MEMORIAL UNIVERSITY

Faculty of Science

Office of the Dean
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MEETING OF THE FACULTY COUNCIL OF THE FACULTY OF SCIENCE

A regular meeting of the Faculty Council of the Faculty of Science will be held on Wednesday, June 17, 2020, at 1:00 p.m. by Webex.

AGENDA

1. **Regrets**
2. **Adoption of the Minutes of May 20, 2020**
3. **Business Arising from the Minutes**
4. **Correspondence:** Draft Strategic Framework for Indigenization 2020-2025 (https://www.mun.ca/aboriginal_affairs/SFI.php) (Paper 4, pages 7-19)
5. **Reports of Standing Committees**:
   - **A. Undergraduate Studies Committee**: None
   - **B. Graduate Studies Committee:**
     - **a.** Department of Computer Science, Request for Approval of a Graduate Course: COMP 6934, Introduction to Data Visualization (Paper 5.B.a., pages 20-25)
     - **b.** Department of Computer Science, Special Topics Course, COMP 6980, Special Topics in Artificial Intelligence, approved by the committee and presented to Faculty Council for information only (Paper 5.B.b., pages 26-30)
     - **c.** Department of Computer Science, Special Topics Course, COMP 691A/B, Special Research Project, approved by the committee and presented to Faculty Council for information only (Paper 5.B.c., pages 31-35)
     - **d.** Department of Physics and Physical Oceanography, Special Topics Course, PHYS 6061, Applications of classical and quantum formalisms in finance and other social sciences, approved by the committee and presented to Faculty Council for information only (Paper 5.B.d., pages 36-39)
   - **C. Library Committee:** No business
6. **Reports of Delegates from Other Councils**
7. **Report of the Dean**
8. **Question Period**
9. **Adjournment**

Travis Fridgen, Ph.D.
Acting Dean of Science

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FACULTY OF SCIENCE
FACULTY COUNCIL OF SCIENCE
MINUTES OF MEETING OF MAY 20, 2020

A meeting of the Faculty Council of the Faculty of Science was held on Wednesday, May 20, 2020, at 1:00 p.m. using Webex.

FSC 2747 **Present**

Biochemistry
M. Berry, R. Bertolo, J. Brunton, V. Booth, S. Harding, M. Mulligan

Biology
T. Chapman, S. Dufour, E. Edinger

Chemistry
C. Bottaro, E. Merschrod, S. Pansare

Computer Science
M. Hatcher, O. Meruvia Pastor, A.Soares

Earth Sciences
G. Dunning, G. Layne

Marine Institute
S. Caines

Mathematics & Statistics
I. Booth, R. Haynes, J. Loredo-Osti, S. Mantyka, M. Merkli, D. Pike, S. Sullivan, A. Variyath, J. Xiao

Ocean Sciences
G. Fletcher

Physics & Physical Oceanography
L. Beaulieu, S. Curnoe, J. Lagowski, M. Morrow, J. Munroe, K. Poduska, I. Saika-Voivod

Psychology
A. Swift-Gallant, C. Thorpe, C. Walsh, D. Wilson

Dean of Science Office
S. Bungay, K. Foss, T. Fridgen, G. Jackson, G. Kenny, T. Mackenzie, R. Newhook, L. Zedel

Staff
C. Hyde, A. Langille, S. Malek, J. Pittman, B. Power, N. Vanasse, E. Whelan

Graduate Students
A. Alfosool

FSC 2748 **Regrets**
K. Fowler

FSC 2749 **Adoption of Minutes**
Moved: Minutes of the meeting of April 15, 2020, meeting be adopted (Sullivan/Berry).
One abstention. Carried.

FSC 2750 **Business Arising:** None

FSC 2751 **Correspondence:** None

FSC 2752 **Reports of Standing Committees:**

.

A. Undergraduate Studies Committee:
Presented by Shannon Sullivan, Chair, Undergraduate Studies Committee.

a. Department of Biology, special topics course BIOL 4914, Special Topics in Marine Mammal Acoustics, approved by the committee and presented to Faculty Council for information only.

b. Department of Biology, special topics course BIOL 4915, Special Topics in Social Insects, approved by the committee and presented to Faculty Council for information only.

B. Graduate Studies Committee:
Presented by Graham Layne, Chair, Graduate Studies Committee.
Departments of Mathematics and Statistics and Physics and Physical Oceanography, cross-listed course MATH 6252/PHYS 6852, Quantum Information and Computing. (Layne/Loredo-Osti). **Carried.**

C. Nominating Committee: None

D. Library Committee: None

FSC 2753 **Report of the Dean**
Presented by Travis Fridgen, Acting Dean

1. **a) Fall semester will be offered remotely**

This is going to provide obvious challenges in many of our programs, from the offering of remote labs to evaluation, and remote instruction. I know there are a lot of concerns and that this is going to be a lot of work for faculty and staff transitioning to remote instruction. If there are things that the university might be able to do to assist in making this process easier, there is an academic scenario planning steering committee who are discussing how we implement this online semester, right down to things such as how to get textbooks to students. Please send any requests that will make this work easier to your Heads, and I would be happy to bring these to the committee for discussion and recommendation to Vice-Presidents Council.

b) Academic Support Representative

Keith Power is Faculty of Science's academic support representative who will be available to work with Departments over the coming months to help with pedagogy and technical issues in the delivery of on-line courses. Requests should go through department heads. Chat and phone support will also be available for "just in time" help associated with technical questions.

c) Bringing Honours Students to Campus

Academic units can now submit proposals to permit students on campus for the Fall semester. At a Heads' meeting last month, we discussed bringing necessary Honours project students to campus. I have asked Heads to identify numbers of students in each academic unit who will be doing Honours projects which will represent a maximum number of students. Each department will have a brief plan including the following:

1. Health and safety measures (i.e. PPE).
2. Equity and accessibility (we cannot compel students to come to campus). We will need to identify projects that can be done remotely for students who cannot come to campus for various reasons.
3. Contingency plan. What if alert levels go backward and we are forced to evacuate campus?

2. **Level 4 research activities**

We are currently receiving and looking at proposals to allow Level 4 research activity. It is important to get this right. If we limit our proposed research activities to those prioritized in the document under Level 4. If we get this right, the AVPR has suggested that future levels of activity could be handled at the faculty level.

3. **Hats off Ceremony**

The University is planning a Hats Off Ceremony to recognize the completion of students' academic programs. The event will take place on May 28, at 7 pm via Facebook Live with a message from President Vianne Timmons and appearances by alumni, including Alan Doyle and Trent McClellan. More information will be shared with departments.

4. **Summer Courses for Grade 12 students**

Grade 12 students will be able to take credit courses that are scheduled to begin June 4 with classes ending August 12. The Faculty of Science is proposing to offer EASC 2918, PSYC 1000, and OCSC 1000. Thank you to OCSC, PSYC, and EASC for quick responses and submitting these courses.

There will be much variety in our incoming students' math skills due to the truncation of the school year. Some students in semesterised schools will have only three weeks of instruction in their second semester courses, and for which they have received a passing grade based on work done. I would like to thank the Math department and the committees who have done a fantastic job designing credit and non-credit bridging programs for our incoming students. Math is offering MATH 1090 and 1000, for credit, as refreshers as well as non-credit remedial instruction to students this summer.

5. **Roof on Henrietta Harvey Building**
I was initially told that work on the roof of Henrietta Harvey would begin by the 3rd week of June. However, the recent Newsline has pushed this up to next week. I am now told action will be beginning next week weather permitting. FM will soon provide building wide notification of the anticipated work schedule.

6. **Course Equivalencies Committee**
I am one of 8 members of the Special Committee on Course Equivalencies. After almost 7 months of work, I am excited to report that the committee will be releasing a document for feedback soon.

7. **Spring semester meetings.**
While we do not normally meet in the spring semester, I propose we continue monthly meetings in June, July, and August.

FSC 2754 Question Period

There was discussion on the delivery of courses for the Fall semester, and specifically concerning whether faculty would teach from home or from campus. The assumption is that more faculty and staff will be permitted on campus when the province moves to Level 2 of the current COVID-19 Alert Level System. Lecture capture is preferred by most faculty members for course delivery.

Concern was expressed about the pausing of hiring faculty during the current Public Health Emergency. Very few universities are putting out ads for faculty positions at this time. The Acting Dean will continue to raise the issue of permitting job searches with the Provost.
A **motion** was put forward by E. Merschrod:
We encourage you to speak up to VPC on resuming job searches.
Seconded by O. Meruvia-Pastor.
Discussion: It is understood that the university will not be conducting in-person interviews at this time. If job ads can be posted and searches started, at least we can move this work forward.
Motion carried unanimously.

The issue of extending emergency funding for graduate students is being considered and a decision will be made next week and will be communicated to the departments and graduate students.

FSC 2755 Adjournment

The meeting adjourned at 2:09 p.m.

MEMORIAL UNIVERSITY

Strategic Framework for Indigenization 2020-2025

Introduction

Memorial University campuses are situated in the traditional territories of diverse Indigenous groups – the Beothuk, Mi'kmaq, Innu and Inuit. Acknowledging the diverse histories and cultures of the Indigenous peoples of this province is important in recognizing Indigenous peoples' enduring connection to their traditional territories. Beyond acknowledging, however, it is also incumbent on the University to give space, both literally and figuratively, to Indigenous peoples and their knowledges, pedagogies, perspectives, and more, within the academy.

In October 2017, President Kachanoski and Provost and Vice-President (Academic) Golfman issued a position statement on Indigenization. This statement underscored the critical importance of Indigenization and the fundamental role universities play in reconciliation. In April 2020, Memorial's new president, Dr. Vianne Timmons, further announced Indigenization as one of her priorities.

The way the University moves forward has significant potential for renewed meaningful relationships with Indigenous peoples. The release of the Truth and Reconciliation Commission (TRC) report in 2015 and the subsequent adoption of Universities Canada's Principles on Indigenous Education have compelled us to re-examine our approach to the inclusion of Indigenous Peoples in the academy. The TRC makes it clear that universities have a fundamental role to play in our country's reconciliation efforts. Therefore, it is no longer enough simply to provide supports to students so that they can succeed in the mainstream environment, but rather we must look at ways to indigenize the academy for the benefit of all – Indigenous and non-Indigenous – students, employees and others with a stake in the academy.

In the two years following the release of the position statement, the Office of Aboriginal Affairs, supported by the President's Advisory Committee on Aboriginal Affairs, undertook a comprehensive set of consultations. From August 2018 to August 2019, Memorial University held 26 engagement sessions with Indigenous communities across Newfoundland and Labrador. A summary report was released in November 2019 outlining what was heard from Indigenous community members. Three overarching themes emerged: Increasing Knowledge of Indigenous Peoples and Places; Indigenizing the Academy; and, Strengthening University-Indigenous Community Relationships. Community members were generous with their time, thoughts, and ideas. We thank them immensely for their contributions, as this framework would not be possible without them.

The consultation process focused on engaging faculty, staff, students and administrators throughout the University – at the Labrador Institute, the Grenfell campus, the Marine Institute, the Signal Hill campus and the St. John's campus. Indigenization will impact both academic and non-academic units throughout the University, and it is important to hear from various levels within the institution.

This report presents a set of actions grounded in consultations and framed so the University can advance reconciliation. The strategic framework sets out four strategic priorities: Leadership and Partnership; Teaching and Learning; Research; and Student Success. Within each strategic priority, actions have been identified that reflect what was heard from both Indigenous communities and the University community.

Indigenization must be led by Indigenous peoples. This is the only way that Indigenous ways of being, doing, and knowing are brought into the institution in a robust and ethical manner. At the same time, the strategic framework also recognizes that in order to indigenize the academy, there are other actions by settlers and non-Indigenous people that must necessarily happen in concert. Some of these actions can be classified as decolonizing, truth-telling, building capacity, and reconciliation. The entire Memorial University community has a role to play in ensuring that Indigenization is successful.

Goal 1: Leadership and Partnership

To ensure strong, accountable leadership and collaborative partnership for building meaningful reconciliation.

Observation

This goal focuses on two distinct principles:

Leadership, which is courageous, challenging and transformative and contributes to the aspirations and success of Mi'kmaq, Innu and Inuit, and other Indigenous peoples; and

Partnership, which serves as the foundation for meaningful and sustainable relationships.

Reconciliation between Indigenous and non-Indigenous Peoples across Newfoundland and Labrador means establishing and maintaining respectful relationships. It requires knowledge of both the accurate history and present-day situations of Indigenous Peoples in the province and across Canada. It means ensuring strong and constant Indigenous leadership in all University structures on all campuses.

1.1 Strengthening Indigenous leadership within Memorial University

There is a diversity of capacity within Indigenous communities that encompasses lived experience. These Indigenous ways of knowing, being and doing must be reflected in teaching and learning, research, and administration at Memorial University.

Response

1. Memorial University supports the Truth and Reconciliation Commission of Canada's 2015 report and will respond to those Calls to Action pertaining to post-secondary education.

2. Ensure appropriate Indigenous representation on the Board of Regents and the Senate which is in alignment with Principle #4 of Universities Canada's Principles on Indigenous Education.

3. Ensure the Office of the Special Advisor to the President is aligned with the objective of Indigenization by: retitling the position to Vice President, Indigenous; and increasing the staff complement of the office to be commensurate with all of the responsibilities of Indigenization.

4. Make the position of Associate Vice President (Indigenous Research), within the Office of the Vice President Research, permanent to ensure the continuation of the important and necessary work initiated since the position was created.

5. Create a strategy to recruit and retain Indigenous employees that provides employment stability with compensation that is market competitive.

6. Determine priority areas for Indigenous employee recruitment in order to implement some of the recommendations in this framework. The following positions should be the first of these priority areas:

   (i) Create a position of Manager, Indigenous Affairs at the Grenfell Campus that will lead and manage the implementation of campus-specific Indigenization initiatives. This position will report to both leadership at the Grenfell Campus as well as the Office of the Vice President, Indigenous.

   (ii) Hire an Indigenous-specific position in the Human Resources Department, at a senior level, to develop strategies to attract, mentor, upskill, recruit and retain Indigenous employees, or convert an existing position to meet these responsibilities. This position will have a dual report to the Office of the Vice President, Indigenous.

   (iii) Hire an Indigenous-specific position in the Office of the Registrar, at a senior level, to provide oversight, advice and support in all operational areas of the Office, or convert an existing position to meet these responsibilities. This position will report to both leadership within the Office of the Registrar as well as the Office of the Vice President, Indigenous.

7. Ensure Indigenous representation on advisory and decision-making committees, boards, panels, etc. Until such time that there are enough internal Indigenous candidates to fulfill demand, external Indigenous community members should be appointed and compensated.

8. Develop protocols/guidelines to address issues of Indigenous identity as they pertain to internal processes such as targeted hires, reserved seats, and other Indigenous-specific opportunities.

9. Create an Elder-in-Residence program on each campus, which serves to strengthen Indigenous leadership in the University and support Indigenous student success. Create guidelines for the remuneration of Elders.

1.2 Strengthening post-secondary options in Labrador

For over 40 years, Memorial University has had a presence in Labrador through the Labrador Institute, providing research and education supports. However, the Institute has never had academic unit status. The Inuit and Innu communities have long articulated the need for more post-secondary programs in Labrador, focused on Innu, Inuit, and other Indigenous priorities and ways of knowing and doing, beyond the current activities of the Labrador Institute.

Response

1. Prioritize the establishment of a Labrador Campus of Memorial University that includes supporting the development of a constitution, governance structure, and business case.

2. Secure adequate funding to ensure the successful establishment of the campus.

3. Ensure 1-2 Indigenous hires for the Labrador Campus for its first year of operation.

1.3 Increasing Knowledge of Indigenous Peoples and Places

Reconciliation starts with building knowledge of the Indigenous Peoples of this place. Indigenous Peoples have lived on these lands and waters since time immemorial, and continue to live in their traditional territories, yet the modern story of Newfoundland and Labrador is often rendered absent from the Province's and university's societal consciousness. The history and legacy of colonialism in this province must be recognized and addressed as we collectively move forward, and all University members must collectively increase knowledge of Indigenous Peoples and places for this purpose.

Response

1. Educate employees – senior leaders, faculty, staff, and administrators– about Indigenous Peoples, cultures, histories, and achievements, as well as historical and ongoing structures of settler colonization. Workshops will be delivered on a regular basis, and modified versions incorporated into orientation sessions for all new faculty and staff. Following protocol, Memorial University will partner with Indigenous groups to develop curriculum for such workshops.

2. Recognizing that entry-level university students lack knowledge of Indigenous Peoples, Memorial University will play a role in addressing systemic curriculum and professional development issues in the K-12 system. Memorial University will reach out to work in partnership with the provincial Department of Education to ensure Indigenous curriculum is effectively included and delivered in provincial schools.

3. Develop and deliver cultural humility workshops for Memorial University employees that will encourage self-reflection of assumptions and practices, comfort with 'not

knowing' and recognition of the power imbalance that exists in cross-cultural relationships and interactions.

4. Ensure that robust and effective processes are implemented to deal with Indigenous-specific racism.

Goal 2: Teaching and Learning

To enhance the learning and teaching environments at Memorial University for students, faculty, and staff to engage with each other to foster a more inclusive university environment that values Indigenous knowledges as commensurate with academic knowledge.

Observation

Indigenization within Memorial University begins with a learning environment that includes a greater number of Indigenous scholars and Indigenous curriculum specialists who can support each other and foster growth across all programs.

2.1 Supporting Teachers

Reconciliation and Indigenization must be supported by the faculty members and instructors who are at the core of Memorial University's mandate, and with a network to support each other in and out of the classroom.

Response

1. Recruit Indigenous thinkers, with lived experience, in tenure-track faculty positions, regardless of discipline, through a cluster hire framework as a means of significantly increasing the number of Indigenous scholars and ensuring a peer-support network for their academic success within the University. This cluster hire framework must be thoughtfully implemented with awareness of all campuses.

2. Launch a peer-to-peer faculty network, co-chaired by two Indigenous mentors, to inform how the educational experience of all Memorial University students could be strengthened through Indigenized content.

3. Ensure appropriate levels of curriculum development support by Indigenous curriculum development specialists (with the goal of having three who represent the various Indigenous groups within the province). These Indigenous curriculum development specialists will work with the current team within the Centre for Innovation in Teaching and Learning to develop Indigenous curriculum; to mentor Indigenous scholars; and to support and guide settler and non-Indigenous scholars who aim to incorporate Indigenous content within their courses.

4. Develop clear guidelines to support the delivery of Indigenous content when taught by settler and non-Indigenous scholars to increase the ubiquity and respectful delivery of Indigenous content across all programs.

5. Create a pathway program for growing Indigenous tenure-track faculty by providing opportunities to recruit Indigenous graduate students and emerging Indigenous scholars and to facilitate their becoming tenure-track faculty.

6. Establish opportunities to recognize innovation and excellence in Indigenous teaching and learning, and provide funding opportunities to reach those goals.

2.2 Focusing on Programs and Students

Strengthen and expand academic programs with an Indigenous focus.

Response

1. Launch additional degree and certificate programs, which may be complementary to existing degree programs, that: attract more Indigenous students, support culture and language revitalization, and strengthen partnerships between the University and Indigenous communities.

2. Review, expand and revive existing Indigenous-specific degree programs, and continue to work with Indigenous communities and governments in the Province to identify additional Indigenous-specific cohort degree programs.

3. Add at least three additional courses per academic year to better inform Memorial University students about Indigenous Peoples, cultures, histories, and achievements, as well as historical and ongoing structures of settler colonization. As such, these courses could be developed and delivered, in partnership with and under the leadership of Indigenous peoples, in a way that makes them specific to academic units.

4. Strike an Indigenous-led task force to audit academic curriculum, in partnership with academic units, to identify areas for increased Indigenous content and universal exposure to necessary lessons.

5. Develop a set of online modules that includes information of Indigenous Peoples, cultures, and histories; the history and legacy of colonialism; and the challenge of reconciliation that addresses the unique aspects of this Province. Make this a requirement for students while the University builds its academic offerings.

6. Memorial University must ensure that its graduates, regardless of their discipline, demonstrate a basic literacy in and knowledge of Indigenous peoples, histories and cultures as well as the history and ongoing impacts of colonialism and residential schools.

7. Develop an academic regulation requiring students to complete at least a 3-credit course, from a designated list of Indigenous courses approved by the Vice President, Indigenous, to graduate from any program at Memorial University.

8. Examine the designated seats programs to ensure that the program is meeting the desired outcomes.

9. Create an Indigenous-specific student career experience program, at the undergraduate and graduate levels, available on all campuses.

10. Ensure that academic support services are accessible and relevant to Indigenous students.

2.3 Focusing on Delivery

Ensure equitable access to education through inclusive pedagogical methods and course delivery.

Response

1. Increase access to courses for Indigenous communities through delivery in communities, blended delivery methods, and by online delivery.

2. As a partner institution in the University of the Arctic, Memorial University is able to avail of courses at other partner institutions. Ensure that the University provides opportunities for Indigenous students to access relevant partner institutions' courses.

3. Indigenous content in academic curriculum is an important piece of the equation, but this must be supported by Indigenous pedagogical methods to support enhanced learning environments.

Goal 3: Research

Undertake Indigenous-led and Indigenous-partnered research that is transformative and beneficial for Indigenous communities, in accordance with Indigenous ethical frameworks.

Observation

This goal focuses on supporting and enhancing Indigenous research for both Indigenous and non-Indigenous researchers.

3.1 Developing an ethical framework for engaging in Indigenous research

Research in Indigenous communities has an ongoing legacy of extraction and colonialism. The University has a responsibility to rectify this situation. Indigenous research carried out by members of the University community must adhere to Indigenous ethics and protocols.

Response

1. Introduce a clear policy framework that ensures a fulsome respectful and reciprocal engagement by Indigenous communities prior to embarking on any research initiative.

2. Develop a detailed inventory of research topics that are of interest to Indigenous communities, in partnership with Indigenous communities that responds to the needs and priorities of Indigenous communities.

3. Create guidelines and principles for engaging with Indigenous communities and traditional Indigenous knowledges.

4. Convene a group of settler and non-Indigenous researchers, elected by Indigenous research communities, to advise on ethical Indigenous research.

5. Create guidelines for the traditional knowledge keepers who work with the University in their expert capacities that addresses data ownership, compensation, co-authorship, and intellectual property.

6. Develop and deliver mandatory training for all those engaged in, or who will be engaged in, Indigenous research.

7. Adopt a data sovereignty framework to ensure Indigenous data is owned, accessible to, and controlled by Indigenous groups.

8. Created dedicated funding to support building relationships with Indigenous partners before research begins.

9. Ensure that all forms of Indigenous research, including but not limited to classroom research and program evaluation, adheres to principles of good conduct.

3.2 Strengthening Indigenous research at the University

Develop capacity and support for Indigenous research.

Response

1. Develop courses on anticolonial research methods for students, faculty, and staff at all levels.

2. Maintain a public inventory of Indigenous research within and across all campuses. Ensure that existing inventories of research recognize Indigenous-led and Indigenous-partnered research.

3. Identify and promote internal and external funding opportunities for Indigenous research that recognize the importance of developing relationships with Indigenous communities.

4. Create an Indigenous-specific career experience program that develops research skills, at the undergraduate and graduate levels, available on all campuses.

5. Develop and support networks for Indigenous staff and students who are conducting research.

6. Continue and expand on featuring Indigenous research in University-wide and/or divisional research forums, communications and marketing as often as possible.

7. Actively recruit Indigenous graduate students and postdocs.

Goal 4: Indigenous Student Success

To increase Indigenous student success by providing an inclusive environment in which Indigenous students thrive and succeed.

Observation

Indigenous Student Success focuses on providing equitable access to post-secondary education in Newfoundland and Labrador for Indigenous students. It is tied to systemic change in teaching and learning, research and governance, and can be directly supported through recruitment initiatives, transition planning and retention strategies, and supporting career development, ensuring that educational experiences are delivered through a culturally respectful physical and inclusive environment.

4.1 Indigenous Learners

The access to culturally relevant academic programming and student support services is a key factor in the success of Indigenous learners.

Response

1. Create a new Indigenous University transition program to transition Indigenous students to University study. The program will provide comprehensive supports, with both academic and student life-related focuses.

2. Increase the promotion of post-secondary programs and the recruitment of Indigenous students across Newfoundland and Labrador, and beyond.

3. Create an Elder-in-Residence program on each campus, which serves to strengthen Indigenous leadership in the University and support Indigenous student success. Create guidelines for the remuneration of Elders.

4. Review academic policies and student support services to ensure they are culturally relevant in order to promote academic success and social and cultural well-being. This can be supported by the new Indigenous-specific position in the Office of the Registrar.

4.2 Space and Place

Memorial University can welcome Indigenous Peoples to its campuses by reflecting Indigenous culture and language in architecture, art and signage, and through an increased presence of Indigenous faculty and staff.

Observation

It is important to have spaces that promote dialogue between Indigenous and non-Indigenous members of the University community.

Response

1. Provide a physical space that will welcome Indigenous students at each Memorial University campus that is commensurate with the growing number of Indigenous students at each campus. For example, the new Labrador Campus will be reflective of Innu and Inuit cultures, as well as the lands and waters of Labrador.

2. Ensure that Indigenous House is built on the St. John's campus before the end of this strategic framework timeline, where the architecture and the artwork will reflect the Indigenous peoples, cultures, languages and traditions of Newfoundland and Labrador.

3. Ensure that there is a plan for a building at the Grenfell campus that is reflective of its place in Mi'kmaw territory, before the end of this strategic framework timeline.

4. Develop public-facing signage for key buildings, roads, rooms, and other spaces in Indigenous languages of the province.

4.3 Languages and Practices

Memorial University has a responsibility to support Indigenous communities in Newfoundland and Labrador in revitalizing and safeguarding Indigenous languages, and to ensure that cultural practices adopted by Memorial University are clearly understood and consistently applied.

Response

1. Building on existing good work, commit to supporting Indigenous communities in revitalizing and safeguarding their languages.

2. Develop guidelines, in collaboration with Indigenous communities, to accompany Indigenous practices and protocols. This may include, but will not be limited to, land acknowledgements, Elder payments and other protocols to ensure that they are used appropriately and consistently throughout the University system.

From: Graham Layne <gdlayne@mun.ca>
Sent: Wednesday, May 20, 2020 5:19 PM
To: Kenny, Gail
Subject: Re: Computer Science courses - COMP 6934 & COMP6980 - Summary

Gail-

Below is a summary of our deliberations on the above courses:

RE: COMP 6934 Introduction to Data Visualization Regular Course

Committee approved this course.
Math & Statistics (via Asokan Variyath) suggested that, since this is a data science oriented course, it would be good to add “project work” as a part of the course evaluation.

RE: COMP 6980 Special Topics in Artificial Intelligence Special Topics Course

Committee approved this course.
Scientific Computing Program (via Ron Haynes) noted some overlap with MATH 6202, but that the material that overlaps appears to have a different focus and application. So not perceived as a barrier to approval.

Regards,
Graham

On 2020-05-13 13:26, Kenny, Gail wrote:
> Hi Graham,
>
> Attached are two grad course proposals from Computer Science for
> discussion/approval.
>
> (1) 6934 is moving from Special Topics COMP-6774 to a regular course
> offering.
>
> (2) 6980 is a new Special Topics Course
>
> Gail
>
> Gail Kenny
>
> Assistant to the Dean
>
> Faculty of Science Office
>
> Memorial University of Newfoundland
>
> St. John's, NL A1B 3X7
>
> gkenny@mun.ca

Request for Approval of a Graduate Course

School of Graduate Studies

Adobe Reader, minimum version 8, is required to complete this form. Download the latest version: http://get.adobe.com/reader. (1) Save the form by clicking on the diskette icon on the upper left side of the screen; (2) Ensure that you are saving the file in PDF format; (3) Specify where you would like to save the file, e.g. Desktop; (4) Fill in the required data and save the file; (5) Submit the completed form to:

School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: sgs@mun.ca

To: Dean, School of Graduate Studies
From: Faculty/School/Department/Program
Subject: ☑ Regular Course ☐ Special/Selected Topics Course

Course No.: COMP-6934 (credit-restricted with COMP-6774)

Course Title: Introdution to Data Visualization

I. To be completed for all requests:

A. Course Type:
☑ Lecture course
☐ Laboratory course
☐ Directed readings
☐ Lecture course with laboratory
☐ Undergraduate course[1]
☐ Other (please specify)

B. Can this course be offered by existing faculty? ☑ Yes ☐ No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)? If yes, please specify: ☐ Yes ☑ No

D. Will additional library resources be required (if yes, please contact munul@mun.ca for a resource consultation)? ☐ Yes ☑ No

E. Credit hours for this course: 3

F. Course description (reading list required):

Methodology and tools for data visualization in the general area of data science. Methodology is covered as a survey topic; visualization frameworks and tools will be introduced through case study of visualization problems. Students will have individual projects evaluated as presentation of methodology (oral) and design and implementation of practical software solution (written).

G. Method of evaluation:

	Percentage	
	Written	**Oral**
Class tests		
Assignments	80	20
Other (specify):		
Final examination:		
Total	100	

[1] Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

		Instructor's initials
1.	duplication of thesis work	_____
2.	double credit	_____
3.	work that is a faculty research product	_____
4.	overlap with existing courses	_____

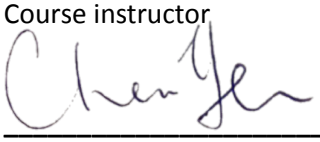
Recommended for offering in the Fall Winter Spring 20 20

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

E Brown _____ Feb 14 2020 _____

Course instructor Date



_____ May 7, 2020 _____

Approval of the head of the academic unit Date

IV. This course proposal was approved by the Faculty/School/Council

_____ _____

Secretary, Faculty/School/Council Date

Part F. Course description (reading list required)

Methodology and tools for data visualization in in the general area of data science. Methodology is covered as a survey topic; visualization frameworks and tools will be introduced in the course of case study of visualization problems. Students will have individual projects evaluated as presentation of methodology (oral) and design and implementation of practical software solution (written). Tools studies will include: gg-plot, plot.ly, and d3js.

Reading List

Munzner, Tamara, (2014) *Visualization Analysis and Design*, 428 pages, Taylor & Francis, IBSN 9781466508910

Matthew O. Ward , Georges G. Grinstein , Daniel Keim, (2015) *Interactive Data Visualization : Foundations, Techniques, and Applications, Second Edition* CRC Press, 578 pages, ISBN 9781482257373

Cairo, A. (2016) *The Truthful Art: Data, Charts, and Maps for Communication*, 376 pages, Pearson Education, ISBN 978031934079

Murray, S. (2017) *Interactive Data Visualization for the Web*, O'Reilly, ISBN 9781491921289

Wickham, H. (2010) *A Layered Grammer of Graphics*, Journal of Computational and Graphical Statistics, 19(1) pp. 3-38.

SuperDataScience, *Learn Plotly (* free video series*)*, online: https://www.superdatascience.com/pages/learn-plotly

Detailed Proposal:

COMP 6XXX

Introduction to Data Visualization

Students Interested

Those in data science or data analysis or data visualization models and tools.

Rationale

Data science is becoming an important computationally related branch of applied science. Visualization tools are becoming more prolific and important in the interpretation, analysis and application of big data and data collections in general, with a wde variety of tools and techniques. An introduction to these tools and methods is a timely contribution to the current offerings.

Objectives of the Course

Provide students with an introductory and working knowledge or common tools, packages and programming techniques in data visualization, along with an understanding of basic models and

methods to apply and create visualization designs appropriate to various types of data analysis problems. Students will get hands-on exposure to coding solutions by working on problems related to information visualization for scientific data sets. Principles, models, techniques and programming environments related to information visualization and code examples will be studied.

Credit Restriction

Credit should not be given for this course and *Special Topics in Data Visualization* COMP6774 offered in Fall 2019.

Background

Common programming languages and platforms (javascript, python and Web programming)

Working knowledge of introductory inferential statistics

Knowledge of machine learning or data mining would be an asset

Representative Course Outline

- Visualization overview
    - Objectives of visualization
    - Types of visual representation
    - Scientific data analysis
        - Distributions, descriptive and inferential stats
        - Machine learning
- Tools and packages
    - Web technologies
    - Languages and libraries for data manipulation
    - Resource considerations for Big Data
- Tools for visualization design (e.g. ggplot2, plotly and D3js)
    - Data manipulation libraries and tools and their visualization models
    - Data animation and interaction
- Principles of visualization design
    - Human visual perception
    - Data types: networks, trees, tables, grids
    - Visual encoding of data: spatial, color, animation
    - Common visual idioms
    - Complex visualization: multiviews, context, focus
- Design methodology contexts
    - Design process and innovation
    - Dashboards
    - Interactive notebooks
    - Data science suites

Readings

See section F of course proposal form

Instructors

E Brown

Calendar Entry

COMP-6XXX : uses programming examples to study the design and implementation of visualizations for the analysis, comprehension, exploration, and explanation of large data collections. Topics to be covered include principles of visual perception, visual encoding of data, visual representation of relationships, interaction methods.

Relationship to Other Courses

There is a current undergrad computer science course in data visualization, which covers similar topics. Students in this graduate level course will be provided individual "real" captured data sets for assignments, involving independent research for applying visualization to individual problems in various scientific and social contexts. Assignments will be staged to reflect research, design and implementation process of a substantial project.

Request for Approval of a Graduate Course

School of Graduate Studies

Adobe Reader, minimum version 8, is required to complete this form. Download the latest version: http://get.adobe.com/reader. (1) Save the form by clicking on the diskette icon on the upper left side of the screen; (2) Ensure that you are saving the file in PDF format; (3) Specify where you would like to save the file, e.g. Desktop; (4) Fill in the required data and save the file; (5) Submit the completed form to:

School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: sgs@mun.ca

To: Dean, School of Graduate Studies
From: Faculty/School/Department/Program
Subject: ☐ Regular Course ☑ Special/Selected Topics Course

Course No.: 6980

Course Title: Special Topics in Artificial Intelligence

I. To be completed for all requests:

A. Course Type:
☑ Lecture course
☐ Laboratory course
☐ Directed readings
☐ Lecture course with laboratory
☐ Undergraduate course[1]
☐ Other (please specify)

B. Can this course be offered by existing faculty? ☑ Yes ☐ No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)? If yes, please specify: ☐ Yes ☑ No

D. Will additional library resources be required (if yes, please contact munul@mun.ca for a resource consultation)? ☐ Yes ☑ No

E. Credit hours for this course:

F. Course description (reading list required):

This course is on the top of Artificial Intelligence, covering algorithmic techniques and data structures used in modern problem-solving environments. Each topic will have a related assignment where the learned techniques are applied to simple video games. Additional details attached as appendix at end.

G. Method of evaluation:

	Percentage	
	Written	**Oral**
Class tests	20	
Assignments	50	
Other (specify):		
Final examination:	30	
Total	100	

[1] Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

		Instructor's initials
1.	duplication of thesis work	DGC
2.	double credit	DGC
3.	work that is a faculty research product	DGC
4.	overlap with existing courses	DGC

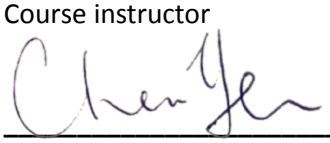
Recommended for offering in the Fall Winter Spring 20 20

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

David Churchill — February 21, 2020

Course instructor — Date



May 7, 2020

Approval of the head of the academic unit — Date

IV. This course proposal was approved by the Faculty/School/Council

Secretary, Faculty/School/Council — Date

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
Department of Computer Science

Computer Science 6XXX
Special Topics in Artificial Intelligence

Instructor:	David Churchill	Phone:	864-6140
Office:	ER-6030	Email:	dchurchill@mun.ca
Office Hours:	TBA	Website:	www.cs.mun.ca/~dchurchill/

Course Website: https://www.cs.mun.ca/~dchurchill/courses/6XXX
(most course activity will take place on D2L)

Course Objectives:

This course is an introduction to Artificial Intelligence (AI), covering algorithmic techniques and data structures used in modern problem-solving environments. Each topic will have a related assignment where the learned techniques are applied to simple video games.

Course Outline:

- Introduction to Artificial Intelligence
  - What is AI? What can Modern AI do?
  - Games as a Testing Environment for AI
  - Agents, Environments, and Problems
- Search Algorithms
  - Exhaustive Search (BFS / DFS)
  - Heuristic Functions / Incorporating Knowledge
  - Heuristic Search (Best-First Search / A*)
  - Introduction to Game Theory / Nash Equilibrium
  - Adversarial Search (Minimax / Alpha-Beta)
  - Data Structures / Optimizations for Search
- Genetic Algorithms (GA)
  - Introduction to Evolutionary Algorithms
  - GA Representations: (Genotype, Phenotype)
  - GA Implementation: Mutation, Crossover, Selection, Reproduction
- Reinforcement Learning (RL)
  - Introduction to RL: Agent, Environment, Actions, Policies, Rewards
  - Bandit Problems (Exploration vs. Exploitation)
  - Markov Decision Processes
  - Generalized Policy Iteration
  - Monte-Carlo Methods
  - Temporal Difference Learning (SARSA / Q-Learning)
- Neural Networks (NN)
  - Artificial Neurons / NN Structure / Training
  - Brief Introduction to Deep Learning

Textbook: Artificial Intelligence: A Modern Approach (Optional)
Russel & Norvig

Reinforcement Learning: An Introduction (Free Online)
Sutton & Barto
http://incompleteideas.net/book/the-book.html

Format: 2 lectures per week on Tuesday / Thursday (80 minutes each)

Evaluation:

The evaluation structure of the course is as follows:

• Assignments		50% (≤ 2 Per Group)
○ Intro to JS + BFS/ DFS	(Programming)	
○ A* Search Pathfinding	(Programming)	
○ Minimax + Alpha-Beta	(Programming)	
○ Genetic Algorithm	(Programming)	
○ Reinforcement Learning	(Programming)	
• Midterm Exam	(Written)	10% (Solo)
• Final Exam	(Written)	20% (Solo)
• Final Project	(Programming)	20% (Solo)

Note: Due the group work nature of this course, in order to show that you have individually learned the material, you must pass the final exam to pass the course. If your grade on the final exam is less than 50%, then your overall course grade will be equal to the mark that you received on the final exam. If your final exam grade is greater than or equal to 50%, your course grade is determined by the scheme above.

Memorial University Policies:

Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities (www.mun.ca/policy/site/policy.php?id=239). Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity (www.mun.ca/blundon).

Students are expected to adhere to those principles which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University. For more information regarding this policy, students should refer to the University Regulations for Academic Misconduct (Section 6.12) in the University Calendar.

Differences from COMP 3200 (undergrad):

This course will be taught along with the undergraduate course COMP 3200, and therefore will cover many of the same topics as that course. In order to differentiate it from COMP 3200, there will be several differences which assign extra reading / work to graduate students, in order to further their learning beyond that of the undergraduate course.

- Graduate students will be assigned extra reading for advanced topics
- Graduate student assignments will be done solo in this course
- This course will have a project requirement, unlike 3200
- This course will have a more difficult final exam from 3200
- Assignments will have bonus material for graduate students

Rationale for COMP 691A/B

Current work term placement opportunities have been dramatically reduced as a result of the current pandemic. As an extraordinary measure to deal with the scarcity of available opportunities in the industry and at the same time allow our students to complete their degrees, the Computer Science Department will allow students to complete two additional courses in lieu of the work term (Comp 601W).

Usually, CS grad students take COMP6999 and COMP601W in different terms as part of the requirements to complete their degrees. We view the credit value of Comp 601W (the work term placement) to correspond, at least, to the work done by a grad student in one term. Thus, we see COMP601W similar to a student taking two courses over one term, which is the closest rounded integer to the average number of courses taken by our students in the thesis and work term routes in one term. This is why, in our view, COMP6999 + two other courses could replace 601W.

Comp691A/B is similar to the current Comp 6999, with the difference that this course will take place over two terms, as opposed to one, and will be presented as an additional option for the MSc work term students to complete their degree in lieu of Comp601W as follows:

-COMP 6999 + Two additional courses

or

-COMP 691A/B + One additional course

Eventually, we plan to propose a regular version of this course, but we are proposing this special topics version now so students can benefit from this option as soon as possible.

MEMORIAL UNIVERSITY

School of Graduate Studies

Request for Approval of a Graduate Course

Adobe Reader, minimum version 8, is required to complete this form. Download the latest version: http://get.adobe.com/reader. (1) Save the form by clicking on the diskette icon on the upper left side of the screen; (2) Ensure that you are saving the file in PDF format; (3) Specify where you would like to save the file, e.g. Desktop; (4) Fill in the required data and save the file; (5) Submit the completed form to:

School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: sgs@mun.ca

To: Dean, School of Graduate Studies
From: Faculty/School/Department/Program
Subject: ☐ Regular Course ☑ Special/Selected Topics Course

Course No.: Comp 691A/B

Course Title: Special Research Project

I. To be completed for all requests:

A. Course Type:

☐ Lecture course
☐ Laboratory course
☐ Directed readings
☐ Lecture course with laboratory
☐ Undergraduate course[1]
☑ Other (please specify) Project Course

B. Can this course be offered by existing faculty? ☑ Yes ☐ No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)? If yes, please specify: ☐ Yes ☑ No

D. Will additional library resources be required (if yes, please contact munul@mun.ca for a resource consultation)? ☐ Yes ☑ No

E. Credit hours for this course: 3

F. Course description (reading list required):

This course is analogous to Comp 6999, but is designed to run over the course of two terms. Students are required, with supervision by a member of the Department, to prepare a research report in an area of Computer Science... (for the complete version of the course description please see the Appendix)

G. Method of evaluation:

	Percentage	
	Written	**Oral**
Class tests		
Assignments		
Other (specify):	100	
Final examination:		

Total 100% Research Report

[1] Must specify the additional work at the graduate level

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

		Instructor's initials
1.	duplication of thesis work	OEMP
2.	double credit	OEMP
3.	work that is a faculty research product	OEMP
4.	overlap with existing courses	OEMP

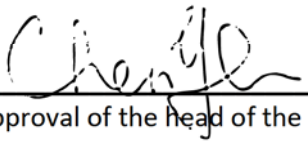
Recommended for offering in the Fall Winter Spring 20 20-3

Length of session if less than a semester: Session is designed to run over two terms.

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

Oscar Meruvia (Deputy Head, Grad. Studies) — 29/Apr/2020

Course instructor — Date



2020.05.19

Approval of the head of the academic unit — Date

IV. This course proposal was approved by the Faculty/School/Council

Secretary, Faculty/School/Council — Date

Appendix for Section F

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
Department of Computer Science
Computer Science 691A/B
Special Research Project

Summary:

This course is analogous to Comp 6999, but is designed to run over the course of two terms. Students are required, with supervision by a member of the Department, to prepare a research report in an area of Computer Science. Original research is not essential, but the student should demonstrate an ability to carry out research work independently. The report will be evaluated according to SGS regulations. A 50 minute presentation at the end of the second semester will be given by the student. This course is open only to students in non-thesis based programs in Computer Science. This course is designed to be accepted, in conjunction with another course in Computer Science, in lieu of Comp 601W(work term), for those students who have not been able to secure a work term placement, as a consequence of work place closure for Master students in Option 2 (Work term route).

Credit Restrictions:

Comp 6999

Calendar Entry:

Students are required, with supervision by a member of the Department, to prepare a research report in an area of Computer Science. Original research is not essential, but the student should demonstrate an ability to carry out research work independently.

Textbook:

N/A

Format:

Direct supervision with no lectures. Supervision will be remote or in person, if Health & Safety regulations allow it. A 50 minute presentation at the end of the second semester will be given by the student. The presentation will be done using Online

Rooms or pre-recorded lectures, uploaded to the Computer Science Virtual Seminar Room on Brightspace/D2L and made publically available.

Evaluation:

100% Course Report

Memorial University Policies:

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MEMORIAL UNIVERSITY

School of Graduate Studies

Request for Approval of a Graduate Course

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School of Graduate Studies; Memorial University of Newfoundland; IIC-2012 (Bruneau Centre for Research and Innovation); St. John's, NL A1C 5S7 Canada Fax: 709.864.4702 eMail: sgs@mun.ca

To: Dean, School of Graduate Studies
From: Faculty/School/Department/Program
Subject: ☐ Regular Course ☑ Special/Selected Topics Course

Course No.: PHYS 6061

Course Title: Applications of classical and quantum formalisms in finance and other social sciences

I. To be completed for all requests:

A. Course Type:
☑ Lecture course
☐ Laboratory course
☐ Directed readings
☐ Lecture course with laboratory
☐ Undergraduate course[1]
☐ Other (please specify)

B. Can this course be offered by existing faculty? ☑ Yes ☐ No

C. Will this course require new funding (including payment of instructor, labs, equipment, etc.)? If yes, please specify: ☐ Yes ☑ No

D. Will additional library resources be required (if yes, please contact munul@mun.ca for a resource consultation)? ☐ Yes ☑ No

E. Credit hours for this course: 1.0

F. Course description (reading list required):
This course explores how the elements of the formalism of classical and quantum mechanics can enrich our understanding of problems in decisions making (as described in psychology and economics) and can augment our capacity for model building in financial asset pricing.

G. Method of evaluation:

	Percentage	
	Written	**Oral**
Class tests	40%	
Assignments	20%	
Other (specify):		
Final examination:	40%	
Total	100%	

II. To be completed for special/selected topics course requests only

For special/selected topics courses, there is no evidence of:

	Instructor's initials
1. duplication of thesis work	
2. double credit	
3. work that is a faculty research product	
4. overlap with existing courses	

Recommended for offering in the (Fall) Winter Spring 20 20

Length of session if less than a semester:

III. This course proposal has been prepared in accordance with General Regulations governing the School of Graduate Studies

E. Haven. _____ April 10 - 2020

Course instructor _____ Date

_____ May 29, 2020

Approval of the head of the academic unit _____ Date

IV. This course proposal was approved by the Faculty/School/Council

_____ _____

Secretary, Faculty/School/Council _____ Date

Calendar entry: 6060-69 Special Topics in Interdisciplinary Areas

Physics 6061: Applications of classical and quantum formalisms in finance and other social sciences

Classes: Lectures, schedule: TBD

Instructor: Dr. Emmanuel Haven, Phone: 864 2069, BN1015
email: ehaven@mun.ca

Textbook:

Quantum Social Science (2013), E. Haven and A. Khrennikov (Cambridge University Press, New York)
(available as e-book in the library)

Notes on D2L will also be provided by the instructor after each meeting.

Description: The course is focussed on applying elementary formalisms from both classical and quantum mechanics to finance and other social sciences (notably economics and mathematical psychology). We shall consider the Hamiltonian framework (classical and quantum mechanical) in finance and economics. We shall also present applications of quantum probability to decision making problems which have relevance in both mathematical psychology and economics. After completion of this course, students will be able to understand how classical and quantum probability do offer different viewpoints on important decision making paradoxes. Students will also be able to appreciate how financial asset pricing models (like financial option pricing) can be constructed with some of the formalism from both classical and quantum mechanics.

Please note that this course is self contained. No previous knowledge is needed in either finance; economics or mathematical psychology.

Evaluation
Assignments: 20% (assignments are given every two weeks)
Midterm: 40% (in class test)
Final take home exam: 40%

Part I: Introduction

- Tools of analysis in finance and economics. Examples: Louis Bachelier; Nicolae Georgescu-Roegen
- Potential functions in economics? Examples from basic microeconomic principles
- Lagrangians and Principle of least action in social science

…/…

Part II: Classical mechanics formalism in finance

- Momentum conservation in finance? Hamiltonians in finance? Can the Hamiltonian be conserved?
- Fokker-Planck PDE in finance. Example: volatility estimation
- Option pricing theory with the Backward Kolmogorov PDE: wealth approach versus stochastic approach

Part III: Quantum mechanics formalism in finance and other social sciences

- Wave function and superposition: why can it be useful in finance and other social sciences?
- Classical and quantum probability: decision making paradoxes in economics and psychology
- Semi classical approach: introduction
- Fisher information; applications to financial non-arbitrage theory
- Universal Brownian motion: applications to financial option pricing
- Issues of Hermiticity of financial Hamiltonians

Important general University Policies:

- It is the student's responsibility to familiarize themselves with University guidelines.
- You can find them at University Calendar, School of Graduate Studies, Section 2
- Student Code of Conduct. http://www.mun.ca/student/conduct/
- Accommodations for Students with Disabilities http://www.mun.ca/blundon/accommodations/