S.23-55

SFU GRADUATE AND POSTDOCTORAL STUDIES

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MEMORANDUM

ATTENTION Senate

DATE March 15, 2023

FROM Jeff Derksen,
Chair of Senate Graduate Studies Committee (SGSC)

RE: New Courses

For information:
Acting under delegated authority at its meeting of March 7, 2023, SGSC approved the following new course, effective **Fall 2023**:

Beedie School of Business
New course:
1) BUS 742: Leadership Retreat

Faculty of Applied Science
School of Computing Science
New course:
1) CMPT 722: Rendering and Visual Computing for Artificial Intelligence

School of Sustainable Energy Engineering
New courses:
1) SEE 810: Sustainability and Sustainable Energy Technologies
2) SEE 811: Technical Communication Skills

Faculty of Science
Department of Mathematics
New courses:
1) MATH 726: Probability
2) MATH 750: Introduction to Topology
3) MATH 775: Mathematical Data Science

Department of Molecular Biology and Biochemistry
New course:
1) MBB 778: Molecular Epidemiology of Infectious Disease

SFU BEEDIE SCHOOL OF BUSINESS

Segal Graduate School | Office of the Associate Dean, 500 Granville Street, Vancouver, BC V6C 1W6 | TEL 778.782.9255, FAX 778.782.5122 | bsbgrade@sfu.ca

Memo to SGSC

To: **Senate Graduate Studies Committee**
From: **Andrew Gemino, Associate Dean, Graduate Programs**
Re: **BUS 742 Leadership Retreat**
Date: **January 6th 2023**

The following curriculum revisions have been approved by the Beedie School of Business and are forwarded to the Senate Graduate Studies Committee for approval. These curriculum items should be effective for **Fall 2023**.

Please include them on the next SGSC agenda.

- New Course: BUS 742 Leadership Retreat

The Beedie School of Business would like to create an optional course in the Full-Time MBA program titled: BUS 742 Leadership Retreat. During the retreat, students are offered a leadership framework that teaches students to lead from their strengths. This is an opportunity for leadership development that takes into account the diversity of our student group, reflecting on which leadership style suits each student, considering their unique background (e.g. gender, age, ethnicity, culture). As such, the program functions as a capstone for the leadership identity formation process that students go through during their MBA journey. They will leave the retreat having answered what their unique leadership strengths are. This process takes place in an outdoor setting which offers an opportunity to reflect on how their leadership style can be sustainable – taking care of others and the environment.

The retreat meets two important goals of SFU and of our Full-Time MBA program in particular: 1) develop authentic and sustainable leaders, 2) offer education from a diversity perspective, underscoring students' unique strengths. Students will have the option to enroll in this course in the final term of course work in lieu of BUS 723 Introduction to Managerial Thought. BUS 723 will continue to be a required course for anyone that does not choose to take the optional Leadership retreat.

The Full-Time MBA program successfully piloted an optional Leadership Retreat in August 2022 with 23 students. The experience was supported with the following resources:

- Experienced Leadership Instructors taught the course and supported students the entire experience
    - Dr. Hannes Leroy is a professor from the Rotterdam School of Management in the Netherlands. He led the course and his research focuses on developing authentic leadership. He has led leadership retreats for various business schools around the world.
- Leadership Coaches: Each group of students had a coach to help support their leadership journey and support student wellness during the activities.

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- Outdoor Guides: Experienced local guides were carefully sourced to lead the groups of students on their hikes and ensure proper precautions were taken around routes, equipment needed and safety.
    - Worked with the Canada West Mountain School that has been established and vouched for since 1982. They are the longest hiking and backpacking guide service in BC. Their guides and instructors are certified through the Association of Canadian Mountain Guides (ACMG) and must adhere to the highest international standards for Mountain Guiding.
    - Instructors not only provided safety and guidance to students during the retreat but were available to help plan routes and guidance during the planning stages of their experiences.
    - Their services included safety and emergency equipment, instructional handouts as required, and pre-trip support.
    - The course offered a unique experience for students to use their own creativity in planning their expeditions while also being supported by the guides to ensure routes were safe, realistic, and attainable.
- Staff: 2 staff members joined the students throughout the experience and were prepared to appropriately respond and support various student situations. The staff went through multiple SFU training workshops in advance. Staff were also aware of all SFU resources available to students as well as the student code of conduct and contacts to follow up with if a situation arose. They also prepared a safety plan in advance and undertook First Aidtraining.

Prior to the Retreat, Beedie School of Business staff worked with SFU's Risk Services team to review the risk assessment, insurance and any paperwork needed such as liability waivers.

Quotes from student's that attended the pilot:

" I appreciated having the opportunity to build stronger relationships with my peers, and gain more insights from Hannes [the leadership faculty]. I feel that this was a great way to complete the MBA program!"

"Good opportunity to test our leadership capabilities in a challenging environment."

"It was a great trip and incites self-reflection."

"I hope that SFU continues to offer a leadership retreat in the future, and will provide SFU alumni with the opportunity to provide some form of participation as well!"

Thank you for your attention herein. Should you have any questions or concerns, please do not hesitate to contact me.

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Andrew Gemino
Associate Dean, Graduate Programs, Beedie School of Business

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) BUS	Number (eg. 810) 742	Units (eg. 4) 2

Course title (max. 100 characters)

Leadership Retreat

Short title (for enrollment/transcript - max. 30 characters) Leadership Retreat

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

Through the Leadership Retreat, students develop their own leadership style by reflecting on their personal leadership strengths, gain understanding of others' strengths and weaknesses, learn how to lead diverse teams, and learn how to overcome set-backs and expand their comfort zone.

Rationale for introduction of this course

While some leadership knowledge is discovered in the classroom, research suggests that it takes confrontation, action, and reflection, to update the skills and behavioral patterns that help or hinder us in our leadership. The outdoor environment offers you all of that and is a great environment to accelerate the leadership development that otherwise takes years to grow. It should therefore come as no surprise that some call the outdoor setting the petri-dish of leadership development: removed from distractions, behavioral patterns are put under a microscope and the outdoor environment offers sufficient opportunity (contemplation, coaching, safe experimentation) to update those patterns

Term of initial offering (eg. Fall 2019) Fall 2023	Course delivery (eg. 3 hrs/week for 13 weeks) Prep hours and expedition varies
Frequency of offerings/year Annual	Estimated enrollment per offering 60

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

Prerequisite and/or Corequisite

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☑ Yes ☐ No

Campus where course will be taught ☐ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☑ Off campus

Course Components * ☐ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ FLD

Grading Basis ☐ Letter grades ☑ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? _____	Repeat within a term? ☐ Yes ☑ No
Required course? ☐ Yes ☑ No	Final exam required? ☐ Yes ☑ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Dr. Lieke L. ten Brummelhuis
Additional faculty members, space, and/or specialized equipment required in order to offer this course
Dr. Hannes Leroy

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Bus Grad Program	Agata Cibinska	busarcrd@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee	Signature	Date
Department Chair Lieke L. ten Brummelhuis	Signature	Date 01/09/2023

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? [x] YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Andrew Gemino		01/09/2023

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

BUS 742: Leadership Retreat

Instructor: Hannes Leroy and Lieke ten Brummelhuis	Semester: Summer 2024
Email: ltenbrum@sfu.ca	Classroom: Segal and Offsite locations which include Cheakamus Centre and surrounding areas (Garibaldi Provincial Park)
Phone: 778-782-4150	Office hours: by (Zoom) appointment

Course Description

While some leadership knowledge is discovered in the classroom, research suggests that it takes confrontation, action, and reflection, to update the skills and behavioural patterns that help or hinder us in our leadership. The outdoor environment offers you all of that and is a great environment to accelerate the leadership development that otherwise takes years to grow. It should therefore come as no surprise that some call the outdoor setting the petri-dish of leadership development: removed from distractions, behavioural patterns are put under a microscope and the outdoor environment offers sufficient opportunity (contemplation, coaching, safe experimentation) to update those patterns.

In this 3-day optional course, we will travel to Squamish BC. We will stay for two nights in Cheakamus Centre, to prepare (day 1) and evaluate (day 3) the experience that you plan with your group on day 2. This experience can vary from low to extreme physical and emotional intensity. But all activities will relate to reflection on your MBA experience thus far, your leadership identity, and your unique path forward.

Objectives

The course objectives are built on a Personalized Leadership Trajectory (where every student is unique):

- **Awareness of your leadership challenges**: Students start their course work with a 360 assessment on the five main components (identity, task, relation, change, & ethics) and start the trajectory with a clear plan on how they intend to develop each of these. Throughout the trajectory, ample opportunities are provided for peer feedback and personal coaching for students to hone in on those areas that they want/need to work on.
- **Skill development to improve your leadership abilities**: Understanding their challenges, students and instructors then go on to create natural outdoor challenges that challenge the students in those areas that they need most development. These challenges are all related to their capacity to lead effectively inside and outside of the outdoor setting.
- **Build a strong leadership identity and corresponding narrative**: Having understood, worked through their personal challenges and updated their leadership toolbox, this course also places strong emphasis on the existing strengths that a person brings to the table. We see these strengths as the rough diamond (the unique, authentic way in which all of us have the capacity to lead) that this course intends to help sharpen (by polishing the rough, challenging edges).

Summarized we focus on the following content, skills, and attitudes:

	Mindfulness	Leadership & Teamwork	Coaching
Content	Basic understanding of research/theory supporting mindfulness.	Understanding of the basic four components of leadership (task, relation, change, and ethics) and the inherent tensions between them.	Understanding basic notions of mindful and active listening as well as appreciative inquiry and powerful questions.
Skills	Hands-on application of mindfulness during daily activities.	Applied skills in each content area, such as time management (task), perspective taking (relation), storytelling (change) and ethical reasoning (moral)	We teach students how to paraphrase, summarize, observe behavioural patterns, and formulate questions that are impactful.
Attitude	The mindset to be able disconnect from an automatic mode of being to a more aware state of being.	The leadership and followership identity of knowing that your words and actions impact others and switching this off.	Leadership not through direction but through facilitation.

Course Background

Leadership has been given many names. If we count the leadership styles that have been proposed by gurus and add the variety of approaches suggested by as many consultants, it is very easy to forget that there is a forest behind all these trees. If we put all these approaches in the scientific blender, the four main topics listed below emerge (Yukl, 2010). In covering these four content-buckets, we strive to provide a well-rounded leadership development. Please note how these buckets build on each other (and will therefore be dealt with in a stepwise manner): for instance, it is hard to start talking about moral dilemmas if you have trouble getting things done.

- **Task**: do you have what it takes to *get things done*?
- **Relation**: are you able to *connect successfully* with others?
- **Change**: are your able to *deal with complexity*?
- **Ethics**: are you *aware of your impact*?

Teaching Methods

Teaching for this course is very hands-on. Because every person is unique and every outdoor challenge is unique, there is little in terms of standardized format in which challenges present themselves. Ensuring safety first and foremost, we follow these guiding principles:

1) **Personal challenges**: Students will decide on the activity they choose which ranges from meditation to a challenging hike. On day 3, there will be time/opportunity to debrief the day's events and lessons learned and discuss the challenges for the future (e.g., experiences at work). The challenges will follow the four buckets, building on each other: task, relation, change, and ethics.
2) **Leading yourself and others**: Everyone will receive ample opportunity to lead, follow, and share leadership. Throughout the course instructors will increasingly (depending on the skillset of the followers, ensuring safety at all costs) distance themselves from the actual goal to instead focus on coaching and supporting personal growth. Students will not only be coached, but throughout the trajectory will receive the skills to coach each other. These coaching skills are an effective ingredient to the capacity to lead effectively and we see this as the culmination of experience throughout the trajectory: first you learn how to lead, second you learn how to follow, third you learn how to share leadership, and fourth you learn how to coach others how to lead themselves.
3) **Mindfulness**: A final ingredient of this course is mindfulness. Although one possibility, you do not have to meditate. The outdoor setting and hikes provide ample attitude for students to engage in mindfulness in a very natural way. Instructors will gradually introduce students to the basic principles of this ancient, scientifically tested technique. We see mindfulness not as an end goal but as a catalyst: mindfulness enhances the likelihood that learning occurs.

Course workload

The course workload is the equivalent of 2 ECTS (1 ECTS = 28 hours) = 56 hours, distributed as follows:

Pre-expedition sessions and preparation:	14 hours
Expedition:	36 hours (3 days, 12 hours per day)
Individual assignment:	6 hours (3 hours problem, 3 hours solution)
Total:	56 hours

Logistics

A mandatory supplementary fee (MSF) will be attached to this course. The fee for this course is $1200 CAD. SFU organizes transport from downtown Vancouver to Cheakamus Centre on Day 1 and back to Vancouver on Day 3. Students take care of their own equipment (e.g., hiking shoes, backpack) for the trip - as many have their own equipment or want to borrow from a friend.

Book and Materials

TBD

Learning and Assessments

Assessment summary

Evaluation in the course will be based on a combination of group and individual work.

Individual	360-degree feedback	In class pre-trip	10%
	Case 1 - Task	In class pre-trip	15%
	Case 2 - Relation	In class pre-trip	15%
	Case 3 - Change	In class pre-trip	15%
	Case 4 - Ethics	In class pre-trip	15%
	Legacy Speech	During trip	10%
	In-course progress	During trip	20%
	Total		**100%**

360-Degree Feedback — Due: TBA

To personalize your leadership journey, we are asking you to complete a 360 survey (e-mailed to you approximately one month before the retreat). This is not your traditional 360 survey: we ask people who know you really well (friends, family, …) some personal questions to aid you in your development. Using this feedback, at the expedition, you will receive one letter per day from the home-front.

Cases - Problem — Due: TBA

After the introduction day, students complete a case (around 1 page - single spaced or 500 words) per topic. This is a personal case that describes one or more leadership challenges that you expect to encounter on this course. This case should not be finished (with a solution) but reflect a real and unfinished problem that you are still wrestling with and hope to solve during the expedition. These first drafts of the problem cases (4 in total) are due before the course start date, to be handed in through Canvas). These will be shared with all instructors to help them tailor the expedition to better serve your developmental needs.

Final Cases – Problem and Solution — Due: TBA

After the course, we ask students to work on the solution to their problems. The solution will reflect a concrete plan of action for each of the problems identified before the course. We expect students to hand in their problems and solutions on date tbd through Canvas. In total, this will be around 8 pages, single space, or 1000 words per topic (task, relation, change, and ethics). This means that, in

total, at the end of the course, I will receive four two-page cases on the class topics, reflecting both problem case (500 words) and solution (500 words). Cases will be graded and more important than a perfect problem and solution is the progress that students have made over the course. For instance, we expect that some students will alter their problem statement further based on the solution they have developed.

The cases will be graded with this rubric:

Case:	**Criteria:**
Writing – Lay-out micro & macro structure;	○ Went above and beyond to attract and retain the attention of the reader = 3 ○ Well-structured piece, good but not strong = 2 ○ Writing/format issues detract strongly from overall impression = 1
Evidence of Reflection; **Quality of arguments**	○ Clear arguments with a logical compelling build-up = 3 ○ Clear arguments but somewhat disconnected = 2 ○ Incoherent arguments that are only remotely connected = 1
Authenticity, **Making it personal**	○ Makes specific suggestions on how to improve the situation = 3 ○ Highlights their strengths/weaknesses in the analysis of the problem = 2 ○ Offers a personal case study with clear room for improvement = 1

Legacy Speech — Due: TBA

On day 3 of the retreat, all students will perform a Legacy Speech as the end goal of this course. This speech will be graded on clarity (structure, build-up, key-points, …), authenticity (does this person present themselves as professional yet authentic?), and credibility (would you invest 1000 dollars in this person – what was missing?). Students will receive the tools to build this speech before day 3 of the retreat.

Course Schedule

Pre-Retreat	Pre-Expedition Workshops: dates TBA	
	Topic 1	**Introduction to Outdoor Leadership Development**
	Case:	Gates of the Artic (no preparation needed)
	Topic 2	**Practical Consideration**
	Exercise:	Making a plan

Prepare Day	Day 1	
	8:00 AM	**Travel to Cheakamus**
	9:30 AM	Charter arrives at Cheakamus + put gear away in cabins
	10:30 AM	Activity 1 – Who are you
	12:00 PM	Lunch
	1:00 PM	Activity 2 – How life has shaped you.
	2:30 PM	Activity 3 – Begin with the end in mind.
	4:00 PM	Activity 4 – What leadership strengths do you bring?
	5:30 PM	Dinner
	7:00 PM	Free time
	11:00 PM	Curfew

Experience Day	Day 2	
	TBD	Expeditions begin (start time will depend on your group's plan)
	7:00 PM	Dinner
	8:00 PM	Campfire + smores

	11:00 PM	Curfew

Post-Experience Day	Day 3	
	8:00 AM	Breakfast
	Topic 1	Legacy Speeches
	Exercise:	What kind of leader will you be?
	12:00 PM	Lunch
	Topic 2	Sharing and Remembering (lessons learned)
	4:00 PM	Travel to Vancouver

Inclusiveness and Accommodations

Read the Diversity and Inclusion Community Guidelines and operate from these guidelines while in class, tutorials and any team meetings outside class

All of us have different access needs; some of these may be readily apparent, while others may not. Each student is equally important to the success of the course, so we will work together to make sure that everyone can participate. We want all students to have the opportunity to perform at their highest potential. If a student has a disability and/or may require accommodations, please notify the Centre for Accessible Learning (https://www.sfu.ca/students/accessible-learning.html) as soon as possible. The Centre for Accessible Learning exists to ensure that fair and reasonable accommodations are made for students who need them.

Academic Integrity - General

Plagiarism is the unacknowledged use of other people's ideas or work. Plagiarism is often unintentional and can be avoided through careful work habits and familiarity with academic conventions. But whether intentional or unintentional, plagiarism is recognized as a serious academic offence. The university's strong stance against plagiarism reflects our shared commitment to intellectual honesty, and the original contributions of each student and faculty member validate and sustain the university as a vital centre of knowledge and research. It is your responsibility, as a student and a member of the academic community, to ensure that you have correctly acknowledged and cited all the resources you have used in writing your work.

The following examples are representative but not exhaustive of activities constituting academic dishonesty:

- Plagiarism (presenting the work of another person as your own)
- Submitting the same work more than once without prior approval
- Translating a work from one language to another without complete and proper citation.
- Cheating
- Impersonation (having someone else write your exam)
- Submitting false records or information (forged medical notes)
- Stealing or destroying the work of another student
- Unauthorized or inappropriate use of computers, cell phones, calculators and other forms of technology in course work, assignments or examinations
- Falsifying material that is subject to academic evaluation
- Any activity not specifically outlined in this document that is intended to circumvent the standards of academic honesty

You are expected to contribute comments and write reports and assignments in your own words. Whenever you take an idea or passage from another author, you must acknowledge it by appropriately citing the source. If you are struggling to complete an assignment, please see your instructor or the program office for additional assistance.

SFU's Academic Integrity web site http://www.sfu.ca/students/academicintegrity.html is filled with more elaborate information on what is meant by academic dishonesty, where you can find resources to help with your studies and the consequences of cheating. Check out the site for more information and videos that help explain the issues in plain English.

Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. http://www.sfu.ca/policies/gazette/student/s10-01.html

ACADEMIC INTEGRITY: YOUR WORK, YOUR SUCCESS

About the Course Instructors

Dr. Lieke L. ten Brummelhuis is an Associate Professor of Management and Organizations at the Beedie School of Business, Simon Fraser University. Lieke has taught courses in Organizational Behavior, Social Policy Design, and Teamwork. She is frequently invited by organizations and media to speak about topics including stress, work-life balance and workaholism.

Lieke received her PhD in organizational sociology from Utrecht University in the Netherlands. Prior to joining the faculty at Beedie, she was a visiting scholar at University of Pennsylvania's Wharton School. Lieke's research interests cover topics related to employee well-being including employee recovery, workaholism, work-life balance, and flexible work designs. More specifically, she is motivated to find an answer to the question of *why people work in the way they work, and if there are better work style to improve work outcomes, work-life balance, and eventually well-being.* Her work has been published in academic journals such as Academy of Management Discoveries, American Psychologist, Journal of Applied Psychology, Organizational Behavior and Human Decision

Processes, Journal of Management, and Journal of Organizational Behavior as well as popular scientific outlets such as Harvard Business Review.

https://beedie.sfu.ca/profiles/LieketenBrummelhuis .

Dr. Hannes Leroy

As Academic Director of the Erasmus Center of Leadership, Hannes helps to oversee the quality of leadership development at different levels in Erasmus University (undergraduate, graduate, post-graduate, and executive education). Furthermore, as steward of the League of Leadership initiative he helps to oversee an international consortium of top business schools across the world with the mission of collectively enhancing quality standards of leadership development. Aligned with these efforts, Hannes has published numerous studies on leadership and its development in top journals, has taught a wide variety of leadership classes and is principal coordinator of various leadership development curricula.

https://www.rsm.nl/people/hannes-leroy/

OFFICE OF THE DEAN
Faculty of Applied Sciences
Simon Fraser University

MEMORANDUM

Attention Dr. Jeff Derksen
Dean, Graduate Studies

Date: Feb 22, 2023

From Dr. Parvaneh Saeedi psaeedi@sfu.ca
Faculty of Applied Science, Graduate Studies Committee

Re: FAS-CMPT 722- Advanced Rendering and Visual Computing for Artificial Intelligence

The faculty of Applied Sciences Graduate Studies Committee would like to propose a new graduate course at the School of Computing Science effective Fall 2023 CMPT 722 - Advanced Rendering and Visual Computing for Artificial Intelligence.

This course covers advanced computer graphics topics, focusing on rendering and computer graphics for virtual/augmented reality and artificial intelligence systems. It will be a modernization of "CMPT 761 Image Synthesis," combining traditional topics in photorealistic rendering with coverage of neural rendering, differentiable rendering, and inverse rendering. CMPT 761 number was previously used in 2013-2016, but the old course was withdrawn.

Regards,
Parvaneh Saeedi

SFU

COMPUTING SCIENCE

MEMO

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Web: www.cs.sfu.ca

ATTENTION	**Parvaneh Saeedi, Associate Director**
FROM	Igor Shinkar, Graduate Program Director
RE	New Course Proposal – CMPT 722
DATE	February 7, 2023

COURSE PROPOSAL CMPT 722 - Effective Fall 2023

CMPT 722 - Advanced Rendering and Visual Computing for Artificial Intelligence

The School of Computing Science is proposing a new graduate course effective Fall 2023 – CMPT 722 Advanced Rendering and Visual Computing for Artificial Intelligence.

The course cover advanced topics in computer graphics with a focus on rendering, and computer graphics for virtual/augmented reality and artificial intelligence systems. It will be a modernization of “CMPT 761 Image Synthesis” combining traditional topics in photorealistic rendering with coverage of neural rendering, differentiable rendering and inverse rendering. CMPT 761 number previously used in 2013-2016 but old course was withdrawn.

If you have any questions, please let me know.

Igor Shinkar,
Graduate Chair, School of Computing Science

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC)	Number (eg. 810)	Units (eg. 4)
CMPT	722	3

Course title (max. 100 characters)
Advanced Rendering and Visual Computing for Artificial Intelligence

Short title (for enrollment/transcript - max. 30 characters) Advanced Rendering & VC for AI

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description - max. 50 words)
Advanced topics in computer graphics with a focus on rendering, and computer graphics for virtual/augmented reality and artificial intelligence systems. Topics include photorealistic rendering; advanced ray tracing; light fields and volume rendering; differentiable and inverse rendering; neural rendering; and high-performance architectures for visual computing systems.

Rationale for introduction of this course
Rendering is increasingly used in domains such as augmented reality and artificial intelligence. This course combines traditional topics in photorealistic rendering with coverage of neural rendering, differentiable rendering and inverse rendering and their use for AI systems.

Term of initial offering (eg. Fall 2019)	Course delivery (eg. 3 hrs/week for 13 weeks)
Fall 2023	3 hrs/week for 13 weeks
Frequency of offerings/year 1	Estimated enrollment per offering 40

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)
None

Prerequisite and/or Corequisite CMPT 361 or equivalent and CMPT 726

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite
Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No
Total repeats allowed? _____
Repeat within a term? ☐ Yes ☐ No

Required course? ☐ Yes ☑ No
Final exam required? ☐ Yes ☑ No
Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Manolis Savva, Andrea Tagliasacchi, Richard Zhang, Yasu Furukawa
Additional faculty members, space, and/or specialized equipment required in order to offer this course

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
CMPT	Igor Shinkar	ishinkar@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Igor Shinkar	Signature	Date Feb 7, 2023
Department Chair Mohamed Hefeeda	Signature	Date Feb 7, 2023

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? [x] YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee Parvaneh Saeedi	Signature	Date Feb 22, 2023

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee Jeff Derksen	Signature	Date March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

CMPT 722: Advanced Rendering and Visual Computing for Artificial Intelligence

Advanced topics in computer graphics with a focus on rendering, and computer graphics for virtual/augmented reality and artificial intelligence systems. Topics include photorealistic rendering; advanced ray tracing; light fields and volume rendering; differentiable and inverse rendering; neural rendering; and high-performance architectures for visual computing systems.

Prerequisites: CMPT 361 and CMPT 726

Learning goals

- Understand the fundamentals of advanced rendering algorithms and their use in domains such as augmented/virtual reality, machine learning, and artificial intelligence
- Experience reading, summarising, and critiquing research papers on rendering and visual computing for AI
- Practice synthesising ideas from papers and connecting to own research
- Expand in-depth knowledge of rendering or image generation through a self-selected course project

Weekly schedule template

W1: Graphics fundamentals review: rasterization, ray tracing, spatial acceleration, modelling, transformations, shading, textures, real-time graphics systems & GPU pipelines
W2: 3D representations review: implicit vs explicit, Brep vs Vrep, pointclouds, meshes, multiview, voxels, fields
W3: Modelling 3D shapes & scenes: hierarchical representations, scene graphs, level-of-detail algorithms
W4-5: Rendering fundamentals: radiometry & photometry, BRDFs, lightfields
W6-7: Path tracing: rendering equation preliminaries, Monte carlo integration, volume rendering, path tracing
W8: Differentiable rendering: automatic differentiation, inverse & differentiable rendering, applications
W9: Neural rendering: image-based rendering, neural fields primer, neural rendering architectures
W10: Synthetic data: data generation for machine learning & AI applications
W11: 3D scene generation: 3D generative models overview, floorplans, layouts, shapes, scenes
W12: Graphics for AI: graphics for embodied AI, high-performance & batched rendering systems

Grading

Grading based on written assignments, programming assignments, paper presentations, and a course project.
Grading breakdown:

- 20% Paper reading & summaries
- 20% Programming assignments
- 20% Paper presentations & discussions
- 40% Course project

Material

- Physically Based Rendering: From Theory to Implementation 4th edition [Pharr, Jakob, Humphreys]

OFFICE OF THE DEAN
Faculty of Applied Sciences
Simon Fraser University

MEMORANDUM

Attention Dr. Jeff Derksen
Dean, Graduate Studies

Date: Feb 02, 2023

From Dr. Parvaneh Saeed, psaeedi@sfu.ca
Faculty of Applied Science, Graduate Studies Committee

Re: FAS-SEE Program change

The faculty of Applied Sciences Graduate Studies Committee would like to propose the following changes to the School of Sustainable Energy Engineering's Masters and PhD programs:

1. A new course SEE 810 (Sustainability and Sustainable Energy Technologies) is proposed that fulfills the need for a core course on Sustainable Energy. This will be part of the mandatory requirement for MASc and optional for the PhD students.

2. A new course SEE 811 (Technical Communication Skills) is proposed that fulfills the need for a technical communication skills course taken by all MASc and PhD students.

3. ~~A calendar entry change request to add SEE 810 to the list of mandatory courses articulated in the SEE MASc program requirements and add SEE 811 to the list of mandatory courses articulated in the SEE MASc and SEE PhD programs.~~

   The rational for these additions is that adding SEE 810 and SEE 811 will ensure that students have a suitable foundation in the concepts of sustainable energy and technical communications.

4. ~~We also request to change the scope of courses SEE 896 and SEE 897 as previously articulated in the SEE MASc and PhD program requirements, respectively. This will remove the publication and presentation skills component of the course and reduce the duration to 1hr/week.~~

   ~~The scope of SEE 896 and SEE 897 will narrow down by focusing on traditional graduate seminar components, and instead require separate courses to build on technical and communication skills.~~

We request for the changes to appear in the SEE calendar for Fall 2023.

Regards,
Parvaneh Saeedi

SFU FACULTY OF APPLIED SCIENCES | SUSTAINABLE ENERGY ENGINEERING

5118 - 10285 University Drive
Surrey, BC, Canada V5A 1S6

TEL: 778-782-7038
FAX: 778-782-5802

fas_sry_admin@sfu.ca
www.sfu.ca/see

MEMORANDUM

ATTENTION	Associate Dean Research and Grad Studies, Faculty of Applied Sciences	**DATE**	30 Jan 2023
FROM	Dr. Colin Copeland, Graduate Program Chair, School of Sustainable Energy Engineering	**PAGES**	1
RE:	Creation of SEE 810 and SEE 811 new courses ~~Changes to SEE 896 and SEE 897 courses~~ ~~SEE calendar entry to update the requirements for MASc and PhD programs~~		

This memo is ~~to accompany some changes to the SEE MASc and PhD programs as follows:~~

A new course SEE 810 is proposed that fulfills the need for a core course on Sustainable Energy. This will be part of the mandatory requirement for MASc and optional for the PhD students.

A new course SEE 811 is proposed that fulfills the need for a technical communication skills course taken by all MASc and PhD students.

~~A calendar entry change request to add SEE 810 to the list of mandatory courses articulated in the SEE MASc program requirements and add SEE 811 to the list of mandatory courses articulated in the SEE MASc and SEE PhD programs.~~

~~We also request to change the scope of courses SEE 896 and SEE 897 as previously articulated in the SEE MASc and PhD program requirements, respectively. This will remove the publication and presentation skills component of the course and reduce the duration to 1hr/week.~~

These changes are all anticipated to appear in the SEE calendar for Fall 2023.

The rational for these additions is that adding SEE 810 and SEE 811 will ensure that students have a suitable foundation in the concepts of sustainable energy and technical communications. ~~The scope of SEE 896 and SEE 897 will narrow by focusing on traditional graduate seminar components, and instead require separate courses to build on technical and communication skills.~~

Colin Copeland

SEE Graduate Program Committee Chair

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC)	Number (eg. 810)	Units (eg. 4)
SEE	810	3

Course title (max. 100 characters)

Sustainability and Sustainable Energy Technologies

Short title (for enrollment/transcript - max. 30 characters) **Sustainable Energy Foundations**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

Examines the core concepts of sustainability for graduate students in the School of Sustainable Energy Engineering (SEE). Principles of sustainability and the role of technology in addressing critical challenges relating to society's use of energy are discussed. Specific topics will include technologies for low-impact/renewable electrical energy generation, distribution, and utilization in stationary and mobile applications. It is required for students in the SEE MASc program and is optional for students in the SEE PhD program.

Rationale for introduction of this course

This will become a core course for students in the SEE MASc program and an optional course for students in the SEE PhD program. The SEE graduate program recruits from a broad range of engineering disciplines. As a result, it is important to ensure that all students have an in-depth foundation of the concepts of sustainable energy engineering to accompany their specialist expertise from their research thesis and technical electives.

Term of initial offering (eg. Fall 2019)	Course delivery (eg. 3 hrs/week for 13 weeks)
Fall 2023	4 hrs/wk (3 hrs/wk lecture + 1 hr/wk tutorial) for 13 weeks
Frequency of offerings/year: 1	Estimated enrollment per offering: 20

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

None

Prerequisite and/or Corequisite: Open to SEE MASc students or permission of the Graduate Program Chair. Co-requisites: SEE896 (MASc) or SEE897 (PhD)

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ Tutorial

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No

Total repeats allowed? _____

Repeat within a term? ☐ Yes ☑ No

Required course? ☑ Yes ☐ No

Final exam required? ☐ Yes ☑ No

Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Faculty member from the SEE faculty complement
Additional faculty members, space, and/or specialized equipment required in order to offer this course
None. The course will be taught by an individual faculty member from the SEE faculty complement. The content will be sufficiently general that most SEE faculty will be able to deliver the course. As it replaces a technical elective for student's degree program, it will have no impact on net teaching workload in SEE.

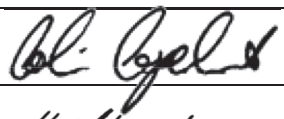
CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Sustainable Energy Engineering	Colin Copeland	colin_copeland@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Colin Copeland	Signature 	Date 2023-01-30
Department Chair Mehran Ahmadi	Signature 	Date January 30, 2023

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

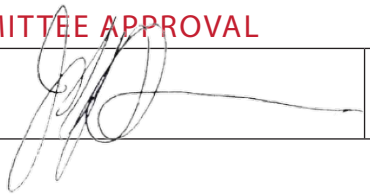
Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
P. Saeedi		Feb 2, 2023

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

School of Sustainable Energy Engineering

SEE 810 – Sustainability and Sustainable Energy Technologies

Units: 3
Lecture hours: 39

Course Description
An introduction to the core concepts of sustainability for graduate students in the School of Sustainable Energy Engineering (SEE). The course will introduce sustainability and the role of technology in addressing critical challenges relating to society's use of energy. Topics will include technologies for low-impact/renewable electrical energy generation, distribution, and utilization in stationary and mobile applications. The course is only open to graduate students in a thesis-based program in SEE. It is required for students in the SEE MASc program and is optional for students in the SEE PhD program.

Topics Covered
- Exploring complexity of sustainability concepts, including the UN SDGs
- Global energy flows, environmental and societal impacts
- Technologies for sustainable energy harvesting, storage and transmission
- End uses of energy and strategies for energy conservation
- Energy conversion technologies and service delivery

Course Organization
The course will be delivered as a lecture/tutorial style and will include group and self-directed learning components. For the course project, the students will work in small groups to explore the drivers and barriers to improving the sustainability of a specific technological application within a major energy system.

Course Learning Outcomes
At the end of this course, students are expected to be able to:
1. Define different viewpoints on the meaning of sustainability and express these views in the context of energy systems;
2. Explain the primary sources, carriers, and end-uses of energy in modern society;
3. Identify and quantify the main energy losses/inefficiencies and environmental impacts of energy technologies; and
4. Evaluate a specific energy technology from multiple viewpoints including economic, environmental, and societal implications.

Indicative Grading Scheme (subject to change)
- Class Discussions: 20%
- Mid-term examination: 30%
- Major project: 50%

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) SEE	Number (eg. 810) 811	Units (eg. 4) 3

Course title (max. 100 characters)

Technical Communication Skills

Short title (for enrollment/transcript - max. 30 characters) Technical Communication Skills

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

Communication skills, knowledge and strategies to support successful graduate student research in engineering including communicating clearly and concisely with interdisciplinary, technical, and non-technical audiences. Students will learn to identify areas for investigation, propose a writing project, source relevant and reliable literature, use an intentional writing process, address rhetorical issues of audience, purpose and style, and practice constructive, analytical and empowering peer review. A special emphasis will be communicating with policy audiences. Students will practice clear, concise, and impactful professional presentations for interdisciplinary audiences.

Rationale for introduction of this course

This will become a core course for students in the SEE MASc & PhD programs. The SEE graduate program recruits from a broad range of engineering disciplines. As a result, it is important to ensure that all students have a suitable foundation in the concepts of technical communications.!The SEE graduate program recruits from a broad range of engineering disciplines. As a result, it is important to ensure that all students have a suitable foundation in the concepts of technical communications.

Term of initial offering (eg. Fall 2019) Fall 2023	Course delivery (eg. 3 hrs/week for 13 weeks) 4 hrs/wk (3 hrs/wk lecture + 1 hr/wk tutorial) for 13 weeks
Frequency of offerings/year 1	Estimated enrollment per offering 25-30

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

Prerequisite and/or Corequisite

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ Tutorial

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? _____	Repeat within a term? ☐ Yes ☑ No
Required course? ☑ Yes ☐ No	Final exam required? ☐ Yes ☑ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Faculty member from the SEE faculty complement
Additional faculty members, space, and/or specialized equipment required in order to offer this course
None. The course will be taught by an individual faculty member from the SEE faculty complement. The content is sufficiently generic that most SEE faculty are be able to deliver the course.

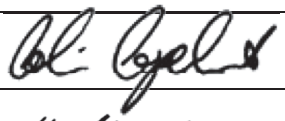
CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Sustainable Energy Engineering	Colin Copeland	colin_copeland@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Colin Copeland	Signature 	Date 2023-01-30
Department Chair Mehran Ahmadi	Signature 	Date January 30, 2023

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
P. Saeedi		Feb 2, 2023

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

School of Sustainable Energy Engineering

SEE 811 – Technical Communication Skills

Units: 3
Lecture hours: 39

Course Description
Imparting critical technical communication skills that are essential for success in the SEE graduate program. The focus is on understanding multidisciplinary, technical, or non-technical audiences and communicating with them clearly and concisely; there is a special emphasis on effectively communicating with policy audiences. Students get a hands-on experience in conducting literature review, and developing and writing research proposals, technical reports, and journal/conference papers. Tips for writing successful grant applications, coupled with practical examples, are shared in the classroom. Students also learn to make clear, concise, and impactful professional presentations to multiple audiences.

Topics Covered
- Identifying and communicating with a range of technical and non-technical audiences
- Unique ways of communicating with policy audiences
- Writing in different formats – papers, reports, proposals, grant applications
- Success in grant applications
- Making impactful presentations

Course Organization
The course will be delivered through interactive lectures, combined with in-class dialogue, group activities, and oral presentations. It will provide guidance for self-directed learning and encourage students to bring in their own research outputs, facilitating completion of their respective research deliverables. Students are expected to undertake peer-review evaluation of class assignments and provide feedback to their classmates.

Course Learning Outcomes
At the end of this course, students are expected to be able to:
1. Develop communication strategies that work for specific, targeted audiences;
2. Write effectively in a number of different formats, including the ability to evaluate and revise their own documents;
3. Make effective and impactful oral presentation, including design of visuals;
4. Understand donor requirements and tailor grant applications to meet those requirements; and
5. Effectively communicate with policy audiences.

Indicative Grading Scheme (subject to change)
- Interactive class discussions: 30%
- Pop quizzes (5): 15%
- Written assignments (4): 30%
- Final presentation: 25%

SFU

MEMO

Faculty of Science

ATTENTION: Senate Graduate Studies Committee

FROM: Vance Williams, Associate Dean Graduate Studies, Faculty of Science

RE: Proposed Course Changes and Additions for Fall 2023, Faculty of Science

DATE: December 7, 2022

Dear SGSC,

The following curriculum changes have been approved by the Faculty of Science and are being submitted to the Senate Graduate Studies committee for approval.

The following new courses are been proposed:

MATH 726 Probability
MATH 750 Introduction to Topology
MATH 775 Mathematical Topics in Data Science

Enclosed are the documents in support of these changes.

Sincerely,

Vance Williams
Associate Dean Graduate Studies, Faculty of Science

To: Dr. Vance Williams, Associate Dean, Graduate Studies, Faculty of Science, SFU
From: Petr Lisonek, Graduate Program Chair, Mathematics

Re: New courses MATH 726, 750, 775
Date: 28 October 2022

The following new courses have been approved by the Department of Mathematics and are forwarded to the Faculty of Science for approval. These curriculum items should be effective for Fall 2023. Please include them on the next SGSC agenda.

All three courses are cross-listed with corresponding undergraduate courses (MATH 426, MATH 450, MATH 475) that already exist in SFU Calendar. Extra requirements for students registered in the proposed graduate courses are listed in the forms.

Department of Mathematics

New courses: MATH 726, 750, 775

Petr Lisonek, Graduate Program Chair, Mathematics

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) MATH	Number (eg. 810) 726	Units (eg. 4) 3

Course title (max. 100 characters)

Probability

Short title (for enrollment/transcript - max. 30 characters) **Probability**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

A study of probability from the rigorous point of view. Topics include: random variables, generating functions, convergence of random variables, the strong law of large numbers and the central limit theorem, stochastic processes, stationary processes, and martingales.

Rationale for introduction of this course

1) To increase the number of graduate-level offerings in probability - an area of high demand amongst our students. 2) To be consistent with our other 400-level undergraduate courses, which are paired with 700-level courses.

Term of initial offering (eg. Fall 2019)	Course delivery (eg. 3 hrs/week for 13 weeks)
Fall 2023	3 hrs/week for 13 weeks
Frequency of offerings/year	**Estimated enrollment per offering**
once every two years	5

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

MATH 426 (two way)

Prerequisite and/or Corequisite **None**

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No

Total repeats allowed? _____

Repeat within a term? ☐ Yes ☑ No

Required course? ☐ Yes ☑ No

Final exam required? ☑ Yes ☐ No

Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☑ Yes ☐ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

MATH 426. Students in MATH 726 will complete additional coursework, which may include a combination of additional homework problems, a project or extra exam questions

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Ben Adcock, Caroline Colijn, Dave Muraki, Nilima Nigam, and Paul Tupper.
Additional faculty members, space, and/or specialized equipment required in order to offer this course
None.

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Mathematics	Ben Adcock	ben_adcock@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Petr Lisonek	Signature	Date 19 Oct 2022
Department Chair Manfred Trummer	Signature	Date 19 Oct 2022

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Vance Williams		November 30, 2022

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

Department of Mathematics, Simon Fraser University

Outline: MATH 726 Probability

Grading Scheme:

- Assignments 50%
- Midterm 20%
- Final Exam 30%

This course is held in conjunction with MATH 426. Students in MATH 726 will complete additional (or alternative) exercises, both in the assignments and the examinations.

Calendar Description: A study of probability from the rigorous point of view. Topics include: random variables, generating functions, convergence of random variables, the strong law of large numbers and the central limit theorem, stochastic processes, stationary processes, and martingales.

Course Overview: In this course students will study the theory of probability. Students are expected to already have some working familiarity with the basics of probabilistic reasoning before taking the course. Building on this foundation, we start with the formal definition of a probability space, and continue on to the definition of random variables and eventually to stochastic processes. Topics will be covered through alternately the formal development of the theory and the working through of various examples. Coursework will likewise involve a combination of demonstrating an understanding of the definitions, theorems, and proofs of probability theory, as well as working through properties of examples and applications to numerous fields.

Required Reading and Outline:

Probability and Random Processes by Geoffrey Grimmett and David Stirzaker, Oxford University Press, 4th Edition, ISBN: 978-0198847595

We plan to cover the following chapters (subject to change at the instructor's discretion):

1. Events and their probabilities
2. Random variables and their distributions
3. Discrete random variables
4. Continuous random variables
5. Generating functions and their applications
6. Convergence of random variables
7. Random processes
8. Stationary processes

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) MATH	Number (eg. 810) 750	Units (eg. 4) 3

Course title (max. 100 characters)

Introduction to Topology

Short title (for enrollment/transcript - max. 30 characters) **Introduction to Topology**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

Topics from point set topology include: basic definitions, continuous maps, homeomorphisms, product and quotient topologies, Hausdorff topologies, connectedness, compactness and compactifications. Topics from algebraic topology include: paths, homotopies, fundamental group, universal covering spaces.

Rationale for introduction of this course

To increase offerings of graduate courses to students in graduate programs in Department of Mathematics. The material covered in MATH 750 is quite relevant to some other graduate courses such as MATH 818, MATH 820 and also to the topics courses.

Term of initial offering (eg. Fall 2019) Fall 2023	Course delivery (eg. 3 hrs/week for 13 weeks) 3 hrs/week for 13 weeks
Frequency of offerings/year once in 2 years	Estimated enrollment per offering 5

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

MATH 450

Prerequisite and/or Corequisite

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? 0	Repeat within a term? ☐ Yes ☑ No
Required course? ☐ Yes ☑ No	Final exam required? ☑ Yes ☐ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☑ Yes ☐ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

Combined with MATH 450. Students enrolled in MATH 750 will be assigned additional problems on assignments and exams.

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Nathan Ilten, Nils Bruin, Tom Archibald, Imin Chen
Additional faculty members, space, and/or specialized equipment required in order to offer this course
None.

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Mathematics	Ben Adcock	ben_adcock@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Petr Lisonek	Signature	Date 19 Oct 2022
Department Chair Manfred Trummer	Signature	Date 19 Oct 2022

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Vance Williams		November 30, 2022

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

MATH 750
Introduction to Topology
Course Outline

Calendar description: Point set topology: definition, continuous maps, homeomorphisms, product and quotient topologies, Hausdorff topologies, connectedness, compactness and compactifications. Algebraic topology: paths, homotopies, fundamental group, universal covering spaces.

Course details: Topology is the study of spaces under continuous deformation and provides the foundation for many topics in modern mathematics, including geometry, differential equations, number theory, and graph theory.

Topics studied in this course include:
Topological Spaces, Basis for a Topology, The Order Topology.
The Product Topology, The Subspace Topology, Closed Sets and Limit Points.
Continuous Functions, The Metric Topology, The Quotient Topology.
Connected Spaces, Components and Local Connectedness, Compact Spaces.
The Countability Axioms, The Separation Axioms, Normal Spaces.
The Urysohn Lemma, The Urysohn Metrization Theorem.
Homotopy of Paths, The Fundamental Group, Covering Spaces.
The Fundamental Group of the Circle, Retractions and Fixed Points.
Deformation Retracts and Homotopy Type.
The Fundamental Group of S^n, Fundamental Groups of Some Surfaces.
Simplicial and Singular Homology.
Additional Topics.

Grading:
Participation 10%
Assignments 20%
Midterm 30%
Final 40%

This course will be taught in conjunction with MATH 450. Students in MATH 750 will be assigned additional problems on assignments and exams.

Textbook: "Topology" by James Munkres. Pearson**,** 2nd edition. ISBN: 9780134689517. Required.

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC) MATH	Number (eg. 810) 775	Units (eg. 4) 3

Course title (max. 100 characters)
Mathematical Data Science

Short title (for enrollment/transcript - max. 30 characters) Math Data Sci

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description)

An exploration of the mathematics of data science. Analysis of the foundations of algorithms currently used in the field. Potential topics to be covered include: machine learning, compressed sensing, clustering, randomized numerical linear algebra, complex networks and random graph models. Students with credit for MATH 475 or APMA 940 may not complete this course for further credit.

Rationale for introduction of this course

1) To increase the number of graduate-level offerings in mathematics of data science - an area of high demand amongst our students. 2) To be consistent with our other 400-level undergraduate courses, which are paired with 700-level courses.

Term of initial offering (eg. Fall 2019) Fall 2023	Course delivery (eg. 3 hrs/week for 13 weeks) 3 hrs/week for 13 weeks
Frequency of offerings/year once every two years	Estimated enrollment per offering 5

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)
MATH 475 (two-way), APMA 940 (one way, MATH 775 equivalent to APMA 940)

Prerequisite and/or Corequisite None

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No	Total repeats allowed? _____	Repeat within a term? ☐ Yes ☑ No
Required course? ☐ Yes ☑ No	Final exam required? ☐ Yes ☑ No	Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☑ Yes ☐ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

MATH 475. Students in MATH 775 will complete additional coursework, which may include a combination of additional homework problems, a project or extra exam questions.

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
Paul Tupper, Ben Adcock, Caroline Colijn, Cedric Chauve
Additional faculty members, space, and/or specialized equipment required in order to offer this course
None

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
Mathematics	Ben Adcock	ben_adcock@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Petr Lisonek	Signature	Date 19 Oct 2022
Department Chair Manfred Trummer	Signature	Date 19 Oct 2022

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Vance Williams		November 30, 2022

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

Department of Mathematics, Simon Fraser University

Outline: Mathematical Data Science MATH 775

Grading Scheme: Assignments 30%, Presentation 10%, Participation 5%, Midterm 20% and Final Project 35%.

Calendar Description: An exploration of the mathematics of data science. Analysis of the foundations of algorithms currently used in the field. Potential topics to be covered include: machine learning, compressed sensing, clustering, randomized numerical linear algebra, complex networks and random graph models. Students with credit for MATH 475 or APMA 940 may not complete this course for further credit.

Course Details:

Subject to change at the instructor's discretion.

- Mathematical preliminaries (probability, linear algebra)
- Linear dimensionality reduction (SVD, PCA, random projections)
- Linear regression (linear least squares, subset selection, LASSO, regularization)
- Topics from compressed sensing (sparsity and best s-term approximation, basis pursuit, greedy methods, thresholding, restricted isometry property and Johnson–Lindenstrauss Lemma, uncertainty principles)
- Foundations of learning (statistical learning theory, PAC learning, VC dimension, rate-distortion theory)
- Deep learning (neural networks, autoencoders, GANs)
- Classification (SVMs, kernel methods, logistic regression)
- Algorithms for Big Data (sketching, streaming)
- Clustering (k-means, spectral clustering, kernel methods)

Text: *Foundations of Data Science* by Avrim Blum, John Hopcroft, and Ravindran Kannan, Cambridge University Press, 2020.

Alternative Text: *Machine Learning: A Probabilistic Perspective* by Kevin P. Murphy, MIT Press, 2012.

SFU

MEMO

Faculty of Science

ATTENTION: Senate Graduate Studies Committee

FROM: Vance Williams, Associate Dean Graduate Studies, Faculty of Science

RE: Proposed Course Changes and Additions for Fall 2023, Faculty of Science

DATE: February 8, 2023

Dear SGSC,

The following curriculum change has been approved by the Faculty of Science and are being submitted to the Senate Graduate Studies committee for approval.

The following *new course* is being proposed:

MBB 778 Molecular Epidemiology of Infectious Disease

Enclosed are the documents in support of this new course.

Sincerely,

Vance Williams
Associate Dean Graduate Studies, Faculty of Science

MOLECULAR BIOLOGY AND BIOCHEMISTRY
Memorandum

To: Vance Williams, Chair, Faculty Graduate Studies Committee, Faculty of Science	**From:** Christopher Beh, MBB Graduate Program Chair
Re: **New Graduate Course:** MBB 778	**Date:** February 6, 2023

We are requesting approval of the following:

NEW GRADUATE COURSE PROPOSAL

MBB 778: Molecular Epidemiology of Infectious Disease (form and outlines attached)

Sincerely,

Dr. Christopher Beh
MBB Graduate Program Chair

SFU GRADUATE AND POSTDOCTORAL STUDIES

New Graduate Course Proposal

Course Subject (eg. PSYC)	Number (eg. 810)	Units (eg. 4)
MBB	778	3

Course title (max. 100 characters)

Molecular Epidemiology of Infectious Disease

Short title (for enrollment/transcript - max. 30 characters) **Molecular Epidemiology**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description - max. 50 words)

Application of modern molecular methods to epidemiological studies. Globally-relevant and emerging infectious diseases will be highlighted.

Rationale for introduction of this course

The creation of this course reflects the expansion of expertise and student interest in modern molecular techniques applied to the surveillance, prevention and treatment of globally-relevant infectious diseases.
MBB and FHS have a long standing tradition of cross-listed courses that are taught by members of both units and that have an almost equal distribution of students from both units enrolled. Both Units support the creation of MBB 778 in order to cross-list this course with HSCI 778.

Term of initial offering (eg. Fall 2019)	Course delivery (eg. 3 hrs/week for 13 weeks)
Fall 2023	3 hrs/week for 13 weeks
Frequency of offerings/year	**Estimated enrollment per offering**
Once	8

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

MBB 478, HSCI 478, HSCI 778 - MBB 778 will be cross-listed with the HSCI equivalents.

Prerequisite and/or Corequisite

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☑ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

Repeat for credit? ☐ Yes ☑ No

Total repeats allowed? _____

Repeat within a term? ☐ Yes ☐ No

Required course? ☐ Yes ☑ No

Final exam required? ☑ Yes ☐ No

Capstone course? ☐ Yes ☑ No

Combined with a undergrad course? ☑ Yes ☐ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

MBB 478; difference in grading. See course outlines with differences highlighted in yellow.

* See important definitions on the curriculum website.

RESOURCES

If additional resources are required to offer this course, provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course
William Hsiao - joint appointment in FHS and MBB
Additional faculty members, space, and/or specialized equipment required in order to offer this course
Robert Holt, Ryan Morin, Fiona Brinkman

CONTACT PERSON

Academic Unit / Program	Name (typically, Graduate Program Chair)	Email
MBB	Christopher Beh	ctbeh@sfu.ca

ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

Graduate Program Committee Christopher Beh	Signature	Date Feb. 6, 2023
Department Chair Lisa Craig	Signature	Date Feb. 8, 2023

FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

Faculty Graduate Studies Committee	Signature	Date
Vance Williams		February 8, 2023

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee	Signature	Date
Jeff Derksen		March 15, 2023

ADMINISTRATIVE SECTION (for DGS office only)
Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

MBB/HSCI 478-3: Molecular Epidemiology of Infectious Disease

Pre or Co-requisites: MBB 331 or HSCI/MBB 326 with a minimum grade of C, or HSCI 338 with a minimum grade of C-. Students with credit for HSCI 478 may not complete MBB 478 for further credit.

Final Exam: In person during the final exam period

COURSE DESCRIPTION: This senior seminar course will provide a broad overview of the application of modern molecular and genomics methods to infectious disease epidemiology. Topics will include the identification, classification, characterization, and monitoring of pathogens in human populations; the application of molecular methods to screening, prevention and treatment of infectious diseases; and the analysis of molecular and genomics data for disease. Globally relevant diseases will be highlighted.

The SFU Calendar describes the course as follows: Application of modern molecular methods to epidemiological questions. Globally relevant and emerging infectious diseases will be highlighted. Students with credit for HSCI 432 in 2010 may not complete HSCI 478 for further credit.

COURSE OBJECTIVES:
By the end of the course, students will have a strong foundational knowledge of molecular and genomic epidemiology methods, the distribution of host and pathogen genetic diversity in populations, and an understanding of how genetic factors influence disease risk and outcomes. The assignments for this course will provide students with the opportunity to develop, or hone, their presentation skills, their ability to perform primary literature searches, as well as improve their reading, interpreting, critiquing and summarizing of primary research articles. Hands-on computational data analysis assignments are designed to show students state-of-the-art genomic epidemiology analytic solutions.

- Explain the techniques and applications of modern laboratory methods, including phylogenetic analyses, to the identification, surveillance, prevention, and treatment of infectious diseases
- Describe how host and pathogen genetic variation is distributed globally and enumerate examples of how such variation influences disease acquisition risk and disease outcomes
- Explain how information on pathogen genetic variation is (and can be) incorporated in the design of intervention strategies (e.g.: vaccines, therapeutics)
- Conduct basic literature searches
- Conduct basic genomic epidemiological data analysis
- Demonstrate competence in reading, interpreting and critiquing primary research articles and present the material in an accessible manner

CORE COMPETENCIES:
Molecular Methods for Microbial Typing – Primary
Microbial Phylogenetics and Phylogenomics – Primary
Basic Molecular and genomic Epidemiology – Primary
Public Health Microbiology - Primary
Molecular Biology – reinforced
Microbial Population Genetics – reinforced

TEACHING FORMAT: There will be one 3-hour class each week that will include a lecture by the course instructor or guest lecturer, discussion, in-class activities and/or student presentations.

REQUIRED TEXT: None.

Required readings will be in the form of primary and review articles in scientific journals. These will be made available on Canvas prior to the lecture. This will include PowerPoint versions of the lectures, links to online materials, announcements, and other information. PowerPoint versions of the lectures will be provided by 5pm the day before the lecture. Please check Canvas on a regular basis to ensure you have updated course information.

ASSESSMENTS AND GRADING:

This course comprises a combination of lectures, demoes, in class and online discussions. Six in class short quizzes (2-3 questions / 15 min) at the beginning of the classes (see dates below) are designed to help you keep up with the material. Three take-home computational assignments are designed to help you learn hands-on genomic epidemiology analysis.

1. Assignment #1: Molecular Typing – in-silico MLST

2. Assignment #2: Genomic Variant Analysis - SNP

3. Assignment #3: Genome-wide Association Study

3. Oral Presentation: Peer-reviewed paper related to modern molecular or genomic epidemiology 3-4 min per person on a paper in a

4. Quizzes:
The quizzes will cover material presented in the preceding one or two weeks (non-cumulative) to help you demonstrate your understanding of the course concepts. The test will consist of multiple choice and true/false.

5. Final Exam
The final exam will be based on all course lectures and readings. The exam will consist of short and long answer questions.

6. Mark Breakdown

6 Quizzes (5% each) - missing quizzes count towards final – 30%
3 x Genomic Epi Data Analysis Assignments (10% each) - 30%
Final Exam – 30% (up to 60% if there are missing quizzes)
Participation – 10%

COURSE SCHEDULE:
Please complete the assigned readings before each class as lectures will be presented based on the assumption that you have read these materials.

Class Schedule:

Date (week)	**First Half (2:30-3:45)**	**Second Half (4:00-5:20)**
September 12 2022	**1a Welcome**	**1b Introduction to Molecular Epidemiology**
September 19 2022	**2a Pathogen Evolution - bacterial**	**2b Pathogen Evolution - viral**
September 26 2022	**3a Population Genetics Discussion**	**3b Host Variations and Immunity**
October 3 2022	**Quiz 1 (5%) Population Genetics 4a Traditional Molecular Epidemiology Techniques**	**4b Modern Molecular Epidemiology Techniques Assignment 1 (Molecular Typing Using in-silico MLST)**
October 10 2022 (Thanksgiving)	**No Class**	**No Class**
October 17 2022	**Quiz 2 (5%) Molecular Epi Techniques**	**5b Phylogenetic Analysis Discussion and Demo**

	5a Phylogenetic Analysis	
October 24 2022	**Quiz 3 (5%) Phylogenetics** **6a Genomic Epidemiology**	**6b Genomic Epidemiology Discussion and Demo** **Assignment 2 (Genomic Epidemiology - SNP)**
October 31 2022	**7a Genomic Epidemiology of MTB**	**7b Genomic Epidemiology of MTB Discussion**
November 7 2022	**Quiz 4 (5%) Genomic Epi (6a+7a)** **8a Genomic Epidemiology of Foodborne Pathogens**	**8b Genomic Epidemiology of Foodborne Pathogens Discussion**
November 14 2022	**9a Bacterial GWAS**	**9b Bacterial GWAS Discussion and Demo** **Assignment 3 (Bacterial GWAS)**
November 21 2022	**Quiz 5 (5%) Bacterial GWAS** **10a Genomic Epidemiology of Influenza Viruses**	**10b Genomic Epidemiology of Influenza Viruses Discussion**
November 28 2022	**Quiz 6 (5%) Genomic Epi of Influenza** **11a Genomic Epidemiology of SARS-CoV-2 Virus**	**11b Genomic Epidemiology of SARS-CoV-2 Virus Discussion**
December 5 2022	**12a Future of Genomic Epidemiology**	**Course Feedback and Exam Review**

NOTE: The instructor may make changes to this syllabus if necessary, within Faculty/University regulations. This includes the possibility of scaling final grades, if they are too high or too low, to meet FHS and SFU grading guidelines.

MBB/HSCI 778-3: Molecular Epidemiology of Infectious Disease

Pre or Co-requisites: None

Final Exam: None

CALENDAR DESCRIPTION:
Application of modern molecular methods to epidemiological studies. Globally relevant and emerging infectious diseases will be highlighted.

COURSE DESCRIPTION: The application of modern molecular and genomics methods to study the epidemiology of infectious diseases will be explored through lectures and discussions. Topics will include the identification, classification, characterization, and monitoring of pathogens in human populations; the application of molecular methods to screening, prevention and treatment of infectious diseases; and the analysis of molecular and genomics data for disease. Globally relevant diseases will be highlighted.

COURSE OBJECTIVES:
By the end of the course, students will have a strong foundational knowledge of molecular and genomic epidemiology methods, the distribution of host and pathogen genetic diversity in populations, and an understanding of how genetic factors influence disease risk and outcomes. The activities throughout the course will provide students with the opportunity to become familiar with relevant review and primary literatures, and improve their reading, interpretation and critiquing of research articles. Hands-on computational data analysis assignments are designed to show students state-of-the-art molecular and genomic epidemiology analytic solutions.

- Explain the techniques and applications of modern laboratory methods, including phylogenetic analyses, to the identification, surveillance, prevention, and treatment of infectious diseases
- Describe how host and pathogen genetic variation is distributed globally and enumerate examples of how such variation influences disease acquisition risk and disease outcomes
- Explain how information on pathogen genetic variation is (and can be) incorporated in the design of intervention strategies (e.g.: vaccines, therapeutics)
- Conduct basic literature searches
- Conduct basic genomic epidemiological data analysis
- Demonstrate competence in reading, interpreting and critiquing primary research articles

CORE COMPETENCIES:
Molecular Methods for Microbial Typing – Primary
Microbial Phylogenetics and Phylogenomics – Primary
Basic Molecular and genomic Epidemiology – Primary
Public Health Microbiology - Primary
Molecular Biology – reinforced
Microbial Population Genetics – reinforced
Presentation skills - reinforced

TEACHING FORMAT: There will be one 3-hour class each week that will include a lecture by the course instructor or guest lecturer, discussion, in-class activities and/or student presentations.

REQUIRED TEXT: None.

Required readings will be in the form of primary and review articles in scientific journals. These will be made available on Canvas prior to the lecture. This will include PowerPoint versions of the lectures, links to online materials, announcements, and other information. PowerPoint versions of the lectures will be provided by 5pm the day before the lecture. Please check Canvas on a regular basis to ensure you have updated course information.

ASSESSMENTS AND GRADING:

This course comprises a combination of lectures, demoes, in class and online discussions. Six in class short quizzes (2-3 questions / 15 min) at the beginning of the classes (see dates below) are designed to help you keep up with the material. Three take-home computational assignments are designed to help you learn hands-on genomic epidemiology analysis.

1. Assignment #1: Molecular Typing – in-silico MLST

2. Assignment #2: Genomic Variant Analysis - SNP

3. Assignment #3: Genome-wide Association Study

4. Quizzes:
The quizzes will cover material presented in the preceding one or two weeks (non-cumulative) to help you demonstrate your understanding of the course concepts. The test will consist of multiple choice and true/false.

5. Current Paper Presentation
The presentation will be based on reviewing and presenting one or more current papers related to a topic in molecular biology. An additional graduate student only session will be scheduled for the presentation in the last two weeks of the class.

6. Term paper
Due after the last day of classes.

7. Mark Breakdown

6 Quizzes (5% each) - missing quizzes count towards final – 30%
3 x Genomic Epi Data Analysis Assignments (10% each) - 30%
1 x Presentation on a current genomic epidemiology study – 10%
Term paper – 20%
Participation – 10%

COURSE SCHEDULE:
Please complete the assigned readings before each class as lectures will be presented based on the assumption that you have read these materials.

Class Schedule:

Date (week)	**First Half (2:30-3:45)**	**Second Half (4:00-5:20)**
September 12 2022	**1a Welcome**	**1b Introduction to Molecular Epidemiology**
September 19 2022	**2a Pathogen Evolution - bacterial**	**2b Pathogen Evolution - viral**
September 26 2022	**3a Population Genetics Discussion**	**3b Host Variations and Immunity**
October 3 2022	**Quiz 1 (5%) Population Genetics 4a Traditional Molecular Epidemiology Techniques**	**4b Modern Molecular Epidemiology Techniques Assignment 1 (Molecular Typing Using in-silico MLST)**
October 10 2022 (Thanksgiving)	**No Class**	**No Class**

October 17 2022	**Quiz 2 (5%) Molecular Epi Techniques** **5a Phylogenetic Analysis**	**5b Phylogenetic Analysis Discussion and Demo**
October 24 2022	**Quiz 3 (5%) Phylogenetics** **6a Genomic Epidemiology**	**6b Genomic Epidemiology Discussion and Demo** **Assignment 2 (Genomic Epidemiology - SNP)**
October 31 2022	**7a Genomic Epidemiology of MTB**	**7b Genomic Epidemiology of MTB Discussion**
November 7 2022	**Quiz 4 (5%) Genomic Epi (6a+7a)** **8a Genomic Epidemiology of Foodborne Pathogens**	**8b Genomic Epidemiology of Foodborne Pathogens Discussion**
November 14 2022	**9a Bacterial GWAS**	**9b Bacterial GWAS Discussion and Demo** **Assignment 3 (Bacterial GWAS)**
November 21 2022	**Quiz 5 (5%) Bacterial GWAS** **10a Genomic Epidemiology of Influenza Viruses**	**10b Genomic Epidemiology of Influenza Viruses Discussion**
November 28 2022	**Quiz 6 (5%) Genomic Epi of Influenza** **11a Genomic Epidemiology of SARS-CoV-2 Virus**	**11b Genomic Epidemiology of SARS-CoV-2 Virus Discussion**
December 5 2022	**12a Future of Genomic Epidemiology**	**Course Feedback**

NOTE: The instructor may make changes to this syllabus if necessary, within Faculty/University regulations. This includes the possibility of scaling final grades, if they are too high or too low, to meet FHS and SFU grading guidelines.