

## 4.2. List of Courses

*Provide a list of courses that will be offered in support of the program. The list of courses must indicate the unit responsible for offering the course (including cross-lists and integrations, as appropriate), the course number, the credit value, the short course description, and whether or not it is an existing or new course. For existing courses, the frequency of offering should be noted. For new courses, full course proposals are required and should be included in the proposal as an appendix. (The list of courses may be organized to reflect the manner in which the courses count towards the program requirements, as appropriate; e.g. required versus optional; required from a list of specified courses; specific to certain concentrations, streams or fields within the program, etc.)*

| Code | TItle | Rubric | Cr | Description | Status |
|------|-------|--------|----|-------------|--------|
| ADMS2500 | Financial Accounting | ADMS | 3 | An overview of the accounting discipline, useful to both majors and non-majors. Includes accounting history, the uses of accounting information in personal and business contexts and the rudiments of financial reporting. | Req |

| ADMS3530 | Finance | ADMS | 3 | The role of financial managers in accomplishing organizational objectives, uses of financial statements, present value theory, risk/return analysis, leverage, cost of capital, resource allocation models. | Opt/Elect |
|---|---|---|---|---|---|
| CSSD2211 | Introduction to Cloud Computing | EECS | 3 | CSSD2211 introduces the fundamental concepts of cloud computing. Topics include the motivation of cloud computing, the benefits and risks of cloud computing compared to the traditional on-premises paradigm, cloud service models, virtualization of computing, storage and network, virtual machines vs containers, and architectures for cloud-based services. Students work on projects where they create and manage virtual machines and container clusters using existing cloud computing services (e.g., AWS and Azure). Students are familiarized with the concept and practice of Software-Defined Environment. The course prerequisite is CSSD2101 (advanced programming), and students could elect it from term four in the program. | Opt/Elect |
| CSSD2221 | Intro to Security Threats | EECS | 3 | CSSD2221 is a placeholder for the first course in the Cybersecurity stream. Its prerequisite is CSSD2101 (advanced programming), and students could elect it from term four in the program. This course will be defined and developed by prospective faculty members who will be hired for the CSSD program and are subject matter experts in Cybersecurity. | Req |
| CSSD3221 | Network Security | EECS | 3 | CSSD3221 is a placeholder for the third course in the Cybersecurity stream. Its prerequisite is CSSD2221 (Intro to Security) and students could elect it from term six in the program. This course will be defined and developed by prospective faculty members who will be hired for the CSSD program and are subject matter experts in Cybersecurity. | Opt/Elect |
| CSSD3xxx | Web and Mobile Programming | EECS | 3 | Introduction to technologies for programming web and mobile applications. Languages and frameworks of focus include HTML/CSS, JavaScript and associated frameworks and introductory Java EE technologies. Modern mobile device features and architecture is discussed and | Opt/Elect |

| | | | | reliability, scalability, security and user interface aspects are emphasized. | |
|---|---|---|---|---|---|
| ECON1000 | Introduction to Microeconomics | ECON | 3 | Introduces the principles and methods of economics with emphasis on microeconomic theory. Topics include general and basic concepts of demand and supply, utility analysis and demand, production and costs, pricing in competitive and monopolistic markets, and government regulation. | Req |
| ECON1010 | Introduction to Macroeconomics | ECON | 3 | Introduces the principles and methods of economics with emphasis on macroeconomic theory. Topics include basic models of national income and employment determination, fiscal policy, banking and monetary policy, the theory of international trade and finance, and contemporary macro-economic issues such as unemployment, inflation, and government budget policy. | Req |
| ENTP4945 | Technology Entrepreneurship | ADMS | 3 | This course explores the role of technology in entrepreneurship from two perspectives. First, students will evaluate certain emerging technologies and consider how they might impact product development, operations, and competitive positioning. Second, it will provide hands-on exposure to starting a technology venture by way of an engaging simulation exercise that allows teams to compete while establishing strategies to overcome the uncertainty and complexity associated with new technology venture. Students will interact with 'real-life' technology entrepreneurs and with members of entrepreneurial ecosystems who support the development of technology ventures. | Opt/Elect |
| FINT1210 | Introduction to Programming through Finance | FINT | 3 | An introduction to problem solving, task decomposition, and algorithm development in the context of object-oriented and structured programming techniques. Taught in Java, topics include primitive data types, control structures, simple classes, strings and arrays. The course also introduces object-oriented design and the use of API's to develop applications from existing classes. | Req |
| FINT2010 | Introduction to Financial Technologies | FINT | 3 | Offers a broad non-technical introduction to the financial sector with an emphasis on how technologies are used to support | Req |

| | | | | financial services. Topics include banking and related services (cash management, lending, mortgages and debt collection, payments and money transfers, trading and finance services, advising), treasury and forex, financial markets (capital markets, exchange and execution, intermediaries, algorithmic trading), insurance as well as cross-cutting concerns including customer relationship management, security, risk management and regulatory compliance. Example textbook: Randal Duran. Financial Services Technology: Processes, Architecture, and Solutions, 2nd Edition. | |
|---|---|---|---|---|---|
| FINT2210 | Intermediate Programming for Financial Technologies | FINT | 3 | The course starts with an introduction to the Python programming language, followed by a deeper view of object oriented concepts in both Java and Python, with a focus on inheritance, polymorphism and events. | Req |
| FINT3010 | Cases in Financial Technologies | FINT | 3 | Surveys the current state of financial technologies internationally, including innovations and the state of the art in payments and micro-payments, distributed finance, micro-lending, robo-advising, algorithmic trading, open-data and interoperability, regulatory technologies. Students are asked to critically study real of hypothetical cases of applications of financial technologies and identify benefits, drawbacks and threats, both from a technical but also from an economic, environmental and societal / social justice viewpoint. | Req |
| FINT3310 | Data and Knowledge Management | FINT | 3 | An introduction to data and knowledge management systems. Topics covered are conceptual modelling, relational database design and querying, ontology representation and querying using W3C standards. A survey of modern data management technologies (e.g. NoSQL, columnar) in preparation for advanced courses on the topic is also offered. | Req |
| FINT3320 | Machine Learning for Finance | FINT | 3 | Introduction to machine learning as it applies to finance. Topics include linear models for regression and classification, kernel models, mixture models and cluster analysis, applied over financial data. A thorough discussion of performance analysis is also offered. | Req |

| FINT3410 | Networks and Distributed Systems | FINT | 3 | Introduction to computer networks with a special focus on the Internet architecture. Topics include the layered architecture, addressing, naming, routing, common application protocols (web, email) and security. Students develop a distributed application through low-level socket programming. | Req |
|---|---|---|---|---|---|
| FINT3620 | Financial Intermediation and Banking | FINT | 3 | Theories of financial intermediation, risks and risk management in banking (including liquidity and interest rate risk), balance sheet management, capital adequacy and securitization, performance measurement. Example Books: Bessis, J. Risk Management in Banking. Chichester: Wiley. Matthews, K. and J. Thompson The Economics of Banking. Chichester: Wiley. Saunders, A. and M.M. Cornett Financial Institutions Management: A Risk Management Approach. New York: McGraw Hill. | Req |
| FINT3630 | Investment Management | FINT | 3 | Building on FINT4610, it focuses on portfolio management and optimization: portfolio theory and mean-variance analysis, parameter estimation and optimization, equity portfolios, fixed-income management, global investing, performance measurement, client behavior and ethics. Example Text: Stewart et al. Portfolio Management: Theory and Practice | Opt/Elect |
| FINT4000 | Capstone Project in FinTech | FINT | 3 | Students take on a real or hypothetical problem in the financial domain and conceptualize, design, prototype or otherwise deeply study a technological solution to that problem. Projects include the development of a new financial technology service, such as a mobile app or a decentralized finance application, analyses of mass adoption of a proposed technology, security and reliability analyses of an existing technology, evaluations and recommendations of policies pertaining to the adoption of financial technologies, a business plan for FinTech startup. A critical analysis of their subject of study or proposal with respect to environmental, societal, and economic aspects is an integral part of the studies. Students work in groups on given or self-defined topics. | Req |

| FINT4220 | Engineering Financial Software | FINT | 3 | Introduction to the process for designing, building and maintaining large software systems and well as managing a software development capability. Topics include lifecycles and their main activities (planning, requirements, analysis and specification, design), maintenance, documentation, software metrics and estimation, software project management, staffing, directing and control, estimating, scheduling, monitoring, risk management, and use of tools (incl. configuration management). | Req |
|---|---|---|---|---|---|
| FINT4230 | Software Quality Assurance | FINT | 3 | Methods of testing, verification and validation, quality assurance processes and techniques, methods and types of testing, and ISO 9000/SEI CMM process evaluation. Special focus on security and practices for developing secure software and software for trading and distributed finance (e.g., smart contracts). | Req |
| FINT4350 | Advanced Topics in Machine Learning | FINT | 3 | A course on artificial neural networks and deep learning. Introduces the basic concepts, training algorithms, network types and architectures for different problems. Special focus on problems recurring in the financial domain. | Opt/Elect |
| FINT4610 | Financial Decision Making | FINT | 3 | The course is centered on decision-making situations in the financial service industry. Students learn how to formulate problems, objectives, and constraints, construct mathematical models, develop solutions, and interpret the results. The topics include linear programming, integer programming, and multi-criteria decision analysis. | Req |
| FINT4620 | Capital Markets and Trading | FINT | 3 | Continues the presentation of ITEC2010 by adding technical depth and practical details on the structure and function of capital markets. Topics include: types of markets, applied financial analytics and modeling, trading systems and introduction to algorithmic trading. Possible Books: Kuznetzov. The Complete Guide to Capital Markets for Quantitative Professionals and Raja Velu, Maxence Hardy, Daniel Nehren. Algorithmic Trading and Quantitative Strategies | Opt/Elect |
| FINT4720 | Payment Systems and Cryptocurrencies | FINT | 3 | This course introduces the payment systems that move money among consumers and enterprises, and the | Req |

| | | | | concept of digital money. Students will examine how payment systems work, how they evolved, and the future of payment technology, from mobile payments to tokenization. Students will also develop an understanding of how to contrast the individual purposes and architectures of different cryptocurrencies. They will explore alternative consensus protocols, with special attention given to Proof of Work (PoW). Additional topics include the 51% network attack, the welfare costs and benefits of cryptocurrencies and the surrounding legal issues. | |
|---|---|---|---|---|---|
| FINT4730 | Financial Cryptography and Blockchain | FINT | 3 | Offers an overview of common applications of cryptography in the financial domain. An introduction to various key applications and concerns (e-payments, voting, auctions, digital rights and watermarking, identity management in light of confidentiality, integrity, non-repudiation, privacy and anonymity concerns) is followed by a description of dominant blockchain technologies, with the focus on their architectures and their consensus layer. | Req |
| FINT3900 | Internship in Financial Technologies | FINT | 0 | A paid, full-time work experience with an industry partner from the FinTech space. It requires students to take a break from fulltime academic studies for the duration of the work term (either 4, 8, 12 or 16 months of employment). After accepting an internship job offer at a company, students are enrolled in this course that supports learning and reflection during the work experience and maintains students' fulltime status at the University. Industry supervisors to provide feedback and evaluation of students' workplace performance and relevant skills, which in addition to students' own critical reflection on the experience, are used to assess the credit/no credit grade for the work term course. Assessment is exclusively performed by a full-time faculty member of the program. | |
| ITEC2622 | Data Structures | ITEC | 3 | A completion to introductory problem solving and algorithm development. Taught in Java, topics include linked lists, binary trees, stacks, queues and other elementary data structures. Complexity analysis is | Req |

| | | | | introduced with an emphasis on searching and sorting algorithms. Note: This course will not count for computer science major or minor credit. | |
|---|---|---|---|---|---|
| ITEC3310 | Data Visualization | ITEC | 3 | Focuses on designing and implementing data visualization techniques to support exploratory analysis, statistical modeling, and presentation of results from large datasets. Topics include principles of visual perception, data cleaning, implementing static and interactive visualizations, and data storytelling with visualization. Students get hands-on experience by implementing visualizations using programming libraries and completing projects in groups. | Opt/Elect |
| MATH1013 | Applied Calculus I | MATH | 3 | Introduction to the theory and applications of both differential and integral calculus. Limits. Derivatives of algebraic and trigonometric functions. Riemann sums, definite integrals and the Fundamental Theorem of Calculus. Logarithms and exponentials, Extreme value problems, Related rates, Areas and Volumes. | Req |
| MATH1014 | Applied Calculus II | MATH | 3 | Calculus in Polar Coordinates. Techniques of Integration. Indeterminate Forms. Improper Integrals. Sequences, infinite series and power series. Approximations. Introduction to ordinary differential equations. | Req |
| MATH1131 | Introduction to Statistics I | MATH | 3 | Displaying and describing distributions; relations in categorical data; Simpson's paradox and the need for design; experimental design and sampling design; randomization; probability laws and models; central limit theorem; statistical inference including confidence intervals and tests of significance; matched pairs; simulation. | Req |
| MATH2030 | Elementary Probability | MATH | 3 | Introduction to the theory of probability as preparation for further study in either mathematical or applied probability and statistics. Topics include probability spaces, conditional probability, independence, random variables, distribution functions, expectation, Chebyshev's inequality, common distributions, moment-generating functions and limit theorems. | Req |

| MATH2280 | Theory of Interest (Fixed Income) | MATH | 3 | Measurement of interest, annuities, amortization of loans, bonds, sinking funds and depreciation. | Req |
|---|---|---|---|---|---|
| MATH2281 | Models of Financial Economics | MATH | 3 | A quantitative introduction to financial economics. The topics include arbitrage pricing theory, forwards and futures, American and European options, interest rate derivatives, yield curves, arbitrage hedging and pricing, put-call parity, arbitrage bounds, binomial model, Black-Scholes formula, risk-neutral valuation, trinomial model. | Req |
| MATH3285 | Quantitative Finance | MATH | 3 | A comprehensive introduction to continuous-time Mathematical Finance. This course introduces Brownian motion and Ito calculus and covers interest rate models and derivatives, the Black-Scholes model and the Black-Scholes partial differential equation, implied volatility and Merton's optimal portfolio problem. Example Textbook: Hull's Options, Futures, and other Derivatives | Opt/Elect. |

Note that full course proposals for new courses have not been included in this proposal because their development will lay with the new faculty hired for this program (see Section "7. Resources", for more detail about these hires). Greater content-area expertise, pertinent research and specialization, industry contacts, and knowledge of industry trends are all central elements of these courses and thus new faculty recruited to teach and further develop this program are the lynchpins in the definition and development of these courses. The above short descriptions narrate how we currently understand these courses fitting into this new program.

## 4.3 Anticipated Class Sizes
*Comment on the anticipated class sizes.*

A complete list of courses with the anticipated class size for each course can be found in Appendix A. Courses designated as FINT are new courses offered by this new program, while the course with recognizable rubrics are currently offered courses. This chart indicates class size and the projected number of sections for each course. Specifically:
- Foundational courses (1st and 2nd year) are capped at 100 students/section.
- Technology courses for years 1-3 requiring lab are capped at 35 students per section.
- All 4th year courses are capped at 20 students per section.

These estimates have been developed in alignment with the space capacity at of the Markham campus.

## 4.5. Program Requirements – Calendar Presentation

*As an appendix, provide a copy of the program requirements as they will appear in the Undergraduate Academic Calendar.*

The following is the calendar presentation of the curricular structure.

# Financial Technologies- Honours Bachelor of Science

The School of Information Technology offers an Honours Bachelor of Science (120 credits) in Financial Technologies. This major is offered at Markham Campus.

## Honours Program (120 credits):

The honours program core (78 credits) is defined as:
- AP/ECON 1000 3.00
- AP/ECON 1010 3.00
- SC/MATH 1013 3.00
- SC/MATH 1014 3.00
- SC/MATH 1131 3.00
- AP/FINT 1210 3.00
- AP/FINT 2210 3.00
- LE/CSSD 2221 3.00
- SC/MATH 2030 3.00
- SC/MATH 2280 3.00
- SC/MATH 2281 3.00
- AP/ADMS 2500 3.00
- AP/FINT 2010 3.00
- SC/MATH 3285 3.00 or AP/ADMS3500
- AP/FINT 3410 3.00
- AP/FINT 3310 3.00
- LE/CSSD 2221 3.00
- AP/FINT 3010 3.00
- AP/FINT 3620 3.00
- AP/FINT 3320 3.00
- AP/FINT 4610 3.00
- AP/FINT 4220 3.00
- AP/FINT 4720 3.00
- AP/FINT 4730 3.00
- AP/FINT 4230 3.00
- AP/FINT 4000 3.00

A. General education (30 credits):
- Non-science requirement—at least 15 credits
    - 9.00 credits in either the humanities or social science categories from the approved list of Liberal Arts & Professional Studies general education courses
    - 6.00 credits from the opposite category (social science or humanities) from the approved list of Liberal Arts & Professional Studies general education courses
- 1000-level Mathematics (excluding modified courses)—at least 6 credits
    - satisfied by SC/MATH 1013 3.00 and SC/MATH 1025 3.00
- 1000-level computation courses—at least 3 credits
    - satisfied by LE/CSSD 1201 3.00
- 1000-level foundational science—at least 6 credits from courses with laboratories in either BIOL, CHEM, PHYS (this requirement meets York's BSc Matrix legislation and is completed in place of the 6.00 NATS requirement in the Faculty of Liberal Arts & Professional Studies general education requirements).

B. Major Requirements
- The program core, as specified above (78 credits)

C. Additional credits
- 12 credits of additional credits from the following:
    - AP/FINT4350 3.00
    - AP/ITEC 3310 3.00
    - LE/CSSD 3221 3.00
    - LE/CSSD2211 3.00
    - LE/CSSD3xxx 3.00
    - AP/ENTP 4945 3.00
    - AP/FINT4350 3.00
    - AP/FINT 4620 3.00

D. Science Elective
- BSc degrees at York are required to contain at least 24 credits in science disciplines outside the major (from BIOL, BCHM, BPHS, CHEM, CSE, EATS, GEOG, KINE, MATH, PHYS, PSYC, STS of which at least 3 credits must be at the 2000 level or higher, including:
    - SC/MATH 1131 3.00;
    - SC/MATH 2030 3.00;
    - SC/MATH 2280 3.00;
    - SC/MATH 2281 3.00
    - General education requirements specified above

E. Upper Level Requirement
- At least 42 credits at 3000 or 4000 level (satisfied by the FINT Honours program core)

# 5. Program Structure, Learning Outcomes and Assessment

*The intent of this section is to provide reviewers with an understanding of the knowledge, methodologies, and skills students will have acquired by the time they complete the program (i.e. the program learning outcomes), including the appropriateness of the program learning outcomes and how they will be supported and demonstrated. With that in mind, and with explicit reference to the relevant degree level expectations, it would be useful to focus on what students in the program will know and/or be able to do by the end of a defined period of time and how that knowledge, methodology and/or skill will be supported and demonstrated.*

## 5.1 Program Learning Outcomes and Assessment

### 5.1.a) Program Level Outcomes (PO's)

*Provide the program learning outcomes along with a description of how these are appropriate and align with the relevant degree level expectations.* **Programs should have eight to twelve program learning outcomes.**

The program level outcomes are as follows:

LO1.   Identify, model, analyze, and communicate financial phenomena, problems, and systems with computational and mathematical techniques and technologies

LO2.   Make informed financial decisions using computational and mathematical techniques and technologies

LO3.   Develop secure and high-assurance computing and information systems for solving financial or other business problems

LO4.   Recognize and respond to innovative technologies emerging in the industry

LO5.   Recognize and comply with regulatory, legal, and ethical practices and policies pertaining to financial and technological industries.

LO6.   Identify, describe, and critically analyze the limitations of information and computing technologies in reliably, securely and safely addressing financial problems, and recognize and describe their impact to economies, societies and cultures.

These Learning Outcomes describe and define the different knowledge, skills, and experiences that are part of this interdisciplinary program. In short, Finance courses are most represented through LO1, technical courses pertaining to software development support LO3, while LO2 is predominately supported by courses pertaining to topics such as data analysis, AI, Visualization, along others. LO4 and LO6 are supported by technology courses, especially the newly proposed courses, while LO5 is most advanced through the innovative and interdisciplinary integrative courses.

Further, while these Learning Outcomes are unique to the currently proposed FinTech program, they have been designed to meet the degree level expectations defined across the province. In the chart

below, the relationship between the program POs and the Degree Level Expectations (DLEs) are mapped. Whenever a PO substantially supports fulfillment of a DLE the corresponding cell is marked.

| | LO1: Identify, model, analyze, and communicate financial phenomena, problems, and systems with computational and mathematical techniques and technologies. | LO2: Make informed financial decisions using computational and mathematical techniques and technologies | LO3: Develop secure and high-assurance computing and information systems for solving financial or other business problems. | LO4: Recognize and respond to innovative technologies emerging in the industry | LO5: Recognize and comply with regulatory, legal, and ethical practices and policies pertaining to financial and technological industries | LO6: Identify, describe, and critically analyze the limitations of information and computing technologies in reliably, securely and safely addressing financial problems [...] |
|---|---|---|---|---|---|---|
| Depth and Breadth of Knowledge | ✓ | ✓ | | ✓ | ✓ | |
| Knowledge of Methodologies | ✓ | ✓ | ✓ | | | |
| Application of Knowledge | | ✓ | ✓ | | ✓ | |
| Communication Skills | | ✓ | | ✓ | ✓ | |
| Awareness of Limits of Knowledge | | | | | | ✓ |
| Autonomy and Professional Capacity | | ✓ | ✓ | ✓ | | ✓ |

*Table 4. POs vs. DLEs*

In Sum:

- Depth and Breadth of Knowledge is met by LO1, LO2, LO4, LO5
- Knowledge of Methodologies is met by LO1, LO2, LO3
- Application of Knowledge is met by LO2, LO3
- Communication Skills is met by LO2, LO4, LO5
- Awareness of Limits of Knowledge is met by LO6
- Autonomy and Professional Capacity is met by LO2, LO3, LO4, LO6

## 5.1.b) Program Curriculum vs. Program Learning Outcomes.

*Describe how the program curriculum and structure supports achievement of the program learning outcomes.*

*For undergraduate programs, comment on the nature and suitability of students' final-year academic achievement in the program.*

*Provide a program curriculum map to demonstrate the above. This may be an appendix to the proposal document.*

Appendix B shows a curriculum chart that maps each of the core program courses to the appropriate LO. Along with the mapping of the courses to the LOs, also note that we have identified:

- Whether the course is Foundational (<u>Found.</u>) to that LO (ie the course builds the foundation for more advanced courses in this area), <u>Related</u> to that LO (ie the course is connected to, but not directly met by, the outcome), or Direct to the LO (the course is important for achievement of the outcome).
- Whether courses provide an Introductory (<u>Intro</u>), Intermediate (<u>Inter</u>), or Advanced (Adv.) treatment of content, thus also identifying the progressive achievement of these outcomes.
- The expected form of assessment to track the LOs, namely: Exams and Tests (E), Assignments (A), Labs Tests (L), Group Project (GP), Essays and research papers (S). We expect to continuously broaden and further refine this list as the courses develop.

## 5.1.c) Assessment

*Describe how student achievement of each of the program learning outcomes is assessed, how that assessment is documented and how the methods and criteria for assessing student achievement are appropriate and effective relative to the program learning outcomes.*

It is projected that the following assessments will be used in courses throughout the program, as mapped above/in Appendix B. Assessment strategies include:

o Exams and tests (E): including midterm and final exams and quizzes, whereby students respond in written to questions posed by the exam statement. Multiple-choice and open questions are promoted, with instructors making a judgement on the appropriateness of each question type.
  - Assessment method is applicable to all courses, particularly junior ones.
o Lab tests(L): take place in the lab and students are asked to solve a problem using a software system and do so within a limited time.
  - Utilized in programming and statistical courses, where development and tool use skills are developed.
o Assignments (A): Students are given exercises and questions to be responded to within a certain deadline. In the flipped classroom model, solution of assignments can take place in class under the supervision of the instructor.
  - Suitable for most courses.
o Group Projects (GP): Students are presented with a large case or objective which they progressively address throughout the term. A term project is typically group-based and may involve several assessable results, including:
  - Reports presenting the outcome of a phase
  - Presentations of the outcome of a phase.
  - Developed artifacts, including software code or data products.
  - Clear project management and co-ordination evidence.
  Term projects are suitable for upper-level courses where knowledge of the foundational technologies and methods can be assumed and complex and more realistic cases can now be entertained.
o Essays and research papers (S): Students are asked to critically analyze a problem or situation. The analysis may involve lightweight researching of information about specific cases, regions or events. Essays and research papers are suitable for integrative courses whereby students attain deeper understanding of how the technologies apply in reality. Essays can be replaced by presentations/talks with the same content.

Examples of these include:

- Benefits, threats and pitfalls of applying certain technologies to the financial domain, possibly using cases.
- Analysis of a success or a failure case of a financial technology.
- Presentation and analysis of the state of financial technologies in a country or region.
- Analysis of socio-technical phenomena emerging from the application of financial technologies, e.g. cyptocurrencies, sustainability, crime inequality and social inclusion, algorithmic trading and "flash-crashes", AI and discrimination.
- Contemplation of policy and regulatory interventions to address negative implications of financial technologies.

Note that the above methods are generally understood to be the main assessment methods of a technical or engineering degree. The uniqueness of the program is the addition of essay and research paper components, where societal, economic, historical, political and regional aspects are analyzed and critically addressed and the corresponding modes of communication are cultivated (free-form essays, talks). However, as the program grows, differentiation and innovation in assessment will develop to best respond to changing needs.

## 5.1.d) Post Graduation Assessment

*Describe how the program will document and demonstrate that, upon graduation, students will have achieved all degree level expectations as specified by the program learning outcomes. How will this information be used to inform continuous improvement of the program? (For more information: https://oucqa.ca/guide/assessment-of-teaching-and-learning-2-1-6-a-and-b/)*

The program shall assess long-term achievement of POs through at least three avenues:

- Through social media and events, the program shall maintain strong alumni relations, engaging alumni and their employers regularly to assess whether the set POs are accomplished or require curricular re-alignment or even an update of the POs themselves. The evidence acquisition would include polling (surveys) and focus groups, involving self-reported assessments from participants.
- The internship component shall include opportunities for employers to perform assessment of skill gaps on the part of the interns. These assessments will allow the program's curriculum governance to understand which PO's are underserved and perform the appropriate corrections.
- Continuous (e.g., annual vs. every Cyclical Program Review) review and update of Course Level Outcomes (COs) and mappings thereof with POs, as well as communication across instructors will be encouraged by the program's curriculum governance, so that misalignments and drifts are identified and corrected promptly.

## 5.1.e) Progression and Graduation Requirements

*Include a description of the progression requirements for the degree program and the graduation requirements.*

Standing and graduation requirements: to graduate requires successful completion of all Faculty requirements and departmental required courses and a minimum cumulative credit-weighted grade point average of 2.3/4.0 (C+) over all courses completed.

Progression and graduation requirements for the program align to the University's new Grading Scheme Policy, which is detailed below and is set to take effect in fall 2023 at the same time as the proposed program's launch. It is important to note that a foundational revision to the University's grading scheme is the transition from a 9.00 GPA scale to a 4-point scale. The details below are consistent with the Senate-approved 4.00 GPA scale:

The policy stipulates the following progression requirements for Honours programs:
- students who have earned between 0-53 credits remain in their honours program provided they meet the University and program minimums;
- At 53 earned credits, students must have at least a 2.00 CGPA to continue in the honours program; if the CGPA is between 1.70 and 1.99, the student may continue on a warning for a review period of 30 credits; and, if the CGPA falls below 1.70 by 53 credits, the student is exited from the honours and switched to a cognate 90-credit program; and,
- At 83 credits, the student must have at least a 2.00 CGPA to continue; if the CGPA is less than 2.00, the student is exited from the honours program.

Graduation Requirements:

Graduation requirements are set out by the Faculty Rules for all undergraduate programs in the Faculty of Liberal Arts & Professional Studies and align to relevant University policies such as the established grading schemes, some of which will be modified for MC:
- Residency requirement: a minimum of 30 course credits and at least half (50 per cent) of the course credits required in each undergraduate degree program major/minor must be taken at York University;
- Graduation requirement: students must successfully complete (pass) at least 120 credits which meet the Faculty's degree and program requirements with a cumulative grade point average of at least 2.00 and a major grade point average of at least 2.3;
- General education: to fulfill the liberal arts & professional studies general education requirements students must take 21 credits of general education including: 6.00 credits in natural science (NATS) [Financial Technologies students will meet a parallel requirement to the NATS course by completing the non-FINT science courses stipulated in the BSc general education requirements]; A 9.00 credit approved general education course in the social science or humanities categories; and a 6.00 credit approved general education course in the opposite category to the 9.00 credit course in the social science or humanities already taken.
- Major/minor credits: as defined by the specific program; a minimum of 78 credits, including at least 18 credits at the 4000 level;
- Upper-level credits: at least 42 credits at the 3000 or 4000 level including at least 18 credits at the 4000 level;
- Science Electives: at least 24 credits in Science disciplines outside the major which includes non-major GenEds and required science credits not in major discipline (all MATH) credits.

General Prerequisites:
- Taking any 2000-level course requires completion of all mandatory 1000 credits, with the following exceptions:

- o Completing all but 3.0 required 1000-level credits allows students to enroll in half of the credits of 2000-level courses, assuming the course-level prerequisites are met.
  - o Completing all but 6.0 required 1000-level credits allows students to enroll at most 9.0 credits in 2000-level courses, assuming the course-level prerequisites are met.
- Taking any 3000-level course requires completion of all mandatory 2000-level courses, with the following exceptions:
  - o Completing all but 3.0 required 2000-level credits allows students to enroll in half of the credits of 3000-level courses, assuming the course-level prerequisites are met.
  - o Completing all but 6.0 required 2000-level credits allows students to enroll at most 9.0 credits in 3000-level courses, assuming the course-level prerequisites are met.

## 5.2. Modes of Delivery

*Describe the proposed mode(s) of delivery, including how it/they are appropriate to and effective in supporting the program learning outcomes.*

The proposed program follows specific guidelines with regards to how the newly developed technology and integrative courses are to be taught and offers these guidelines as recommendations to be followed by the service courses offered by other departments.

Specifically, wherever applicable:
- Courses shall be taught in a *flipped classroom* format, whereby content delivery takes place asynchronously through video presentations and the majority of synchronous meeting time is dedicated towards collaborative student activities.
- A *blended* teaching format will be promoted, where part of class activities is synchronously and asynchronously conducted on-line, using tools and collaboration approaches followed by modern virtual organizations.
- In-person meetings would prioritize lab, open classroom or collaborative spaces whereby maximizing the opportunity for hands-on and collaborative learning activities amongst students.

The goals of the proposed teaching approaches are as follows:
- Simulate, wherever possible, the professional approaches for collaboration and work organization, including project management and communication approaches and techniques.
- Enable a hands-on, learning-by-doing approach and minimizing passive transfer of information (lecturing).
- Enable strong connections and collaborative relationships among students.
- Familiarize students with on-line forms of work, learning and collaboration.

## 5.3. Experiential Education

*Describe the experiential components of the program, if applicable. These may include a wide variety of options, including classroom-based activities, community-based learning, or internships and co-op placements. Describe how students are supervised and assessed when participating in experiential education activities outside of the classroom.*

Experiential education will be built into many courses in this program. Most senior-level courses, including courses on computer programming, software engineering, and machine learning, include term-long projects whereby students individually or collaboratively develop a solution for a realistic problem (e.g., design an application, implement a solution, analyze open-source data).

More specifically, however, experiential education will be prioritized in shaping the program in three main ways:

1. The Financial Technology *Internship* constitutes a 0-credit opportunity for Honors students who meet certain requirements [specified below], to work for 3, 6, or 8 months in a company in the Financial Technology sector.

   These internships would be part of the campus-wide internship capability developed for Markham and its educational and administrative aspects shall be modeled after LA&PSs corresponding internships programs (e.g., the TIP the technology internship program).

   o Students eligible for internship have (a) a major GPA of at least 6.0, (b) and have finished 54 credits, (c) are registered in the 120-credit Honours program, (d) are in good academic standing.

   o The internship comes in the form of a 0-credit course, ITEC3900, within which learning and reflection during the work experience is supported and systematized with student developing skill and competency development goals and writing reflection and self-assessment reports. These, combined with employer feedback are systematically observed by a full-time faculty member, an internship co-ordinator, who assigns the final PASS/FAIL grade for the course.

2. The third-year course, *"Cases in Financial Technologies"* will be focused on collaborative technological problem solving where students will use real world cases in the financial technologies sector (historical or contemporary interest) to discover how technology has shaped the financial sector and how they can evolve these innovations for the future.

3. The fourth-year course *"Capstone Project in Financial Technologies,"* students are given a realistic business case, i.e., a problem from the financial sector to be solved through the development of the technology, and the students work the entire term to collaboratively design, implement and present a solution. Examples of solutions may include developing a new financial product or service, designing and developing a bidding or trading platform, developing data products for performing specific data analyses and visualizations, analyzing the performance, reliability and security of an existing system. Wherever available, such cases will emerge from industrial problems with some participation from industry stakeholders for offering requirements and grading the final outcome.

# 6. Admission Requirements

## 6.1. Admission Requirements – Description

*Describe the program admission requirements, including the language proficiency requirements.*

Domestic Students
Ontario High School Students:
- Ontario Secondary School Diploma (OSSD)
- ENG4U
- SBI4U or SCH4U or SPH4U
- MHF4U
- Three additional 4U or M courses.
  - MCV4U recommended

Target GPA: low 80s

University Transfers:
- Completion of at least four full-year courses or one year of full-time degree studies at an accredited university
- Overall average of 3.0 or better on a 4-point scale (or equivalent)
- SBI4U or SCH4U or SPH4U
- MHF4U
- 4U Math - MCV4U recommended

College Transfers:
- Completion of at least four full-year courses or one year of full-time degree studies at an accredited university
- Overall average of 3.3 or better on a 4-point scale (or equivalent)
- SBI4U or SCH4U or SPH4U
- MHF4U
- 4U Math - MCV4U recommended

Visa 101 Students (examples):

Language requirements:
- TOEFL (iBT): 88 (no score below 20 in each section)
- IELTS: 6.5 (no score below 6.0 in each section)
- Pearson PTE: 60
- DuoLingo: 115

## 6.2. Requirements vs. LOs

*Provide a brief explanation how these requirements are appropriate for the achievement of the program learning outcomes.*

- Given the heavy mathematical and computing components of the program, the requirements are modelled after the corresponding requirements of the Mathematics and Computer Science BSc. They also satisfy the requirements of LA&PS's Financial and Business Economics, which require less math.

- o Science courses are required in accordance to the BSc designation, and the expected lab requirements as part of the required non-major science credits.
- The program being technically and mathematically demanding, evidence of high performance in mathematics is required again in accordance to corresponding requirements already posed by Computer Science BSc.
- English requirements are again modeled after Lassonde's effective requirements and are generally York University's minima – except for a slightly higher TOEFL.

## 6.3. Alternative Requirements

*Explain any alternative requirements, if any, for admission into an undergraduate, graduate or second-entry program, such as minimum grade point average, additional languages or portfolios, along with how the program recognizes prior work or learning experience.*

Minimum GPA requirements for various non-101 categories are specified above. There are no additional requirements posed by the program. The content of the program is such that work experience is not recognized for admission.

# 7. Resources

*This section provides a description of the resources available to support the delivery of the program and support of students' achievement of the program learning outcomes. In addition to the descriptions, the three tables at the end of this section provide evidence of the above.*

## 7.1. Faculty

*Describe the areas of strength and expertise of the faculty who will actively participate in delivering and further developing the program, focusing on their current status and ability to foster a robust intellectual climate.*

| Prof. Sotirios Liaskos | Sotirios Liaskos is an Associate Professor and 2-term Director of the School of Information Technology York University. He is interested in various aspects of Software Engineering including Requirements Engineering and Conceptual Modelling as well as the analysis and evaluation of Blockchain network technologies. Prof. Liaskos can participate in the teaching and further development of the software engineering aspect of the program as well as the teaching of blockchain-related courses. |
|---|---|
| Prof. Andrea Podhorsky | Andrea Podhorsky is an Assistant Professor in the Department of Economics. In addition to a PhD in Economics, she holds an MS in Computational Finance and studies the economic impacts of cryptocurrencies and public policy measures for overseeing fintech. She can participate in the teaching and further development of the economics and finance aspects of the program as well as the teaching of economics and cryptocurrency-related courses. |
| Prof. Zijiang Yang | Zijiang Yang is a professor in the School of Information Technology at York University. She used to be two-term graduate program director and is currently undergraduate program director of the school. Her research interests include machine learning and optimization in the financial service |

| | industry. She can participate in teaching machine learning and operations research related courses. |
|---|---|

*Describe plans to provide further resources that may be necessary to implement and/or sustain the program.*

Please see below "Resources and Class sizes" for hiring plan.

## 7.2. Contract and retired faculty
*Comment on the anticipated role of retired faculty and contract instructors in the delivery of the program, as appropriate.*

### 7.2.1. Part-Time Instructors
The professional orientation of the program makes it suitable for teaching contributions from part-time instructors with a strong professional record in the Financial, FinTech and Tech industries. The FTF hiring projections are based on the assumption of 30% of the sections to be taught by such part-time instructors.

### 7.2.2. Retired Faculty
The following retired faculty member can make contributions to the program particularly in the integrative courses and the capstone projects.

| Prof. Chris Robinson | Chris Robinson, Professor Emeritus of Finance and Senior Scholar, has been teaching, conducting research, writing textbooks, intervening in regulatory matters and working in legal proceedings for 35 years in all aspects of personal financial planning and ethics in finance. He has won awards for research, teaching, university service and journalism. His current research projects include professionalisation of financial planning in Canada, Australia and South Africa, financial counselling in Canada and Australia, the effect of robo-advising on investment advisers and comprehensive stochastic retirement planning. He has a PhD in Finance from the University of Toronto and is a Certified Financial Planner and Chartered Professional Accountant. In 2011 he was named one of the inaugural Fellows of FP Canada. |
|---|---|
| Prof. Gary Spraakman | Gary Spraakman PhD, FCPA, FCMA is a professor emeritus and senior scholar at York University. Before his retirement in 2021, he was a full professor of management accounting and information technology. He has taught undergraduate and graduate courses relating to information technology including on Organization Strategy and IT (graduate), Management Information Systems and Enterprise Resource Planning. His research interests focus on the use of IT and data analytics for managing organizations. Earlier in 2021, with two other professors, he published an empirical paper, Data Analytics and Management Accountants. |

The hiring plan outlined in Section 7.6. Resources and Class sizes" and Table 8 presents 10 FTFE which, assuming an 1.75 FCE/year per resource.

## 7.3. Laboratory Facilities/Equipment

*Where applicable, identify major laboratory facilities/studio space/equipment that will be available for use by undergraduate and/or graduate students and to support faculty research, recent acquisitions, and commitments/plans (if any) for the next five years.*

Lab Space:
The program will heavily rely on access to technology as well as collaboration infrastructure for the support of the flipped classroom model. Specifically:

- For courses with a strong computational component, meetings (including exams) will be run in a computer lab environment whereby students can solve exercises, collaborate and perform activities through the use of computers and computer software.
- Computing configuration shall be similar to the one currently offered by LA&PS's eServices.
- Some classes, such as the Introduction to Financial Technologies, the Cases in Financial Technologies and the Capstone project, will run in rooms where collaboration among students is facilitated, i.e., students are seated in round tables.
- Server capacity will be required for certain courses that heavily rely on such, including the course on Blockchain as well as software engineering. While the Keele server infrastructure will be suitable initially, additional capability will be added according to needs.

The MC has computer lab space and collaborative teaching space available to meet the above requirements.

The plans currently include one instructional laboratory in each of the Physics, Biology, and Chemistry disciplines as well as a robust suite of preparation and support spaces. These will cover the GenEd and Science requirements of the proposed program. There are six state-of-the-art computer labs for instruction that will meet the needs for dedicated in-lab instruction.

There is also an Experiential Education Hub on floor 3 intended to provide administrative space and support for upper year student work on Capstone Projects and act as an intersection for work with Industry partners, students, and faculty.

## 7.4. Office, Laboratory and Research Space

*Describe the office, laboratory and general research space available that will be available for faculty, undergraduate and/or graduate students, including the availability of common rooms for faculty and graduate students, administrative space. If applicable, describe any commitments/plans for the next five years.*

Laboratory and general research space have been described in section 7.3 above. It is worth noting that as new research clusters are formed it is expected that they will be accommodated within space assigned to Faculty Offices or should the demand require it other spaces will be reassigned to this purpose until growth requires fit out of floors 9 and 10 to house larger groups.

Like every other Faculty, LA&PS has a suite of offices for faculty members and administrative staff. Each of these suites has access to meeting rooms of various sizes, networking lounge space, kitchenettes and

various filing and storage facilities. LA&PS occupies almost the entire 8th floor which is equipped as but also offers separate enclosed lounge/ study spaces for graduate and undergraduate students.

Within this space, the Financial Technologies Lab will be available to students of the involved faculty members who engage in research.

- The lab, which may consist of various rooms, features hot desks with large dual-screen docking stations for faculty, undergraduate research project students, graduate students, researchers, visitors, as well as small collaboration meeting desks and rooms.
- In terms of number of seats, the lab is able to house at least *three (3) group members per FTF affiliated with the program*. This guaranteed space will be important for attracting research-intensive FTF to the program.
  - This space guarantee for research faculty can be in part provided by space earmarked for research clusters related to Financial Technologies, or it may be part of a unified space dedicated to FinTech research.
  - Floors 9 and 10 can be utilized for meeting these requirements, should floor 8 become full.

There are several large study areas in the Library to support varying degrees of activity and quiet. Rooms are furnished and designated to permit collaborative work, quiet study and mixed-use including study and socializing. Every floor in the building except floors 7 and 8 has informal student lounge and study space off the main corridors. On the classroom floors 4 and 5 there is also significant bench seating installed in corridors, equipped with power to allow students to connect their devices while filling in time between their classes.

Faculty administrative support is lodged with the faculty office spaces on floors 7 and 8. There is also a suite of offices for the Deputy Provost functions on floor 7. All faculty and staff offices are on floor 3 with the Library collection, study spaces, editing suites, Gaming lab and Maker space. All student Service functions including Advising, Counseling, Alternate Exam facilities, Supplemental Instruction and Tutoring are located on floors 1 and 2.

## 7.5. Academic Supports and Services
*As appropriate, comment on academic supports and services, including information technology, that directly contribute to the academic quality of the program proposed.*

The proposed program will be supported and supplemented by a suite of academic success supports and services that contribute to the quality of the program and the success of students. They include academic advising, accessibility services, general learning skills (e.g., time management, critical thinking, reading and note-taking), discipline specific supports (e.g., writing and numeracy skills), and peer-based learning supports such as peer tutoring and Supplemental Instruction. Students' sense of belonging and community within their program is strengthened through a robust first year orientation and transition program, the active involvement of peer mentors, and a program specific student club/organization. To round out the student experience, students will have access to both in-person and remote student

services delivered by staff based at Markham and Keele campuses. Wholistic student services include registrarial services, student finances and bursaries, health and wellness support and programs, and student activities and involvement programs.

## 7.6. Resources and Class sizes

*Describe how the available resources will support the anticipated class sizes and supervision of any experiential education activities.*

*Table 5. Projected Enrollments*

|  | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | Steady | Retention Rate |
|---|---|---|---|---|---|---|---|---|
| 1 | 60 | 72 | 87 | 107 | 150 | 200 | 200 | |
| 2 | 0 | 48 | 58 | 70 | 86 | 120 | 160 | 0.8 |
| 3 | 0 | 0 | 38 | 46 | 56 | 69 | 96 | 0.8 |
| 4 | 0 | 0 | 0 | 19 | 23 | 28 | 35 | 0.5 |
| Total Sections: | 3 | 5 | 15 | 23 | 34 | 36 | 56 | |

*Table 6. Annual Number of Sections per Expert*

| Row Labels | Section for 2023 | Sections for 2024 | Sections for 2025 | Sections for 2026 | Sections for 2027 | Sections for 2028 | Sections for Steady (2029+) |
|---|---|---|---|---|---|---|---|
| AI Specialist | 0 | 0 | 1 | 3 | 4 | 4 | 6 |
| FT Generalist | 0 | 1 | 3 | 3 | 4 | 5 | 8 |
| Software Engineer | 2 | 3 | 4 | 9 | 10 | 13 | 17 |
| Systems/Networks | 0 | 0 | 1 | 1 | 2 | 2 | 3 |
| FT Specialist | 0 | 0 | 0 | 4 | 4 | 4 | 6 |
| Data and Knowledge Management | 0 | 0 | 1 | 1 | 2 | 2 | 3 |
| Economist/Business | 0 | 0 | 2 | 6 | 8 | 8 | 12 |
| Grand Total | 2 | 4 | 12 | 27 | 34 | 38 | 55 |

(Total Sections Offered)

To identify resource needs and hiring requirements for the program, the projected enrollments of Table 5 are used to offer a rough estimation of the number of sections needed for each course. A realistic retention rate of 80% is assumed. The results are aggregated above (Table 6) per FT expertise required to teach the sections. Hence the following hiring plan will be required for a healthy student-to-FTF ratio, assuming 70% of sections being taught by FTF and the remaining 30% by PTF. In short, the following are the number of new hires needed the first 7 years, assuming program stays as described here:

*Table 7. Hiring Plan - 7 Year Projection*

|  | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|---|---|---|---|---|---|---|---|
| AI Specialist | | | 1 x AI Specialist | | | | |
| FT Generalist | | 1 x FT Generalist | | | | | 1 x FT Generalist |
| Software Engineer | 1 x Software Engin | | | 1 x Software Engine | 1 x Software Engine | | |
| Systems/Networks | | | 1 x Systems/Networ | | | | |
| FT Specialist | | | | 1 x FT Specialist | | | |
| Data and Knowledge Management | | | 1 x Data and Knowle | | | | |
| Economist/Business | | | 1 x Economist/Busir | | 1 x Economist/Busir | | |
| 0 | | | | | | | |
| Total Per Year | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Total Hires through 2029 | 11 | | | | | | |

(Total FTF Hires Per Year)

The projections include resources currently residing in Keele campus who will decide to move to Markham. A more detailed picture of the required profiles can be seen below:

| Year | Expert | Profile | Acquisition |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **2023** **(2 hires)** | Software Engineer | A person with Software Engineering background to take on introductory programming and potentially software engineering courses. | 1 tenure-stream junior or senior FTF hire |
| | FT Generalist | A person with strong FT inclination, probably with a Business background, to prepare and teach the integrative Financial Technology courses of years 2 and 3. Specific specialization area flexible. | 1 tenure-stream junior FTF hire |
| **2025** **(4 hires)** | AI Specialist | A machine learning expert to teach the two Machine Learning courses and grow the AI aspect of the program. Financial background highly desired. | 1 tenure-stream junior FTF hire |
| | Systems/ Networks | A person with expertise Networks and Distributed Systems (incl. consensus networks) and to teach the corresponding courses and grow that aspect. | 1 tenure-stream junior FTF hire |
| | Finance | A Finance expert to take on teaching the finance core and electives. Specific specialization area flexible. | 1 tenure-stream junior FTF hire |
| | Data and Knowledge Management | An expert in data management with knowledge of modern data management and a particular focus on conceptual modelling and ontology engineering, preferably in financial domains. | 1 tenure-stream junior/senior FTF hire |
| **2026** **(2 hires)** | FT Specialist - Blockchain | A person with technical understanding of blockchain technologies (software engineer, networks, distributed systems). | 1 tenure-stream junior or senior hire. |
| | Software Engineering Specialist | A Software Engineer with specialization of high assurance and/or security engineering. | 1 tenure-stream junior or senior FTF hire |
| | Finance | A Finance expert to take on teaching the finance core and electives. Specific specialization area flexible. | 1 tenure-stream junior FTF hire |

| | | | |
|---|---|---|---|
| 2027 (1 hire) | Finance | A Finance expert to take on teaching the finance core and electives. Specific specialization area flexible. | 1 tenure-stream junior FTF hire |
| 2028 (1 hire) | Software Engineer | A Software Engineer of any relevant specialization. | 1 tenure-stream junior FTF hire |
| 2029 (1 hire) | FT Generalist | A person with strong FT expertise, of economics, business or management background, to support teaching of the integrative Financial Technology courses of years 2 and 3. Specific specialization area flexible. | 1 tenure-stream junior FTF hire |

*Table 8. Hiring Plan - Detailed Profiles.*

## 7.8. Funding and cost recovery

*Indicate whether the new program is intended to be funded or to be a full-cost recovery program.*

The proposed program is intended to be funded.

## 7.9. Other quality indicators

*Describe other indicators of the quality of the program that may not have been covered above.*

N/A

### Table 1 – Listing of Faculty

*For undergraduate programs: Identify all full-time faculty who will actively participate in delivering the program, as follows.*

| Faculty Name & Rank | Home Unit | Area(s) of Specialization |
|---|---|---|
| Sotirios Liaskos | School of Information Technology | Software engineering, conceptual modelling, blockchain technologies |
| Andrea Podhorski | Department of Economics | Fintech and blockchain technology, corporate social responsibility, international trade and finance. |
| Zijiang Yang | School of Information Technology | Machine learning, data mining, big data analytics, decision support and optimization in financial services industry |

## 8. Enrolment Projections

|  | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | Steady | Retention Rate |
|---|---|---|---|---|---|---|---|---|
| 1 | 60 | 72 | 87 | 107 | 150 | 200 | 200 | |
| 2 | 0 | 48 | 58 | 70 | 86 | 120 | 160 | 0.8 |
| 3 | 0 | 0 | 38 | 46 | 56 | 69 | 96 | 0.8 |
| 4 | 0 | 0 | 0 | 30 | 37 | 45 | 55 | 0.8 |
| Total Sections: | 0 | 0 | 0 | 4 | 4 | 4 | 6 | |

*Figure 1. Projected Enrollments*

The projected enrollments for the program can be seen in Figure 1. The program will increasingly accept more students from 60 in 2023 to 200 in 2028 which represents the steady state. The number of students in years 2 through 4 are calculated by assumed retention rates of 80%, which we assume to be an upper bound for such rate.

# 9. Support Statements

*Support statements are required from:*

*relevant Dean(s)/Principal, with respect to the adequacy of existing human (administrative and faculty), physical and financial resources necessary to support the program, as well as the commitment to any plans for new/additional resources necessary to implement and/or sustain the program*
- *Vice-President Academic and Provost, with respect to the adequacy of existing human (administrative and faculty), physical and financial resources necessary to support the program, as well as the commitment to any plans for new/additional resources necessary to implement and/or sustain the program*
- *University Librarian confirming the adequacy of library holdings and support*
- *University Registrar confirming the implementation schedule and any administrative arrangements*
- *relevant Faculties/units/programs confirming consultation on/support for the proposed program, as appropriate*
- *professional associations, government agencies or policy bodies with respect to the need/demand for the proposed program, as appropriate*

# 10. Curricula Vitae of the Faculty

*Current CVs should be submitted along with the new program proposal as an independent document complied in a PDF document, in alphabetical order, with a table of contents. Where appropriate, a program may have separate sections for faculty members who hold full-time (including CLAs) positions at York, retirees, and adjunct appointments.  CVs should be submitted in the format relevant to the proposed program.*

**Additional Evaluation Criteria for Joint Degree Programs and Dual Credential Programs**

For all Joint Degree Programs and Dual Credential programs *that will be comprised of a wholly new program(s),* the program proposal should address the additional evaluation criteria. **Additional evaluation criteria for all Joint Degree Programs:**

- In the *Introduction*, identify the participating programs, and indicate if they are existing programs or are being developed in relation to joint program.
- In the *Program Structure, Learning Outcomes and Assessment* section, describe how the joint program will be structured/governed/ managed to assure the level of integration envisioned will be supported by program requirements, including academic procedures (e.g. for graduate programs, thesis/dissertation and examination guidelines and procedures).
- In the *Program Structure, Learning Outcomes and Assessment section*, describe how methods for the assessment of student achievement of the joint program learning expectations and the degree level expectations are consistent between two institutions.
- In the *Admission Requirements* section, confirm that admissions requirements for the joint program are same regardless of institution applied to.
- In the *Resources* section, provided the required information for both institutions, as appropriate.
- In the *Financial support of graduate students' section*, provide details regarding eligibility for financial assistance, where and as appropriate to the concerned program.

**Additional evaluation criteria for Dual Credential/Combined Programs that will be comprised of a wholly new program(s):**

- Throughout the proposal, all elements of the evaluation criteria must be addressed for both programs.
- For Dual Credential Programs, confirmation in the *Program Structure, Learning Outcomes and Assessment* section that students will normally spend at least one two terms at the partner institution.
- In the *Financial support of graduate students' section*, provide details regarding eligibility for financial assistance, where and as appropriate to the concerned program.

# Appendices

# Appendix A

*Table 9. Class sizes and Projected Yearly Sections*

| Code | Title | Yr | Size | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|------|-------|----|------|------|------|------|------|------|------|
| ADMS2511 | Management Information Systems | 2 | 50 | 0 | 1 | 1 | 1 | 2 | 2 |
| ADMS3530 | Finance | 3 | 50 | 0 | 0 | 1 | 1 | 1 | 1 |
| CSSD1101C | Introduction to Programming through Finance | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| CSSD1201 | Coding through Mechatronics | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| CSSD2101 | Object-Oriented Programming | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| FINT3220 | Web Programming | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3240 | Mobile Computing | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3510 | Computer and Network Security | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| MATH1025 | Applied Linear Algebra | 1 | 100 | 1 | 1 | 1 | 1 | 2 | 2 |
| MATH2131 | Introduction to Statistics II | 2 | 40 | 0 | 1 | 1 | 2 | 2 | 3 |
| MATH4280 | Risk Theory - Loss Models and Risk Measures | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| ADMS2500 | Financial Accounting | 2 | 100 | 0 | 0 | 1 | 1 | 1 | 1 |
| CSSD2211 | Introduction to Cloud Computing | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| CSSD2221 | Intro to Security Threats | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| CSSD3221 | Network Security | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| CSSD3xxx | Web and Mobile Programming | 1 | 50 | 1 | 1 | 2 | 2 | 3 | 4 |
| ECON1000 | Introduction to Microeconomics | 1 | 100 | 1 | 1 | 1 | 1 | 2 | 2 |
| ECON1010 | Introduction to Macroeconomics | 1 | 100 | 1 | 1 | 1 | 1 | 2 | 2 |
| ENTP4945 | Technology Entrepreneurship | 3 | 40 | 0 | 0 | 1 | 1 | 1 | 2 |
| FINT1210 | Introduction to Programming through Finance | 1 | 35 | 2 | 2 | 2 | 3 | 4 | 6 |
| FINT2010 | Introduction to Financial Technologies | 2 | 35 | 0 | 1 | 2 | 2 | 2 | 3 |
| FINT2210 | Intermediate Programming for Financial Technologies | 2 | 35 | 0 | 1 | 2 | 2 | 2 | 3 |
| FINT3010 | Cases in Financial Technologies | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3310 | Data and Knowledge Management | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3320 | Machine Learning for Finance | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3410 | Networks and Distributed Systems | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3620 | Financial Intermediation and Banking | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT3630 | Investment Management | 3 | 35 | 0 | 0 | 1 | 1 | 2 | 2 |
| FINT4000 | Capstone Project in FinTech | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4220 | Engineering Financial Software | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4230 | Software Quality Assurance | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4350 | Advanced Topics in Machine Learning | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4610 | Financial Decision Making | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4620 | Capital Markets and Trading | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4720 | Payment Systems and Cryptocurrencies | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |
| FINT4730 | Financial Cryptography and Blockchain | 4 | 20 | 0 | 0 | 0 | 2 | 2 | 2 |

# Appendix B

| Program: | Financial Technologies | | | LEARNING OUTCOMES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degree Type: | BSc | | | LO1 | | | LO2 | | | LO3 | | | LO4 | | | LO5 | | | LO6 | | |
| **CORE REQUIREMENTS** | | | | | | | | | | | | | | | | | | | | | |
| **1st year** | | | | | | | | | | | | | | | | | | | | | |
| *Code* | *Course Name* | *Credits* | | | | | | | | | | | | | | | | | | | |
| ECON1000 | Introduction to Microeconomics | 3 | | Direct | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| ECON1010 | Introduction to Macroeconomics | 3 | | Direct | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| FINT1210 | Introduction to Programming through Finance | 3 | | | | | | | | Found. | Intro | E,A | | | | | | | | | |
| MATH1013 | Applied Calculus I | 3 | | Found. | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| MATH1014 | Applied Calculus II | 3 | | Found. | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| MATH1131 | Introduction to Statistics I | 3 | | Found. | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| *Credit count* | | 18 | | | | | | | | | | | | | | | | | | | |
| **2nd year** | | | | | | | | | | | | | | | | | | | | | |
| MATH2030 | Elementary Probability | 3 | | Direct | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| ADMS2500 | Financial Accounting | 3 | | Direct | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| MATH2280 | Theory of Interest (Fixed Income) | 3 | | Direct | Inter | E,A | Found. | Inter | E,A | | | | | | | | | | | | |
| FINT2210 | Intermediate Programming for Financial Technolog | 3 | | | | | | | | Direct | Inter | E,A,L | | | | | | | | | |
| MATH2281 | Models of Financial Economics | 3 | | Found. | Intro | E,A | Found. | Intro | E,A | | | | | | | | | | | | |
| ITEC2622 | Data Structures | 3 | | | | | | | | Found. | Inter | E,A | | | | | | | | | |
| FINT2010 | Introduction to Financial Technologies | 3 | | Direct | Intro | S,A,E,C | Direct | Intro | S,A,E,C | Direct | Intro | S,A,E,C | Direct | Intro | S,A,E,C | Direct | Intro | S,A,E,C | Direct | Intro | S,A,E,C |
| *Credit count* | | 21 | | | | | | | | | | | | | | | | | | | |
| **3rd year** | | | | | | | | | | | | | | | | | | | | | |
| FINT3310 | Data and Knowledge Management | 3 | | | | | | | | Direct | Inter | E,A,L,GP | Relat. | Inter | E,A,L,GP | | | | | | |
| FINT3620 | Financial Intermediation and Banking | 3 | | Direct | Inter | E,A | | | | | | | | | | | | | | | |
| MATH3285 | Quantitative Finance | 3 | | Direct | Inter | E,A | | | | | | | | | | | | | | | |
| ADMS3530 | Finance | 3 | | Direct | Inter | E,A | | | | | | | | | | | | | | | |
| FINT3410 | Networks and Distributed Systems | 3 | | | | | | | | Direct | Inter | E,A,L,GP | Relat. | Inter | E,A,L,GP | | | | | | |
| FINT3320 | Machine Learning for Finance | 3 | | | | | | | | Direct | Intro | E,A,L | Relat. | Intro | E,A,L,GP | | | | Relat. | Intro | E,A,L,GP |
| FINT3010 | Cases in Financial Technologies | 3 | | Direct | Inter | E,GP,C | Direct | Inter | E,GP,C | Direct | Inter | E,GP,C | Direct | Inter | E,GP,C | Direct | Inter | E,GP,C | Direct | Inter | E,GP,C |
| CSSD2221 | Intro to Security Threats | 3 | | | | | | | | Direct | Inter | E,A,L,GP | Relat. | Intro | E,A,L,GP | Relat | Intro | E,A,L,GP | Direct | Intro | E,A,L,GP |
| *Credit count* | | 24 | | | | | | | | | | | | | | | | | | | |
| **4th year** | | | | | | | | | | | | | | | | | | | | | |
| FINT4220 | Engineering Financial Software | 3 | | | | | | | | Direct | Adv. | E,GP,C | Relat. | Adv. | E,GP | | | | Relat. | Adv. | E,GP,C |
| FINT4720 | Payment Systems and Cryptocurrencies | 3 | | Direct | Adv. | E,A | | | | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP | | | | Direct | Adv. | E,GP,C |
| FINT4230 | Software Quality Assurance | 3 | | | | | | | | Direct | Adv. | E,A | Relat. | Adv. | E,GP | | | | Direct | Adv. | E,GP,C |
| FINT4730 | Financial Cryptography and Blockchain | 3 | | Direct | Adv. | E,A | Direct | Adv. | E,A | | | | | | | | | | | | |
| FINT4610 | Financial Decision Making | 3 | | Direct | Adv. | E,A | Direct | Adv. | E,A | | | | | | | | | | | | |
| FINT4000 | Capstone Project in FinTech | 3 | | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP,C | Direct | Adv. | E,GP,C |
| *Credit count* | | 18 | | | | | | | | | | | | | | | | | | | |
| *CORE credits* | | 81 | | | | | | | | | | | | | | | | | | | |
| *Major Electives* | | 12 / 24 | | | | | | | | | | | | | | | | | | | |
| *Outside Major* | (GenEds and Fee Choices) | 30 | | | | | | | | | | | | | | | | | | | |
| **OTHER COURSES IN THE MAJOR (electives)** | | | | | | | | | | | | | | | | | | | | | |
| ITEC3310 | Data Visualization | 3 | | | | | Direct | Inter. | E,A,L,GP | | | | | | | | | | | | |
| FINT4350 | Advanced Topics in Machine Learning | 3 | | Relat. | Adv. | E,GP | Direct | Inter. | E,GP | Direct | Intro. | E,GP | Direct | Intro. | E,GP | | | | Direct | Adv. | E,GP |
| CSSD3221 | Network Security | 3 | | | | | | | | Direct | Inter. | E,A,L,GP | Related | Intro | E,A | | | | Direct | Adv. | E,GP |
| CSSD2211 | Introduction to Cloud Computing | 3 | | | | | | | | Direct | Inter. | E,A,L,GP | Direct | Intro | E,A | | | | | | |
| CSSD3xxx | Web and Mobile Programming | 3 | | | | | | | | Direct | Inter. | E,A,L,GP | Direct | Intro | E,A | | | | | | |
| ENTP4945 | Technology Entrepreneurship | 3 | | | | | | | | Direct | Intro | E,A,GP | Direct | Intro | E,A,GP | | | | Direct | Intro | E,A,GP |
| FINT3630 | Investment Management | 3 | | Relat. | Adv. | E,GP | Direct | Inter. | E,GP | | | | | | | | | | | | |
| FINT4620 | Capital Markets and Trading | 3 | | Direct | Adv. | E,GP | Relat. | Inter. | E,GP | | | | | | | | | | | | |

*Table 10. Curriculum Map.*

*Relationship Level:*

*Foundational (Found.): course does not address outcome directly but builds foundations for other courses that do, Related: course has a weaker relationship with the outcome, otherwise: the course is important for achievement of the outcome.*

*Content Level: Intro: introductory, Inter.: intermediate, Adv.: Advanced*

*Evaluation: E: Exams and Tests, A: Assignments, L: Lab Tests, (G)P: (Group) Project, S: Essays and research papers, C: Cases*

# Appendix C: Reviewer Reports and Proponents' Response

Prof. Michael R. King

# York University Quality Assurance Procedures (YUQAP)
# New Program Appraisal

## External Appraisal Report on the Proposed New
## Bachelor of Science (BSc) in Financial Technologies
## York University, Markham Campus
Proposed launch in Fall 2023

*Please provide feedback, as appropriate, on the evaluation criteria provided below.*

**External Reviewer(s)**
Michael R. King, Associate Professor and Lansdowne Chair in Finance, Gustavson School of Business, University of Victoria

### 1. Outline of the Visit
- Who was interviewed?

Lyndon Martin, Vice Provost Academic,
Alice Pitt, Senior Advisor, Markham Academic Strategic Planning
John-Justin McMurtry, Dean, Liberal Arts and Professional Studies (LA&PS),
Sean Kheraj, Associate Dean Programs, (LA&PS)
Anita Lam, Associate Dean, Teaching and Learning (LA&PS)
Sotirios Liaskos, School Director/Associate Professor, School of Information Technology,
Zijiang Cynthia Yang, Undergraduate Program Director, School of Information Technology,
Andrea Podhorsky, Assistant Professor, Dept. of Economics

- What facilities were seen

Due to COVID-19, meetings were held virtually over Zoom. I was given a PowerPoint document outlining the new Markham campus, as well as online links.

- Any other activities relevant to the appraisal

I received and reviewed the documents outlined below:
1. The program proposal brief.
2. The review template.
3. Slides introducing the Markham campus (including a clickable link to an overview video).
4. A draft of a proposed collegial governance structure for the campus.
5. A list and summaries of all programs to be offered at Markham.

I was also given links to the University Academic Plan, and the Markham Campus website:
https://www.yorku.ca/uap2020-25/
https://www.yorku.ca/markham/

In April 2020, I conducted a similar external review of a new graduate program at Queen's University, the Master of Financial Innovation and Technology (MFIT). I have one edited volume on the digital revolution in financial services, and a second sole-authored textbook forthcoming on Fintech (both with University of Toronto Press).[1]

### 2. General Objectives of the Program

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[1] https://utorontopress.com/9781487506025/the-technological-revolution-in-financial-services/

- Is/are the program name and degree designation(s) appropriate?

Yes, the program name and degree designation are appropriate given the integration of mathematics, computer programming / IT, finance and economics as well as specialized courses on financial technologies.

- For graduate programs that wish to have a Quality Council endorsed field(s), are the fields indicated in the proposal appropriate?

Not applicable for an undergraduate program.

- Are the general objectives of the program clear and are they consistent with University and Faculty missions and academic plans?

The proposal and features of this program have been designed to fit with York's University Academic Plan (UAP). The Markham campus will attract a broad sociodemographic of students. The proposed program is high quality. There has been considerable thought given to promoting research with a focus on intensive University that is committed to enhancing the well-being of the communities we serve. The location of this program at the Markham campus will fit with the strategic focus on three research clusters – Fintech, AI and society, and digital cultures. One of my suggestions below is to incorporate an entrepreneurship minor by allowing students to take courses offered by the Bachelor of Commerce in Entrepreneurship and Innovation Management.

The BSc Fintech is also a launching point for future graduate diplomas or degrees in fintech, AI and blockchain. Currently Queen's University is the main competitor, with a number of specialized professional Masters degrees on these topics.[2] These programs are driving revenues and growth at the Smith School of Business, providing a platform for attracting and hiring research faculty. Once research faculty are in place, it will be possible to attract PhD students to the Markham campus who are interested in working at the nexus of technology and financial services.

### 3. Need and Demand
- Is there sufficient explanation of need/demand for the program?

Yes, there is high demand for technologically-savvy graduates who understand financial services to work for incumbent financial institutions (banks, insurance, asset managers), related technology companies (IBM, enterprise software companies), and technology companies moving into financial services (BigTech). I have also suggested ways to better prepare interested students for entrepreneurial Fintech ventures.

The program is designed to train innovative, job-ready, and technologically skilled graduates for Toronto's financial services, Fintech, and Information and Communication Technology (ICT) sectors. There are growing job opportunities in these areas.

A key selling point and feature of this program will be incorporating cutting edge technology training into the curriculum, notably AI and machine learning, cybersecurity and digital identity, blockchain and distributed ledgers, big data analytics and visualization, and computer programming. My recommendation is to introduce more core finance courses and electives to ensure the graduates are financially-literate and job-ready for internships and full time positions in financial services. The current proposed curriculum is weak in this area.

The main competition is the Bachelor of Computing and Financial Management: (co-op) at University of Waterloo, which is stronger on accounting, finance and soft business skills but weaker on Fintech, data science, and blockchain. The complaint I hear from incumbent financial institutions (banks, asset managers, insurance companies) is that graduates do not have enough hard, technical skills. I think the current proposal has these

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[2] https://smith.queensu.ca/grad_studies/index.php

technical skills but needs to provide more financial literacy and electives for soft skills (leadership, marketing, business development).

## 4. Program Content and Curriculum
- Does the curriculum reflect the current state of the discipline or area of study? If applicable, comment on the appropriateness of any unique curriculum or program innovations or creative components.

## General Comments

As it stands, the BSc Fintech curriculum is great on Tech (computer programming, AI/ML, data analytics, blockchain and DLTs) but weak on Fin (financial intermediation, financial markets, investing and portfolio management, payments). On blockchain, the program should have a formal connection with York's Blockchain Hub https://theblockchainhub.com/

It is clear that the market (employers, students) is looking for more technical training. But the technical skills above are also taught in a computer science degree. The question, therefore, is why a "*BSc in Fintech*"? The message I have heard from Fintech ecosystem stakeholders is that programmers without knowledge of financial services present a challenge. Graduates need to have a basic literacy in financial services. If not, graduates may find that they need to attend a Masters of Finance or MFIT (i.e. both available from Queen's Smith School of Business).

One solution is to ask employers. I recommend holding focus groups with a range of employers and a diversity of HR and recruiting teams (not simply the IT staff at banks). Given that students completing a 4 year BSc Fintech will have two internships in their 3rd and 4th year, the question to employers is what skills do they need to be employable. A great resource is the TFI 2020 Financial Services Talent Pipeline report available at: https://tfi.ca/files/pages/TFI-FS-Talent-Pipeline-Report.pdf

I also recommend that the BSc Fintech set up and consult with an Advisory Board. York likely has a larger body of alumni working in the GTA in financial services and ICT sectors. For example, the Queen's MFIT has an advisory board with 17 members with a variety of professions and backgrounds.[3] Such an Advisory Board can certainly provide input on key skills that are lacking for entry-level hires in their organizations.

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[3] https://smith.queensu.ca/grad_studies/mfit/advisory_board.php

## Detailed Curriculum Review

To provide context for my detailed suggestions, let's take a look at three Fintech sources and see how many of these lines of business and skill sets are covered in the proposed curriculum: (i) CB Insights, the NY-based market intelligence firm, (ii) Toronto's MaRS Fintech cluster, and (iii) York's executive education course on Fintech.



**CB Insights, "Fintech Trends to Watch in 2019"**
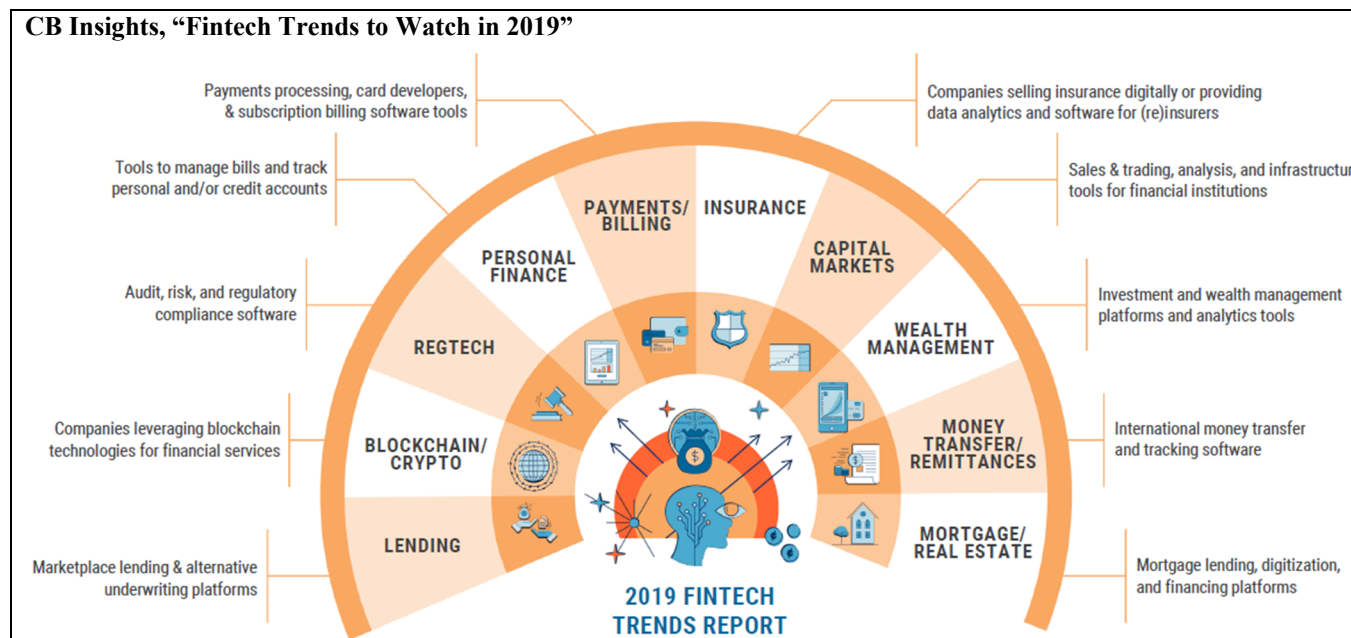
This diagram divides Fintech into 10 business areas (or lines of business) – most which are mapped easily to areas and careers within financial services. The proposed curriculum covers "Blockchain/Crypto" (a new and growing area, which may be known as Decentralized Finance or DeFi), but does not adequately cover the lines of business. Is the intention to specialize in this one niche area?

**MaRS Fintech Areas (**https://www.marsdd.com/our-sectors/Fintech/ **)**
1. **AI, data and analytics**: Machine learning tools to better engage with customers and increase revenue.
2. **Cybersecurity and digital identity**: Identity verification and safe transaction tools that protect personal information.
3. **Alternative finance**: Novel lending, credit, mortgage and investment tools for businesses and consumers.
4. **Insurance**: Technologies that are revolutionizing on-demand insurance and risk management.
5. **Online and mobile retail**: Tailored shopping solutions for on-the-go purchases and improved customer engagement experiences.
6. **Payments and remittance**: Cloud-based platforms and blockchain solutions that enable fast, secure payments anywhere in the world.

This division of Fintech features one area of tools (#1), and five business areas (#2-#6). The proposed curriculum covers the tools "AI, data and analytics" and the cyber portion of "Cybersecurity and digital identity", but does not adequately cover the remaining business areas.

**York Schulich School of Business Fintech Executive Education Course:**
https://seec.schulich.yorku.ca/program/the-Fintech-revolution-redefining-financial-services-in-the-age-of-disruption/details/
**Modules / Curriculum**
1. **Redefining the Financial Services Landscape**
   - A completely digital ecosystem: digitized products, digital customer
   - Digital currency, mobile money
   - Intersection of core verticals
   - Disruptive waves: Plotting a course amidst uncertainty and COVID-19
2. **Rise of Payments & Point-of-Sale Lending**

- Role of shopping cart experience for payments
- Financing from bricks to clicks
- Incumbents and new entrants competing for the customer experience – winning strategies
3. **Digital Banking**
   - Digital Hybrids and Digital Natives
   - Challenger or Neo-Bank examples
   - The move to Open Banking in Canada
   - Entry by the tech giants
4. **InsurTech**
   - Insurtech redefining the industry; adoption by full carriers, distributors and enablers
   - Digital carriers and brokers, micro-insurers, on-demand and usage-based insurers, P2P insurers
5. **E-commerce Transforming the Customer Experience Through Fintech**
   - Evaluating e-commerce partnerships
   - Strategies for winning combinations
   - Optimizing CX with data analytics
   - Social networks and the customer journey
   - AI and data analytics as competitive advantage
6. **Crypto Currency and Blockchain**
   - Future applications of blockchain in Fintech
   - KYC/AML and the decentralized network
   - Cryptocurrency: roles of custodians, asset managers and settlement agencies
7. **M&A in the Fintech Space**
   - Overcoming competitive barriers via acquisitions
   - Accelerating to dominance with consolidation
   - The case for partnership in Fintech

This course divides Fintech into 2 topics (landscape, M&A) and five business areas. Again, the current curriculum does not cover a significant portion of the topics taught in this course.

The proposed curriculum is below. I have underlined and bolded courses that are **REQUIRED**.

| | Technology | Mathematics | Economics, Accounting & Finance | Fintech Integrative |
|---|---|---|---|---|
| 1st yr. | **Introduction to Programming** | **Applied Calculus** **Linear Algebra** **Statistics** | **Microeconomics** **Macroeconomics** | |
| 2nd yr. | **Intermediate Programming** **Data Structures** **Management Information Systems** | **Elementary Probability** **Theory of Interest** | **Financial Accounting** **Management Accounting** | **Introduction to Fintech** |
| 3rd yr. | **Data and Knowledge Management** **Web Programming** **Operating Systems** **Networks & Distributed Systems** **Machine Learning for Finance** **Computer and Network Security** Mobile Computing | Models of Financial Economics | Finance Monetary Economics | **Cases in Fintech** |
| 4th yr. | **Software Engineering** **Software Quality Assurance** Advanced Topics in Machine Learning Data Visualization | **Operations Research for Finance** | | **Financial Cryptography and Blockchain** **Cryptoeconomics** **Capstone Fintech Project** |

Three things stands out from this table:

1. the lack of finance courses
2. the fact that no Finance course are **<u>REQUIRED</u>**, and
3. the absence of any courses in 4<sup>th</sup> year.

For a BSc in Fintech – my reaction was, "You're kidding, right?".

**The proposed curriculum is excellent on technology skills.** It is great to see the integration of AI, data analytics, cybersecurity, enterprise systems design and blockchain / distributed ledgers in the curriculum. It is also very important that graduates master Python and Java. They need to be exposed to Solidity, the programming language for the Ethereum blockchain. They also need to learn Matlab for AI/ML applications.

The proposed curriculum is not credible for a BSc Fintech. It will not provide the financial literacy required by financial sector employers. The goal should be to produce graduates who are prepared in to step into internships and careers in financial intermediaries and financial markets.

**Economics, Accounting & Finance Courses**
- Notice that the current proposal has a choice in 3<sup>rd</sup> year from two optional finance courses, *ADMS3530 Finance* course in 3<sup>rd</sup> year OR , *MATH2281 Models of Financial Economics* (taught by the Math department, so likely much more technically demanding). Both *Finance* and *Models of Financial Economics* should be required courses, with *ADMS3530* in 2<sup>nd</sup> year and *MATH2281* in 3<sup>rd</sup> year, respectively.
- Graduates will need a solid understanding of how financial institutions and financial markets operate. These topics are not covered in the proposed curriculum. Looking at the course descriptions, there is no mention of the valuation and trading of securities (equity, debt) and financial instruments (foreign exchange, derivatives). The only mention is *MATH 2280 Theory of Interest (Fixed Income)*, which is relevant for understanding bonds, but not for valuing and trading them. Much of Fintech focuses on banking, credit and risk management. The word "bank" or "banking" only appears once under any of the course descriptions. The same is true for terms "loan" and "risk management". These are critical gaps in this curriculum.
- While not all students may want to go deeply into the financial side of Fintech, students should have the option to specialize through 4<sup>th</sup> year finance electives: (i) investing and portfolio management, (ii) derivatives and risk management, (iii) corporate finance and capital markets, and (iv) algorithmic trading. For examples of course descriptions, see these courses offered by Waterloo's Bachelor of Computing and Financial Management[4], Queen's MFIT[5] or Columbia Business School's Fintech electives.[6]
- The current proposal has two accounting courses, when only one is required. Students need to understand financial statements and relationships, which is covered in *ADMS 2500 Financial Accounting*. But Fintech students do not need to be accountants. Drop *ADMS2510 Introduction to Management Accounting*.
- The current proposal has three economics courses: Micro and Macro in first year, and Monetary Economics in 3<sup>rd</sup> year. This suggestion is based on teaching the same courses for the BSc Fintech that are required for an Bachelors of Arts in Economics. Economics is valuable for any undergraduate degree but Fintech is not an economics profession. The only slice of Fintech that is economics heavy is the cryptocurrency and cryptoassets field, which is only one of a dozen areas under Fintech (despite the massive speculation in Bitcoin and Altcoins). Students need one

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[4] https://ugradcalendar.uwaterloo.ca/page/ARTS-BCFM-Overview-and-Degree-Requirements
[5] https://smith.queensu.ca/grad_studies/mfit/program-details/index.php
[6] https://www8.gsb.columbia.edu/Fintech/fincourses

*Introduction to Economics* course (covering both macro and micro) in first year. The Monetary Policy course is mislabeled, because what is needed is a course on Financial Intermediation, focusing on banking, insurance, payments, financial markets, and regulation. As a former central banker, monetary policy is too narrow and specialized for this level of student targeting Fintech. Financial intermediation and banking are critical. I recommend replacing *Monetary Economics* with a course on *Financial Markets and Financial Intermediation* as a required 3$^{rd}$ year course.

**Technology**
- Cybersecurity is the biggest operational risk facing financial services, and a key distinguishing feature of this course. Currently there is a required course in 3$^{rd}$ year (FINT 3510 Computer and Network Security). It is not clear that this course incorporates digital identity, but it should.
- I would recommend adding a 4$^{th}$ year elective course in the area of cybersecurity and/or digital identity if possible.

**Fintech Integrative**
- I do not see how you can teach an *FINT2010 Intro to Financial Technologies* in 2$^{nd}$ year without introducing *Finance* first. (Imagine teaching *Environmental Biology* before *Introduction to Biology*).
- *FINT 2010 Introduction to Financial Technologies* does not appear to be well thought out. Students do not need more than 15 minutes on the history of calculators and transaction ledgers, and maybe 20 minutes on the history of money. What they need to understand is the Fintech landscape, the lines of businesses, the business models, and the technologies.
- There are two required blockchain courses in 4$^{th}$ year (**FINT 4720 Financial Cryptography and Blockchain , FINT 4730 Cryptoeconomics**). I recommend making the former FINT 4720 a required 3$^{rd}$ year course, then offer the latter FINT 4730 as a 4$^{th}$ year elective for students who wish to specialize in crypto. Despite the hype, not all Fintech students will want to specialize in crypto. We need to recognize that crypto is only one application of blockchain and distributed ledger technology (DLT), but by no means the only one. A payments app can use DLT without requiring cryptocurrencies as the means of payment. See the R3 Corda platform for a live business example of a private, permissioned distributed ledger for financial services.
- Students specializing in crypto need an elective on Ethereum and Decentralized Finance (DeFi), as well as practice with the programing language Solidity. DeFi is the most promising growth area for decentralized financial markets, but it will likely co-exist alongside the traditional financial infrastructure for decades to come.
- **FINT 4000 Capstone Project in Fintech** is a valuable addition to the course. I would recommend broadening it to include development of a mobile app, or business plan for a Fintech startup

**The proposed curriculum does not provide entrepreneurship training for students interested in founding or working in a Fintech startup.** Students should have the ability to incorporate an entrepreneurship minor by allowing students to take courses offered by the Bachelor of Commerce in Entrepreneurship and Innovation Management. I would also recommend building connections with: York's YSpace Innovation Hub (https://yspace.yorku.ca/). I would also recommend building relationships with stakeholders in the Fintech ecosystem: incubators & accelerators (University of Waterloo & Velocity / Communitech), Ontario Centre of Innovation (formerly Ontario Centres of Excellence), Rotman's Creative Destruction Lab (Prof. Francesco Bova), and MaRS Fintech (Michelle Peng Greenberg).

I recommend incorporation a hackathon into the curriculum as an experiential component. Hackathons are great learning environments for students, and recruiting fairs for employers. York could partner with a third party, such as Hackergal (https://hackergal.org/), Waterloo's Hack The North (https://hackthenorth.com/) or Western University's HackWestern (https://www.hackwestern.com/).

- For undergraduate programs, comment on the appropriateness of the anticipated class sizes. For graduate programs, is there adequate evidence that each graduate student in the program will take a minimum of two-thirds of the course requirements from among graduate level courses?

Class sizes in 1st & 2nd year are reasonable, 3rd year is not mentioned (except labs capped at 35), and 4th year seems too small at 20.

## 5. Program Structure, Learning Outcomes and Assessment
- Are the program requirements and learning outcomes clear, appropriate and in alignment with the relevant degree level expectations?

The Program Requirements are laid out clearly, but I have suggested changes on which courses to include and what should be required vs. optional – see above.

The Learning Outcomes in "5.1.a) Program Level Outcomes" are very computer science focused. There is no mention of finance at all.

- Comment on the appropriateness of the program curriculum and structure to support the program learning outcomes. For undergraduate programs, comment on the nature and suitability of students' final-year academic achievement in the program.

I recommend removing a 3-year BSc option with 90 credits. This option will dilute the BSc Fintech degree and confuse employers who will not understand the difference between a 3-year BSc and 4-year BSc honours. The 3-year degree as proposed will not have sufficient finance and Fintech to deserve the Fintech title – instead I recommend giving students who exit at this point a BSc in Computer Science. Employers in financial services will expect students to have 4 years of undergraduate education with the corresponding credits and internships. To be credible and successful, students will need at least two internships. They will also need to specialize by choosing among the advanced 4ht year electives.

- Are the methods and criteria for assessing student achievement of learning outcomes and documenting those are appropriate and effective?

The forms of assessment are appropriate and effective, namely: Exams and Tests (E), Assignments (A), Labs Tests (L), Group Project (GP), Essays and research papers (S).

- Comment on the appropriateness of the proposed mode(s) of delivery to meet the program learning outcomes.

I like the modes of delivery described in the proposal: the flipped classroom, blended teaching, and in-person.

- Comment on the appropriateness of the experiential education component of the program, if applicable.

Experiential learning, combined with internships / work placements, will be a key success factor for this program. This feature will not only mirror the requirements at competitor schools (Waterloo), but they will provide invaluable learning opportunities that allow students to put into practice the skills and knowledge they develop in the program.

The proposal says the program will be part-time student friendly, targeting both local first-degree students and professionals in the Markham area interested in entering Fintech.

## 6. Admission Requirements
- Are the admission requirements appropriately aligned with the program learning outcomes?
- Is there sufficient explanation of any alternative requirements, if any, for admission into an undergraduate, graduate or second-entry program, such as minimum grade point average, additional languages or portfolios, along with how the program recognizes prior work or learning experience?

I found the admission requirements to be appropriate with sufficient explanation.

## 7. Resources

### For all programs
- Adequacy of the administrative unit's planned utilization of existing human, physical and financial resources, and any institutional commitment to supplement those resources, to support the program.

There were no support statements in the proposal from the relevant Dean(s)/Principal, with respect to the adequacy of existing human (administrative and faculty), physical and financial resources necessary to support the program.

- Appropriateness of the collective faculty expertise to contribute substantively to the program.

There were no faculty listed in my version of the proposal. The faculty member at York's Schulich School of Business who is leading on fintech is Professor Pauline Shum (https://schulich.yorku.ca/faculty/pauline-m-shum/ ). Pauline is the founder of a fintech startup in the wealth management space called Wealthscope (https://www.wealthscope.ca/). She would know whom to approach in the GTA with fintech expertise.

York has expertise on blockchain, evidenced by the Blockchain Hub https://theblockchainhub.com/

- Participation of a sufficient number and quality of faculty who are competent to teach and/or supervise in the program, including qualifications, research, innovation and scholarly record.

There were no faculty listed in my version of the proposal.

- Evidence that there are adequate resources (e.g. library, laboratory, studio space, equipment) to sustain the quality of scholarship produced by undergraduate students as well as graduate students' scholarship and research activities.

The Markham campus proposal shows more than adequate shared resources for this degree. Students will have a first-class experience.

### Additional criteria for undergraduate programs only
- Evidence of and planning for adequate numbers and quality of: (a) faculty and staff to achieve the goals of the program; or (b) of plans and the commitment to provide the necessary resources in step with the implementation of the program; (c) planned/anticipated class sizes; (d) provision of supervision of experiential learning opportunities (if required); and (e) the role of adjunct and contract faculty.

The program has outlined anticipated class sizes and the growth in enrolment over time. These projections are achievable, as there will be high demand both domestically and internationally.

The big gap in the proposal at this point in staffing. These sections were blank in the proposal: 7.1 Faculty, 7.2 Contract and retired faculty, 10.Curricula Vitae of the Faculty. It will be particularly difficult to hire faculty to teach the Fintech Integrative courses. In Canada, there are only a handful of finance faculty with Associate Professor or Professor level who are researching and teaching fintech. Most of the innovative work is coming from Assistant Professors and recent PhD graduates. Many top schools are looking to hire these faculty.

In the interim, York will need to rely on (i) faculty from other schools at York, (ii) adjunct or visiting faculty from other universities, and (iii) lecturers and professionals who teach specific courses (such as the two instructors from York's Executive Education program on Fintech, Jerome Dwight and Brian Metcalf.[7] As the program evolves, hiring should target the two largest annual finance recruiting conferences: the Financial Management Association each October, and the American Finance Association each January (part of the ASSA meetings). Job ads should be advertised on SSRN FEN Job Openings.[8]

The research cluster at Markham and the future potential for graduate teaching (professional Masters degrees, PhD program) will be important incentives for attracting both established faculty and new hires off the job market.

## 8. Quality of Student Experience
- Is the evidence of a program structure and faculty research that will ensure the intellectual quality of the student experience?

The MSc Fintech will be intellectually rich and demanding for students. It will be a great designation and preparation for careers in financial services and ICT in the Greater Toronto Area and across Canada. I am confident that the students will have an excellent experience, given the interdisciplinary curriculum, the learning methods, the internships and experiential learning, the research clusters (Fintech, AI, digital cultures) and brand new the facilities of the Markham campus.

*Note: Reviews are urged to avoid using references to individuals. Rather, they are asked to assess the ability of the faculty as a whole to deliver the program and to comment on the appropriateness of each of the areas/fields of the program that the university has chosen to emphasize, in view of the expertise and scholarly productivity of the faculty.*

## 9. Other Issues

**10. Summary and Recommendations** (*Note: The responsibility for arriving at a recommendation on the final classification of the program belongs to the Appraisal Committee of Quality Council. Individual reviewers are asked to refrain from making recommendations in this respect.*)

The proposed Bachelor of Science (BSc) in Financial Technologies at York's Markham campus is a timely, high profile and marketable addition to undergraduate education in Canada. It targets an important growth area at the nexus of computer programming, financial services, information and communication technologies, and entrepreneurship. The technology focus integrating AI and machine learning, cybersecurity and digital identity, blockchain and distributed ledgers, big data analytics and visualization, and computer programming will be very attractive.

My main recommendations are to incorporate more required and elective finance courses into the curriculum, while dropping proposed courses that are not integral to fintech (advanced accounting and economics). To be financially literature and job-ready, graduates will need a solid understanding of how

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[7] https://seec.schulich.yorku.ca/program/the-fintech-revolution-redefining-financial-services-in-the-age-of-disruption/details/
[8] https://www.fma.org/for-job-seekers ; https://careers.afajof.org/jobs/ ; https://www.ssrn.com/index.cfm/en/janda/job-openings/?jobsNet=203 .

financial institutions and financial markets operate. These topics are not covered in the proposed curriculum. I also recommend including the opportunity for an entrepreneurship minor with the proposed BCom, Entrepreneurship and Innovation Management.

To get feedback on the final curriculum, I recommend holding focus groups with employers targeted for internships, being careful to consider all sides of the business. I also suggest constituting an Advisory Board of York alumni working in relevant fields to gain their insights and feedback. The success of the program will be judged by the availability of student internships and success in securing full-time employment upon graduation.

A key challenge is adequately staffing this program with qualified faculty and part-time lecturers. Attracting fintech faculty will be a multi-year effort that will involve delivering on the research cluster opportunities while holding out the possible expansion in the future into graduate and PhD programs.

Prof. Michael R. King

**York University Quality Assurance Procedures (YUQAP)**
**New Program Appraisal**


**External Appraisal Report on the Proposed New**
**Bachelor of Science (BSc) in Financial Technologies**
**York University, Markham Campus**
Proposed launch in Fall 2023

**External Reviewer:**
Michael R. King, Associate Professor and Lansdowne Chair in Finance, Gustavson School of Business, University of Victoria

I have received and reviewed the revised program proposal for the **LA&PS Honours Bachelor of Science- Financial Technologies** (February 2022)). This 135-page proposal contains my initial appraisal report (from September 2021), the  Response to the External Reviewer's Recommendations (from January 2022). It also contains two sets of documents missing in the original proposal: (i) the CVs of faculty and (ii) the letters of support from other faculties.

**I find that the main recommendations in my September 2021 appraisal have all been addressed in this revised proposal. In my opinion, the BSc Fintech curriculum is much improved.**  Below, I highlight the recommendations from my appraisal *in italics* and how they have been addressed.

I see that my feedback has been taken seriously and 95% of my suggestions have been addressed. My only remaining suggestion is to consider offering an introductory finance course in 2nd year. The original proposal included *ADMS 3530 Finance* as a 3rd year elective, but it has been dropped. No doubt staffing is an issue. If that is the case, one the solution may be to allow BSc Fintech students to take this course at Schulich School of Business (or have it taught by an adjunct).

I would be happy to discuss any of these points and wish you success with this program.

Best,

Michael R King PhD CFA
Lansdowne Chair in Finance
Gustavson School of Business, UVic
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c:(250) 530-9015

Prof. Michael R. King

March 29, 2022

Below, I highlight the recommendations from my appraisal *in bullet and italics* and how they have been addressed.

## 3-year Option

- *Remove a 3-year BSc option with 90 credits. This option will dilute the BSc Fintech degree and confuse employers.*

The revised proposal does not mention of 90-credit 3-year BSc. I assume it has been dropped?

## Curriculum Design

- *The original BSc Fintech curriculum is weak on financial intermediation, financial markets, investing and portfolio management, payments. Introduce more core finance courses and electives to ensure the graduates are financially-literate and job-ready for positions in financial services. Add these topics to the curriculum: alternative finance (lending and investment tools), insurance / insurtech, digital banking, payments and point of sale lending, and e-commerce.*

Four courses have been added to strengthen the finance component of the proposed program – two core (MATH3285 – Quantitative Finance, FINT3620 – Financial Intermediation and Banking) and two electives ( FINT3630 – Investment Management, FINT4620 – Capital Markets and Trading). One elective course is now mandatory (MATH2281 – Models of Financial Economics).

Oddly, ADMS 3530 Finance – which I see as introductory finance – has been dropped.

### Finance, Economics, & Accounting

- *Incorporate more required and elective finance courses into the curriculum, while dropping proposed courses that are not integral to fintech (advanced accounting and economics).*

DONE

- *ADMS3530 Finance should be a required course in 2<sup>nd</sup> year and MATH2281 Models of Financial Economics required in 3<sup>rd</sup> year, respectively.*
- *I do not see how you can teach an FINT2010 Intro to Financial Technologies in 2<sup>nd</sup> year without introducing basic finance concepts first.*

ADMS 3530 Finance has been dropped. This was the only introductory finance course, and was formerly listed as a 3<sup>rd</sup> year elective. I think it is a mistake not to have an introductory finance course in 2<sup>nd</sup> year.

MATH2281 is now mandatory in 2<sup>nd</sup> year.

- *Graduates will need a solid understanding of how financial institutions and financial markets operate. Replace Monetary Economics with a course on Financial Markets and Financial Intermediation as a required 3<sup>rd</sup> year course.*

DONE (added FINT3620)

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New Program Proposal- Financial Technologies                                                                58

- *Students should have the option to specialize through 4th year finance electives: (i) investing and portfolio management, (ii) derivatives and risk management, (iii) corporate finance and capital markets, and (iv) algorithmic trading.*

DONE (FINT3630, FINT4620)

- *Drop ADMS2510 Introduction to Management Accounting.*

DONE

### Fintech Integrative / Technology
- *FINT 2010 Introduction to Financial Technologies does not appear to be well thought out.*

The FINT 2010 course description is much improved.

- *Make FINT 4720 Financial Cryptography and Blockchain a required 3rd year course, then offer the latter FINT 4730 Cryptoeconomics as a 4th year elective for students who wish to specialize in crypto.*

DONE. FINT4730 is also a required 4th course.

- *Add an elective on Ethereum and Decentralized Finance (DeFi), as well as practice with the programing language Solidity.*

*FINT4730 Financial Cryptography and Blockchain* will cover the foundations of smart contract languages such as Solidity (Ethereum) or Chaincode (HL Fabric)

- *Develop a formal connection with York's Blockchain Hub https://theblockchainhub.com/*

DONE

- *Add a 4th year elective course in the area of cybersecurity and/or digital identity.*

DONE. By taking *CSSD3221 Network Security* as elective, students fulfill the prerequisite to study cybersecurity more deeply by dedicating 6.0 of their non-major credits for taking any or both: *CSSD3121 Information Systems Forensics*, *CSSD4221 Vulnerability Detection*. The program will cover aspects of digital identity in *FINT4730 Financial Cryptography and Blockchain*.

### Entrepreneurship / Business
- *Include the opportunity for an entrepreneurship minor with the proposed BCom, Entrepreneurship and Innovation Management. Incorporate a hackathon into the curriculum as an experiential component.*

DONE. There is a strong entrepreneurship connection with a number of electives. There is discussion about introducing a major/minor configuration, whereby students can major in FinTech and minor in Entrepreneurship, with mention in the letter of support from the School of Administrative Studies.

- *Build connections with York's YSpace Innovation Hub and stakeholders in the Fintech ecosystem.*

There is no explicit mention of these connections. But I see mention of interaction with ecosystem partners in *ENTP4945 Technology Entrepreneurship*. I recommend pursuing this more broadly.

- *Broaden FINT 4000 Capstone Project in Fintech to include development of a mobile app, or business plan for a Fintech startup*

While there is no explicit specific mention of mobile apps or startups for *FINT4000 Capstone Project*, I see this as a possibility with the entrepreneurship courses. I also see mention that interested students can pursue a smart-contract-based project in this capstone course.

## Support Statements

- *There were no support statements in the proposal from the relevant Dean(s)/Principal, with respect to the adequacy of existing human (administrative and faculty), physical and financial resources necessary to support the program.*

I see letters of support from: Department of Economics, School of Administrative Studies, Department of Mathematics and Statistics, Schulich School of Business and York University Libraries.

I encourage the BSc Fintech faculty to follow up on this offer in the letter from Schulich: "We would welcome discussion as to whether Schulich undergraduate students might consider fulfilling their degree requirement of non-Schulich courses through enrolment in courses in this program as well as the idea of opening some seats in our undergraduate courses for your students."

## Faculty & Staffing

- *The big gap in the original proposal was staffing. There were no faculty listed. It will be particularly difficult to hire faculty to teach the Fintech Integrative courses. In the interim, York will need to rely on (i) faculty from other schools at York, (ii) adjunct or visiting faculty from other universities, and (iii) lecturers and professionals who teach specific courses. Attracting fintech faculty will be a multi-year effort that will involve delivering on the research cluster opportunities while holding out the possible expansion in the future into graduate and PhD programs.*

I see CVs from five faculty who will be teaching on the program. These faculty have complimentary skills. I note that two faculty (Chris Robinson, Gary Spraakman) are emeritus, which is no doubt an interim solution until more recruiting takes place in future.

Staffing will always be a challenge, as it is with every Canadian university in this specialized space.

## Advisory Board & Outreach

- *Set up and consult with an Advisory Board*

The revised proposal states "The formation of an industry advisory board is indeed a part of our agenda".

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- *Hold focus groups with a range of employers and a diversity of HR and recruiting teams (not simply the IT staff at banks).*

I see this reference in the proposal: "Through social media and events, the program shall maintain strong alumni relations, engaging alumni and their employers regularly to assess whether the set POs are accomplished or require curricular re-alignment or even an update of the POs themselves. The evidence acquisition would include polling (surveys) and focus groups, involving self-reported assessments from participants."

# Bachelor of Science in Financial Technologies

## Responses to the External Reviewer's Recommendations and Summary of Changes to the BSc Program

## Contents

## Second Round

Updated: March, 2022

We would like to thank again the external reviewer for his thorough examination of our updates. We append this short note to our original report to describe how we have further updated the proposal to reflect the Reviewer's March 29th updated letter.

- 3rd Year Option. The 3-year option has indeed been dropped as per the reviewer's recommendation.
- Finance Course. As per the reviewer's suggestion, *ADMS3530-Finance* has been reinstated as an alternative to the math-heavy *MATH3285-Quantitative Finance*.
- Finance Course vis-à-vis FinTech Course. We found the recommendation that a finance course is taken before the *Introduction to Financial Technologies* course difficult to implement. The needed prerequisite structure of any of the available finance courses necessitates its placement at the 4th term of the program the earliest. This means that the *FINT2010 - Introduction to Financial Technologies* must then be moved to the third year the earliest. However, it would not be optimal that FinTech students are given an overview to the subject of their studies only after spending 2 years in the program.. To address the concern, we hence design ITEC2010 to offer a birds-eye-view of the field (what the financial services industry does and how it computerises it) that we believe is possible without a deep understanding of Finance and its techniques – aspects of which are introduced in this course as needed.
- Capstone Content. The description of possible projects now includes mobile apps, start-up business plans, and DeFi apps (typically involving smart contracts).

# First Round
Updated: January, 2022

We are grateful to the external reviewer for his detailed and insightful report. We herein discuss the steps that have been taken to improve the proposal according to his recommendations. We specifically address how we have strengthened the finance component of the program proposal, how we have integrated an entrepreneurship component and related partnership opportunities, as well as how we have responded to other miscellaneous comments and suggestions made in the review.

## Strengthening of the Finance Aspect

While finance is taught in an integrated and interdisciplinary manner throughout the program, we have revised the proposal to substantially increase the discernable finance content as per the reviewer's recommendations. Specifically:

- Four (4) courses have been added to strengthen the finance component of the proposed program as follows:
    - [CORE] MATH3285 – Quantitative Finance, developed specifically for FinTech Students, offers a thorough technical treatment of the basic financial objects and instruments and their valuation.
        - MATH2281 – Models of Financial Economics has now become mandatory.
    - [CORE] FINT3620 – Financial Intermediation and Banking describes the function, structure and management of modern banks and financial institutions from a financial perspective.
    - [ELECTIVE] FINT3630 – Investment Management focusses on the theoretical and applied aspects of portfolio management and optimization, with a focus on the use of computational methods to construct optimal portfolios. The course will also cover client behavior and ethics.
    - [ELECTIVE] FINT4620 – Capital Markets and Trading builds on FINT2010 – Introduction to Financial Technologies with more depth on how capital markets are structured and supported by technology.
- The descriptions of the following courses have been updated:
    - FINT2010 – Introduction to Financial Technologies, takes a non-technical bird's-eye view of the financial services industry and how it is supported by technology. The course covers most of the areas identified in the review including banking and related services (cash management, lending, mortgages and debt collection, payments and money transfers, trading and finance services, advising), treasury and foreign exchange, financial markets (capital markets, exchange and execution, intermediaries, algorithmic trading), insurance as well as cross-cutting concerns including customer relationship management, security, risk management and regulatory compliance.

        The material is covered at a level appropriate for a second year course, with more

depth and advanced topics - particularly on capital markets - offered in FINT4620 – Capital Markets and Trading Systems and, depending on the choice of project, FINT4000 – Capstone Project.
- o FINT4720 – Payment Systems and Cryptocurrencies, which starts by describing the architecture of the payment systems in North America, followed by a high-level introduction to cryptocurrencies as a means for storing and exchanging value.
    - ▪ FINT4730 – Financial Cryptography and Blockchain now follows up FINT4720 by offering an introduction to cryptography as it applies to the financial domain and also introduces some technical aspects of cryptocurrencies including an introduction to smart contracts.
- The following courses have been dropped, following the recommendations:
  - o Management Accounting.
  - o Monetary Economics.

These changes are reflected in the updated curriculum and its mapping to program outcomes (POs). We note here that we view finance, mathematics and computing as foundational to attain the FinTech POs. Our graduates are meant to acquire a necessary part of the competencies, rather than the full breadth, for each of these subjects. As such, we feel that the original POs and their focus on financial technology adequately cover the goals of the program. Nevertheless, references to economics specifically have been removed, as the program does not have the economics orientation originally planned.

## Entrepreneurship
The proposed program strongly focusses on developing technical skills, which may be applied in an entrepreneurial environment.

When desired, broader entrepreneurship education can be acquired by taking courses that are part the BCom in Entrepreneurship and Innovation, proposed for Markham Campus in parallel to this program. To facilitate this, we have added the following course as an elective:
- ENTP4945 – Technology Entrepreneurship

To be able to take this course, students can dedicate two of their three non-major courses by taking the following prerequisites:
- [non-major] ENTP2920 – Innovation and Creativity
- [non-major] ADMS3920 – New Venture and Small Business Management

The third non-major course could be any of the following courses according to the course progression map of the BCom in Entrepreneurship and Innovation proposal:
- ENTP3990 – Hackathon I
- ENTP3950 – Social Entrepreneurship
- ENTP3995 – Independent Study in Entrepreneurship
- ENTP4960 – Principles of Entrepreneurship: Field Project

- ENTP4599 – Entrepreneurial Finance

In the future, we will explore whether we can offer a version of ENTP3990 – Hackathon that pertains to FinTech problems and tools.

The above can offer to students of the BSc program a strong understanding of the relevant aspects of entrepreneurship, while maintaining a focus on financial technology throughout their studies. The relationship between the BSc Financial Technologies and the BCom in Entrepreneurship and Innovation can further be deepened in the future through the introduction of a major/minor configuration, whereby students can major in FinTech and minor in Entrepreneurship.

Furthermore, the proposed BSc aspires to build strong ties with the The BlockchainHub at York University as follows:
- All senior FinTech students will be fully qualified to take the blockchain certification courses offered by The BlockchainHub if they desire to become trained in specific networks, tools and languages including Ethereum/Solidity, Hyperledger Fabric and EOS. The BSc core courses will offer excellent theoretical foundations for students to master the tools taught in these courses.
- The BlockchainHub also offers an excellent context in which blockchain-specific capstone projects with an entrepreneurial vision can be executed. Specifically, the incubation environment of The BlockchainHub's C-Lab is a natural place in which students' ideas could be developed into marketable products and services.

## Other curriculum updates and clarifications
- As discussed above, the content of FINT2010 – Introduction to Financial Technologies has been updated to reflect the need for greater introductory Finance content. We believe that it is important that students are offered a survey of the areas comprising the broad field of financial technology no later than the 2nd year of their studies, which will guide them in choosing future electives. Students will deepen their understanding of the role of banks and financial intermediaries in the economy in FINT3620 – Financial Intermediation and Banking and how capital markets work in FINT4620 – Capital Markets and Trading.
- The proposal continues to maintain separate introductory courses for micro- and macroeconomics to ensure that students have a foundational understanding of how markets work, prior to focussing on financial institutions and services. Also, since both of these courses are prerequisites for third-year economics courses, these courses will permit greater choice among electives and will open more academic pathways.
- The program has also been updated to allow deeper specialization into Security and Cloud Computing through participation to the BSc in Computer Science in Software Development (CSSD), proposed for Markham in parallel to this program. Specifically, a number of CSSD courses have been added as electives (CSSD2221 – Intro to Security Threats being required), constituting a foundation on which strategic choice of non-major credits from CSSD can offer stronger specialization into those two areas.

- The program will cover aspects of digital identity in FINT4730 - Financial Cryptography and Blockchain. Further, it will cover the foundations of smart contract languages such as Solidity (Ethereum) or Chaincode (HL Fabric) in FINT4730. High-assurance software engineering in these languages is covered in FINT4230 – Software Quality Assurance and interested students can pursue a smart-contract-based project in FINT4000 – Capstone Project.
    - Additional tool-specific training can be acquired through The BlockchainHub's many certification courses, as described above.
- The formation of an industry advisory board is indeed a part of our agenda to further develop, enrich and ensure the relevance of the BSc in Financial Technologies program.

## Summary

We again want to thank the reviewer for their frank and thorough comments and recommendations, which we believe we have now addressed and adopted as best possible. We have added a substantial number of core and elective finance courses, created an entrepreneurship component, and have taken additional measures to ensure that graduates are financially literate and job-ready for internships and full-time positions in the financial services industry. Finally, the program proposal now outlines opportunities for future growth (e.g. sister BCom and BA programs), which we hope will exploit whatever opportunities for FinTech education this program leaves unexplored.

# Appendix D: Support Statements

April 4,  2022

Professor Sotirios Liaskos
School of Information Technology
3051 Victor Phillip Dahdaleh Building

Dear Associate Professor Liaskos:

**Re: Decanal Support for the Honours Bachelor of Science- Financial
Technologies Proposal**

I am pleased to provide you with a letter of support for the Honours Bachelor of
Science in Financial Technologies proposal for a new degree to be housed in the
School of Information Technology within LA&PS.

The proposed program aligns closely to the priorities and principles outlined in
the University Academic Plan, 2020-25. First, in creating a professional degree
program that combines hands-on technical training in the rapidly expanding
financial services and banking sectors with the conceptual, mathematical, and
methodological knowledge of a university education, the proposed program
meets several goals under the UAP priorities "21st century learning" and
"working in partnership," including: to "continually reinvent our programs to
address emerging issues and labour market needs that call for new pedagogical
approaches and cross-disciplinary thinking;" to "build essential twenty-first
century skills into our programs, including digital fluencies, information
literacies, critical thinking, and the ability to ask good questions, marshal
evidence, and communicate effectively across varied media;" and, to connect
"our entrepreneurship and innovation activities to the broader innovation
ecosystem of Ontario."

The proposed program also aligns to the Faculty of Liberal Arts & Professional
Studies Academic Plan, 2021-26. By proposing to develop an internship
opportunity for students in a multi-disciplinary program with course offerings
from the School of Information Technology, the School of Administrative
Studies, the Faculty of Science, and the Department of Economics to be offered
at Markham Campus, the proposal aligns to the following points under principle
two and principle four: to "promote collaborations with Toronto, Peel Region,
and York Region (including Markham) to make a positive local impact on the
communities we serve;" to "promote and support curricular and pedagogical
innovation across all units and all levels of study, with particular attention to the
first-year experience and experiential learning opportunities for students in all
programs;" and, to "support opportunities for professional development and
curricular collaboration, where colleagues from different units can advance their
skills and work together on options to enhance student engagement."

By, preparing students for further study and employment in one of Ontario's fastest expanding labour markets, the proposed program also aligns to the point in SMA 3 that York University has "expanded our program offerings in areas of increasing need in Ontario- health sciences, engineering, computer science and technology, digital media and business and professional programs" (from the graduate employment rate in a related field metric). The designation of the program as an Honours Bachelor of Science provides the necessary curricular structure to ensure that the academic programming is both specific and nimble enough to adequately prepare students for career paths in engineering, computer science and technology, digital media, and business and professional contexts, which are constantly changing.

In response both the 1st and 2nd Reviewer's report, the program has added a substantial number of core and elective finance courses, created an entrepreneurship component, and have taken additional measures to ensure that graduates are financially literate and job-ready for internships and full-time positions in the financial services industry. Finally, the program proposal now outlines opportunities for future growth (e.g., sister BCom and BA programs), which we hope will exploit whatever opportunities for FinTech education this program leaves unexplored.

**Recommendation 1-Strengthening of the Finance Aspect:**

While finance is taught in an integrated and interdisciplinary manner throughout the program, we have revised the proposal to substantially increase the discernable finance content as per the reviewer's recommendations. Specifically:

Four (4) courses have been added to strengthen the finance component of the proposed program as follows:

[CORE] MATH3285 – Quantitative Finance, developed specifically for FinTech Students, offers a thorough technical treatment of the basic financial objects and instruments and their valuation.

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The material is covered at a level appropriate for a second year course, with more depth and advanced topics - particularly on capital markets - offered in FINT4620 – Capital Markets and Trading Systems and, depending on the choice of project, FINT4000 – Capstone Project.

FINT4720 – Payment Systems and Cryptocurrencies, which starts by describing the architecture of the payment systems in North America, followed by a high-level introduction to cryptocurrencies as a means for storing and exchanging value.

FINT4730 – Financial Cryptography and Blockchain now follows up FINT4720 by offering an introduction to cryptography as it applies to the financial domain and also introduces some technical aspects of cryptocurrencies including an introduction to smart contracts.

The following courses have been dropped, following the recommendations:

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Monetary Economics.

These changes are reflected in the updated curriculum and its mapping to program outcomes (POs). We note here that we view finance, mathematics and computing as foundational to attain the FinTech POs. Our graduates are meant to acquire a necessary part of the competencies, rather than the full breadth, for each of these subjects. As such, we feel that the original POs and their focus on financial technology adequately cover the goals of the program. Nevertheless, references to economics specifically have been removed, as the program does not have the economics orientation originally planned.

**Recommendation 2 -Entrepreneurship:**

The proposed program strongly focusses on developing technical skills, which may be applied in an entrepreneurial environment.

When desired, broader entrepreneurship education can be acquired by taking courses that are part the BCom in Entrepreneurship and Innovation, proposed for Markham Campus in parallel to this program. To facilitate this, we have added the following course as an elective:

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In the future, we will explore whether we can offer a version of  ENTP3990 – Hackathon that pertains to FinTech problems and tools.

The above can offer to students of the BSc program a strong understanding of the relevant aspects of entrepreneurship, while maintaining a focus on financial technology throughout their studies. The relationship between the BSc Financial Technologies and the BCom in Entrepreneurship and Innovation can further be deepened in the future through the introduction of a major/minor configuration, whereby students can major in FinTech and minor in Entrepreneurship.

**Recommendation 3- the proposed BSc aspires to build strong ties with the The BlockchainHub at York University as follows:**

All senior FinTech students will be fully qualified to take the blockchain certification courses offered by The BlockchainHub if they desire to become trained in specific networks, tools and languages including Ethereum/Solidity, Hyperledger Fabric and EOS. The BSc core courses will offer excellent theoretical foundations for students to master the tools taught in these courses.

The BlockchainHub also offers an excellent context in which blockchain-specific capstone projects with an entrepreneurial vision can be executed. Specifically, the incubation environment of The BlockchainHub's C-Lab is a natural place in

which students' ideas could be developed into marketable products and services.

Other curriculum updates and clarifications

As discussed above, the content of FINT2010 – Introduction to Financial Technologies has been updated to reflect the need for greater introductory Finance content. We believe that it is important that students are offered a survey of the areas comprising the broad field of financial technology no later than the 2nd year of their studies, which will guide them in choosing future electives. Students will deepen their understanding of the role of banks and financial intermediaries in the economy in FINT3620 – Financial Intermediation and Banking and how capital markets work in FINT4620 – Capital Markets and Trading.

The proposal continues to maintain separate introductory courses for micro- and macroeconomics to ensure that students have a foundational understanding of how markets work, prior to focussing on financial institutions and services. Also, since both of these courses are prerequisites for third-year economics courses, these courses will permit greater choice among electives and will open more academic pathways.

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The program will cover aspects of digital identity in FINT4730 - Financial Cryptography and Blockchain. Further, it will cover the foundations of smart contract languages such as Solidity (Ethereum) or Chaincode (HL Fabric) in FINT4730. High-assurance software engineering in these languages is covered in FINT4230 – Software Quality Assurance and interested students can pursue a smart-contract-based project in FINT4000 – Capstone Project.Additional tool-specific training can be acquired through The BlockchainHub's many certification courses, as described above.The formation of an industry advisory board is indeed a part of our agenda to further develop, enrich and ensure the relevance of the BSc in Financial Technologies program.

We again want to thank the reviewer for their thorough comments and recommendations, which we believe the program has now addressed and adopted as best possible. The program has added a substantial number of core and elective finance courses, created an entrepreneurship component, and have taken additional measures to ensure that graduates are financially literate and job-ready for internships and full-time positions in the financial services

industry. Finally, the program proposal now outlines opportunities for future growth (e.g. sister BCom and BA programs), which we hope will exploit whatever opportunities for FinTech education this program leaves unexplored.

In terms of the resources and infrastructure needed to deliver this program, I am pleased to note that LA&PS will commit to offering several supports. We are willing to resource the following hiring plan for full-time, tenure or tenure-track YUFA appointments to Financial Technologies: two hires in 2022, two hires in 2022, one each in years 2024 through 2028, as well as two to three potential cross-appointments of existing faculty members to the program. Rank and area of expertise prioritized for each posting will be confirmed collaboratively between the Dean's Office and the program's home academic unit during each year's recruitment cycle. Second, space planning at Markham Campus for LA&PS programs was undertaken to ensure that there would be adequate office space for faculty members to conduct research and meet with students, so the need for office space set out in the proposal can be met. Finally, I note that the Markham Campus is outfitted with computer labs and collaborative spaces to meet the needs of the program's course offerings. These spaces are managed centrally and are not part of the Faculty's designated space on the campus; however, I am confident that the campus's space and infrastructure plan supports the successful delivery of this program. Administrative and service supports for students and faculty in the program are also organized through a central collaborative effort and are adequate to ensure successful delivery of the Honours Bachelor of Science in Financial Technologies, which I am excited to see launch. In sum, this is a high-quality proposal of an important strategic academic initiative that I support in full.

Sincerely,

J.J. McMurtry
Dean
Faculty of Liberal Arts & Professional Studies

cc: Alice Pitt, Senior Advisor, Markham Academic Strategic Planning

# YORK U

## UNIVERSITÉ UNIVERSITY

**FACULTY OF LIBERAL ARTS & PROFESSIONAL STUDIES**

**Department of Economics**

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Tel  416 736-5083
Fax 416 736-5987

December 2, 2021

Re: Support for BSc Financial Technologies program at Markham

To Whom It May Concern:

On behalf of the Department of Economics, I am pleased to write this letter in support of the proposal for a new *Bachelor of Science (BSc) in Financial Technologies* to be offered at the new Markham Campus at York University.

We have reviewed the new program proposal and agree that there is a role for economics to play in the curriculum along with the mathematics, computing and finance components. In particular, the Department of Economics is happy to support the inclusion of our Principles of Microeconomics and Macroeconomics courses, ECON 1000 and ECON 1010, as requirements in the program. Students that meet the proposed admission requirements for the BSc in Financial Technologies (especially MHF4U Ontario high school math) will be well prepared to succeed in ECON 1000 and ECON 1010 courses. Furthermore, these courses will provide students with training in topics such as market dynamics, monetary policy, and marginal decision making which underpin the "financial" side of the program.

We appreciate the work that the program proponents have put into developing this new and innovative program. In summary, we are delighted to support the newly proposed Bachelor of Science in Financial Technology at the Markham Campus at York University.

Sincerely,

Neil J. Buckley, Ph.D.
Undergraduate Program Director and Associate Professor
Department of Economics
Faculty of Liberal Arts and Professional Studies
York University

# YORK U

UNIVERSITÉ
UNIVERSITY

**FACULTY OF
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Saturday, October 23, 2021

Re: Letter of support / BSc Financial Technologies

TO WHOM IT MAY CONCERN:

I write this letter on behalf of the School of Administrative Studies in support of the proposal for a new *Bachelor of Science in Financial Technologies (FinTech)* to be offered at the new Markham Campus at York University.

The School of Administrative Studies has been consulted since the early stages of the development of this new program and there is no significant overlapping of curricula between the proposed program and the programs offered at the School of Administrative Studies. The School fully supports the proposed program with the following courses:

• ADMS2500 – Financial Accounting
• ADMS2511 – Management Information Systems
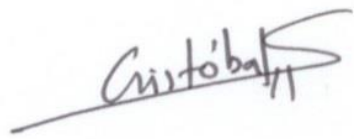• ENTP/ADMS4945 – Technology Entrepeneurship

The new program opens exciting possibilities for further involvement of SAS with additional courses in several areas such as Finance, Auditing and Assurance, Accounting, and Entrepreneurship. We are happy to continue the conversation with the FinTech program leadership on how SAS can further contribute to the new program.

We would like to thank professor Liaskos for his  efforts in developing this interesting and innovative proposal in this emerging and fast-growing field of Financial Technologies.

We fully support the development of the BSc of Financial Technologies at the Markham Campus at York University.

Sincerely,

Cristóbal Sánchez-Rodríguez, PhD
Associate Professor
sanchezc@yorku.ca

School of Administrative Studies, Faculty of Liberal Arts and Professional Studies,
York University, Tel. 416 736 2100 Ext 22893
Atkinson Building, Room 282, 4700 Keele Street, Toronto, Ontario M3J 1P3, Canada

# YORK U

UNIVERSITÉ
UNIVERSITY

**FACULTY OF SCIENCE**

**Department of Mathematics and Statistics**

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8 December 2021

The Department of Mathematics and Statistics is pleased to support the New Program Proposal of a Bachelor's degree in Financial Technologies (FinTech) at the Markham Centre Campus.

We plan to offer our existing courses Math 1013, Math 1014, Math 1131, Math 2030, Math 2280, and Math 2281 at the Markham Centre Campus to students in the FinTech program in the projected numbers.

In addition, we will work with ITEC on a course proposal for a new course Math 3285 on Introductory Quantitative Finance, which will be required for FinTech students.

We plan to offer Math 1013, Math 1014, Math 1131 to these students starting in 2023; Math 2030, Math 2280, and Math 2281 starting in 2024; and Math 3285 starting in 2025.

The Complement Plan for the Department of Mathematics and Statistics at the Markham Centre Campus explicitly includes these course offerings to students in the numbers projected in the FinTech New Program Proposal.

The Department of Mathematics and Statistics is pleased to contribute to this program and we expect it to be successful.

Best regards,

*Stephen Watson*

Professor Stephen Watson  (he/him)
Chair
Department of Mathematics and Statistics
York University

# Memorandum

**Schulich**
**School of Business**
York University

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**To:**        John-Justin McMurtry, Dean, Faculty of Liberal Arts and Professional Studies

**cc:**        Sean Kheraj, Associate Dean, Programs
            Kathryn M. Doyle, Associate Director, Faculty Curriculum
            Sotirios Liaskos, Director of the School of Information Technology

**From:**    Detlev Zwick, Interim Dean, Schulich School of Business

**Date:**    October 6, 2021

**Subject:**    Proposal for MCC-based (Honours) Bachelor of Science in Financial Technologies

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I am pleased to provide this letter of consultation on behalf of the Schulich School of Business for the Faculty of Liberal Arts and Professional Studies' proposed new degree program – the (Honours) Bachelor of Science in Financial Technologies – which is being planned for a launch at the Markham Centre Campus in fall 2023. The School fully supports the development of this new program.

Schulich applauds the Faculty's vision of creating this Bachelor of Science in Financial Technologies for offering at our Markham Centre Campus. We believe that the proposed degree program with its specific industry orientation and strong experiential component is in line with the Markham Centre Campus vision and will be an important contribution to York's efforts in this regard.

Colleagues reviewed the proposed curriculum closely and found it to be complimentary to the curriculum of Schulich's BBA Specialization in Finance. We do not see this program as being in competition with Schulich's undergraduate activity and we do not believe is would create any confusion in the market.

There may be opportunities for collaboration at the course level between our two Faculties arising from the launching of this program. We would welcome discussion as to whether Schulich undergraduate students might consider fulfilling their degree requirement of non-Schulich courses through enrolment in courses in this program as well as the idea of opening some seats in our undergraduate courses for your students.

Math and computer programming are important skills for future finance professionals, and the proposed curriculum would result in graduates from this new degree program being quite marketable. Of course, graduate credentials will increase marketability in the field and so students in this program may wish to consider continuing their studies in one of our Master programs.

On behalf of the Schulich School of Business I wish the Faculty of Liberal Arts and Professional Studies every success in implementing this new program.

# Memorandum

**YORK UNIVERSITY LIBRARIES**

**Office of the Dean**

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To: Sotirios Liaskos

From: Joy Kirchner, Dean of Libraries

Date: October 13, 2021

Subject: Bachelor of Science in Financial Technologies Program Support Letter

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York University Libraries (YUL) is strongly positioned to support the curriculum and research needs of students and faculty in the proposed Bachelor of Science in Financial Technologies program at York University's Markham Campus. As noted in the Statement of Library Support, YUL provides access to an extensive array of resources and services that support the academic engagement of students and faculty in this program. I draw your attention to the new Markham Campus Centre Library (MCCL) spaces that will provide immersive, technology enhanced spaces that lends itself well to your program.

I also highlight YUL's curriculum integration offerings, digital literacy programs, our business collections, business elearning modules, and specialized programming offered through our digital scholarship centre. YUL also offers broad and deep knowledge and infrastructure to support emerging curricular needs in financial, marketing and entrepreneurship literacies.

We look forward to contributing to the success of students and faculty in Bachelor of Science in Financial Technologies program at the Markham Campus of York University.

cc: Patti Ryan, Director, Content Development and Analysis
Jack Leong, Associate Dean of Libraries, Research and Open Scholarship
Andrea Kosavic, Associate Dean, Digital Engagement and Strategy

January 14, 2022

To the Committee on Curriculum, Curricular Policy and Standards (CCPS),

**Re: Letter of Support - Bachelor of Science in Financial Technologies Program, Markham Campus**

The LA&PS Experiential Education Office offers this letter in support of the Bachelor of Science in Financial Technologies Program and its proposed internship component and other experiential education opportunities that support the vision and goals of the new Markham Campus, the University Academic Plan, and the Faculty.

The proposed internship component is aligned with current National best practices in work-integrated learning and will make an important contribution to providing Markham Campus students with high-impact learning experiences within the vibrant York Region. The proposed program structure and eligibility requirements align with those of the existing optional LA&PS Internship Program, including enrollment in a 120 credit Honours degree program, good academic standing, and completion of 54 credits to participate. Internships are always paid, full-time work experiences with an industry partner and require students to take a break from full-time academic studies for the duration of the work term (either 4, 8, 12 or 16 months of employment). As per National co-op and internship guidelines, students must return to one term of full-time studies after their final work term, and therefore may remain eligible to job seek in the program until they have fewer than 9 credits remaining in the degree to graduate. After accepting an internship job offer at a company, students are enrolled in a 0-credit work term course that supports their learning and reflection during the work experience and maintains students' full-time status at the University. It is common best practice for industry supervisors to provide feedback and evaluation of students' workplace performance and relevant skills, which in addition to students' own critical reflection on the experience, are used to assess the credit/no credit grade for the work term course.

The LA&PS Experiential Education Office, in partnership with the AVP Teaching & Learning and leaders currently planning for the launch of the Markham Campus, is looking forward to lending its expertise to support the development, execution, and ongoing administration of the Internship Program and other curricular experiential education opportunities as needed for the BSc Financial Technology Program and its students to thrive.

Sincerely,

Melanie Belore
Associate Director, Experiential Education
AVP T&L Special Advisor on Experiential Education Strategy, Markham Campus

# MEMO

**TO:**           Sean Kheraj, Vice Dean and Associate Dean, Programs
Faculty of Liberal Arts and Professional Studies

**FROM:**     Dan Palermo, Vice Dean, Lassonde School of Engineering

**CC:**           Richard Hornsey, Chair, Department of Electrical Engineering & Computer Science
Alice Pitt, Senior Advisor, Markham Academic Strategic Planning

**SUBJECT:**   Statement of Support for LA&PS Honours Bachelor of Science – Financial Technologies (FINTECH)

**DATE:**       February 9, 2022

I am pleased to express our support for the new Honours Bachelor of Science – Financial Technologies (FINTECH) program to be launched at the Markham Campus in fall of 2023. Similar to the two new Lassonde School of Engineering (LSE) programs (Computer Science for Software Development and Digital Technologies) recently approved by York Senate, the delivery of FINTECH is in line with York University's strategic priorities with a commitment to the Markham community in providing increased access to talent to address the skills shortage in the ICT sector.

The proponents of the proposed FINTECH program from LA&PS have consulted with colleagues in our Department of Electrical Engineering and Computer Science (EECS) on the structure of the program and the proposed courses. Through this consultation, the Department of Electrical Engineering and Computer Science (EECS) has agreed to deliver courses for the FINTECH program at Markham starting in the fall of 2023 that are aligned with the area of computer science and with their expertise. It is noted that these courses are incorporated into the program's curriculum to satisfy the learning outcomes that are core to the program. LSE and EECS are committed to ensuring that these courses are made available as required at the Markham Campus. This includes the following list of courses, that are currently identified in the proposal:

| | |
|---|---|
| CSSD2221 | Intro to Security Threats |
| CSSD2211 | Introduction to Cloud Computing |
| CSSD3xxx | Web and Mobile Programming |
| CSSD3221 | Network Security |

Colleagues from EECS will collaborate with the proponents of the FINTECH program to further develop the above noted courses to meet the course learning objectives and program level outcomes of the FINTECH program. LSE and EECS are also prepared to deliver other courses listed in the proposed FINTECH curriculum in addition to those listed above. This will include courses that encompasses content that is within the expertise of EECS. The proponents of FINTECH will continue to consult with EECS on the development of these other courses, and this consultation will guide which colleagues are suited to deliver the courses and where additional faculty complement is required.

The above noted CSSD courses will require one additional faculty member within EECS to deliver the courses for the FINTECH program. Thereafter, commensurate with the courses in addition to the CSSD courses, additional complement may be required for LSE. The current complement plan for EECS at Markham only considers the delivery of the two Lassonde programs.

Lassonde also supports ongoing collaboration as FINTECH admits its first cohort and reaches key milestones in its development as a program in this emerging field of study. EECS has agreed to participate in the ongoing operationalization of the program to ensure its success. Given that EECS will be responsible for two additional four-year programs at the new campus, scheduling courses collaboratively will be a priority as will be ongoing evaluation of the suitability of the curriculum for student learning and achievement of the learning outcomes. Adjustments may be required based on how well FINTECH students are prepared to succeed in the CSSD courses, and ongoing shared responsibility for the implementation and development of the program is required.

Lassonde looks forward to these discussions and to the articulation of governance processes and procedures that will support collaboration, particularly in light of the program's expressed interest in establishing a stand-alone academic unit at the Markham Campus.