UNIVERSITY OF THE FRASER VALLEY
Faculty of Science

SCIENCE FACULTY COUNCIL
AGENDA

Friday, September 5, 2025 - 1:15 PM - D213

Page

1. WELCOME

2. AGENDA and MINUTES

2.1. Adoption of Agenda

3 - 5 **2.2. Approval of the Minutes - May 30, 2025**

3. GUESTS
None

4. FOR DECISION

4.1 Bachelor of Science

6 - 18 **4.1.1. Entrance Requirement Updates**

4.2 Math Course Changes

19 - 24 **4.2.1. Math 111**

25 - 30 **4.2.2. Math 112**

31 - 36 **4.2.3. Math 125**

37 - 40 **4.2.4. Math 225**

41 - 45 **4.2.5. Math 355**

5. FOR DISCUSSION

5.1. Option for Early Declaration of Major - Ian

6. INFORMATION ITEMS

6.1 Monthly reports from the FoS to the Provost can be found at the link below.you'd like included in the next report, please email Science@ufv.ca.

https://ufv.ca/science/deans-office/monthly-department-highlights/

7. REPORTS
None

8. ADJOURN

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Next Meeting: October 3, 2025 @ 1:15 PM D213

Quorum - 14 voting members

UNIVERSITY OF THE FRASER VALLEY
Faculty of Science

SCIENCE FACULTY COUNCIL
MINUTES - DRAFT
Friday, May 30, 2025 - 1:00 PM - D213

Chair
Ian Affleck

In Person
Michael Hitch, Janice Nagtegaal, Alan Reid, Caroline Majeau, Stan Manu, Chris Bodnar, Vanessa Radzimski, Carmen Herman, Jeff Chizma, Robin Endelman, Anna Kuczynska, Renee Prasad, Stefania Pizzirani, Gilliam Mimmack, Daniel Iwama, Afia Raja, Almaz Butaev, Mitra Tabatabaee, Harley Gordon, Alida Janmaat, Janice Nagtegaal, Dina Navon, Jake Spooner, Ben Vanderlei, Dylan Ziegler, Mark Rempel, Andrew Staal, Vahid Tadayon

Virtual
Carolyn Atkins, Jenn Barrett, Frank Zhang, Jay Thomas, Cindy Loten, Sandra Gillespie, Justin Lee, Kristen Switzer, Nathan Bialas, Dina Navon, Declan Rssss, Linus Chang, Serhii Myroshnychenko, Natalia Varankovich, Hardil Singh, Yvonne Dzal, Kseniya Garaschuk, Cory Beshara

Recorder
Alison Reeves

1. **WELCOME**
2. **AGENDA and MINUTES**

2.1 Approval of Agenda

MOTION: that Faculty Council approve the agenda as presented.

Approved with 4.12 moved to be 4.3.
1st Gillian Mimmack, 2nd Daniel Iwama. Carried.

2.2. Approval of the Minutes - April 4, 2025

MOTION: that Faculty Council approve the minutes as presented.
1st Alan Reid, 2nd Afia Raja. Carried.

3. **GUESTS**
None

4. **FOR DECISION**

4.1. PHYS 118 New Course

4.2. PHYS 499 New Course

4.3. PHYS 281 New Course

MOTION: to approve Physics New Courses 118 , 281 and 499
Approved with edits
1st Vanessa, 2nd Almaz. Carried.

4.4. PHYSICS Minor Program Changes

4.5. PHYSICS Major Program Changes

4.6. PHYSICS Honours Program Changes

MOTION: to approve the Physics Program Changes for Minor, Major & Honours
Approved with edits
1st Vanessa, 2nd Jeff. Carried.

4.7. GEOG 260 and PLAN 260 Cross listed

MOTION: to approve GEOG/PLAN 260
Approved with edits
1st Stefania, 2nd Renee. Carried.

4.8. MATH / ENGR 152 Course Changes

4.9. MATH 415 Course Changes

4.10. MATH 416 Course Changes

MOTION: to approve MATH/ENGR Course Changes 152, 415 and 416
Approved with edits
1st Almaz, 2nd Gillian. Carried.

4.11. AGRI 292 Course Changes

MOTION: to approve AGRI 292
Approved with edits and update to newest course outline
1st Chris, 2nd Renee. Carried.

4.12. BAS Program Changes

MOTION: to approve BAS Program Changes
Approved with edits
1st Chris, 2nd Renee. Carried.

5. FOR DISCUSSION

5.1. Divisional Review Committee (DRC)

Discussion of committee organization.
ACTION: Michael to send academic standards to the FC.

6. INFORMATION ITEMS

6.1 Monthly reports to the Provost from the Faculty of Science can be found below. If you have news to share, please email Alison so it can be included on our next report. https://ufv.ca/science/deans-office/monthly-department-highlights/

6.2 Rhodes Scholarships

7. REPORTS

Dean's Report – Budget review

Advising – Graduation applications complete, Planning sessions for incoming students happening

BSc – External report complete, action plan to address external report in work

Indigenization – School Visits in planning stages, Nov 12 tentative date

EDI – No Report

Senate – No Report

Student Report – No Report

8. ACHIEVEMENT AWARDS

8.1. Awesome Achievement Award

8.2. Terrific Teaching Award

8.3. Outstanding Outreach Award

8.4. Remarkable Research Award

8.5. Superb Service - Faculty

8.6. Superb Service - Staff

8.7. Perfect Attendance

9. ADJOURN

Next Meeting: September 5, 2025 @ TBD

Quorum - 14 voting members

Memo for Program Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei, Department Head, Mathematics & Statistics

Date: August 18, 2025

Subject: Program change Bachelor of Science

1. Summary of changes (select all the apply):

   ☐ Program revision that requires new resources
   ☐ Addition of new course options or deletion or substitution of a required course
   ☐ Change to the majority of courses in an approved program
   ☐ Change to the duration, philosophy, or direction of a program
   ☐ Addition of a new field of specialization, such as a concentration
   ☒ Change in requirements for admission
   ☐ Change in requirements for residency or continuance
   ☐ Change in admission quotas
   ☐ Change which triggers an external review
   ☐ Deletion of a program not included in the Program Discontinuance policy
   ☐ Other – Please specify:

2. Rationale for change(s): *The proposed changes to the mathematics entrance requirement of the BSc. align with proposed changes to the prerequisites for MATH 111, which is a required course in the program. Changing the MATH 111 prerequisites without changing the BSc admission requirements would mean that a portion of students admitted to the BSc. would require an upgrading course before being able to register for a course that is required by the program. The long-term goal of these changes is to improve the completion rate of students in the BSc. by ensuring that they are adequately prepared.*

3. If program outcomes are new or substantially changed, explain how they align with the Institutional Learning Outcomes:

4. What consideration has been given to Indigenizing the curriculum?
   Indigenization is given thorough consideration within the BSc. The Faculty of Science Curriculum Committee discusses considerations for individual course changes, and the Science Indigenization Committee meets regularly to facilitate conversations that help faculty address Indigenization in their own classrooms.

5. Will additional resources be required? If so, how will these costs be covered? *No additional resources are required. If enrolments in MATH 111 initially decrease as a result of the changes, we expect that there will be a comparable increase in MATH 110 enrolments.*

6. How will students be impacted? (Indicate the projected number of students impacted.) Is the change expected to increase/decrease enrolment in the program? *We are requesting a delay in the*

implementation of these changes to give local secondary schools and their students an opportunity to adjust their course planning to prepare for these changes. Given adequate notice of these changes, we are hopeful that students intending on entering the BSc. at UFV will adjust their planning so that long-term enrolments in the program are not significantly impacted.

7. Does the number of required core or elective credits from the program-specific discipline change? If so, will this change the total number of courses to be offered within the discipline? *No change to program requirements.*
8. Identify any available resources that will be used to accommodate the program changes. (Eg. seats in existing classes, conversion of sections, timetabling changes, deletion of courses, etc.) *No change to program requirements.*
9. Is the number of required or elective courses from other disciplines in the program changing? If so, what is the estimated impact to enrolments in these courses? Provide a memo from the respective dean(s) of the impacted faculty to confirm if budgetary implications have been considered and addressed. *No change to program requirements or electives.*
10. Provide a memo from the program's dean to confirm that budgetary implications of the proposed changes have been considered and will be addressed within the faculty budget.

Bachelor of Science degree

The UFV Bachelor of Science (BSc) is a program of academic study for students pursuing educational or career goals in the natural sciences. The program requirements encourage a breadth of intellectual and academic experience, and at the same time, recognize the importance of concentrated study in a specific field or discipline. The BSc may serve as an educational goal in itself, as qualification for those who wish to pursue advanced degrees at other educational institutions, or as a qualification for employment.

The BSc consists of a minimum of 120 credits. To receive a Bachelor of Science degree, students must, at a minimum, complete the requirements for at least one of a science honours, science major, or double science minor, in addition to the general **program requirements**.

Entrance requirements

1. One of the following:
    - B.C. secondary school graduation or equivalent
    - Completion of nine university-level credits with a minimum CGPA of 2.00 based on all university credits attempted

    Note: Once a student has nine or more university-level credits, admission will be based on their cumulative GPA.

2. **Mathematics requirement:** one of the following:
    - Pre-calculus 12 or Principles of Mathematics 12 with a minimum grade of B and Calculus 12 with a minimum grade of B
    - Pre-calculus 12 or Calculus 12 with a minimum grade of A
    - MATH 092 and MATH 093, each with a minimum grade of B
    - MATH 095 with a minimum grade of B (discontinued)
    - MATH 096 with a minimum grade of B
    - MDPT score of 70% or better

- MATH 110 with a minimum grade of C+
- MATH 111 with a minimum grade of C
- MATH 112
- MATH 118

3. **Science requirement:** one of the following courses, with a minimum grade of C+:
   - Anatomy and Physiology 12, Biology 12, BIO 093, or BIO 111
   - Chemistry 12, CHEM 093 (discontinued), CHEM 110, or CHEM 113
   - COMP 150, COMP 152, or COMP 155
   - Geography 12, Physical Geography 12, GEOG 101 (discontinued), GEOG 102 (discontinued), GEOG 103, or ENV 111 (formerly GEOG 111)
   - Geology 12 or GEOG 116
   - Physics 12, PHYS 093, PHYS 100, PHYS 101, PHYS 105, or PHYS 111
   - STAT 104 or STAT 106
4. **English requirement:** Applicants must meet the Degree/diploma level English language proficiency requirement. For details on how this requirement may be met, see the **English language proficiency requirement** section of the calendar.

Attendance at a Bachelor of Science information session or personal interview with an Advisor is recommended.

Students who do not meet these requirements might consider **Qualifying Studies**.

When to apply

Applications are accepted for entrance to the Fall, Winter, and Summer semesters. For application deadlines, see **Specific intake application process**.

How to apply

1. Apply online at **ufv.ca/admissions/apply**.

Additional documents required for a complete application:

- For secondary school entrance, a final official transcript (if graduated). For students currently in Grade 12, see the **secondary school grades and transcripts** section of the **Admissions** website for more information.
- For university students, Official transcripts (or interim transcripts) from all post-secondary institutions attended (excluding UFV) showing grade/course achievement as per entrance requirements. To be considered official, transcripts must be sent directly to UFV from the originating institution; see the **Transfer Credit** section for details.

2. Proof of completion of prerequisites is required for course registration. It is essential that applicants submit an official secondary school transcript at least two weeks before registration.
3. Applicants will be advised of an admission decision and, if accepted, will be provided with registration information. A deposit is required prior to registration (see the **Fees and Other Costs** section) and will be applied toward tuition fees.

Basis for admission decision

1. Applicants must meet the minimum standard for entry.
2. Applicants who qualify will be offered seats in order (from highest to lowest) of one of the following:
   - For secondary school entrance, an admission GPA based on the best Grade 12 science and either Pre-calculus 12 or Principles of Mathematics 12 (or equivalent).
   - For university entrance, a cumulative GPA based on all university credits attempted.
3. Application date and time will be used to break ties when students have the same GPA.
4. Applicants who do not meet the minimum standard may be admitted to **Qualifying Studies**.

Fees and additional costs

See the **Fees and Other Costs** section. Books and additional supplies could cost approximately $50–200 per course.

Program duration

With appropriate planning, the Bachelor of Science requirements can be completed in four years of full-time study. Because upper-level courses are offered on a limited basis, students should seek the help of an Advisor to plan their courses in advance, in order to complete their degree in a timely manner. The choice of which courses are to be offered each year will be made with reference to the needs of students who have declared their BSc major. Students staying for a longer period may wish to pursue the **Co-operative Education** option. All graduation requirements must be completed within 10 years of initial entry to the program.

Location

First-year courses can be completed at either the Abbotsford or Chilliwack campus. Currently, most courses beyond first year are only offered at the Abbotsford campus.

Program requirements

To be eligible for the BSc students must satisfy the following general requirements:

1. 120 applicable university-level credits, with a minimum GPA of 2.00. At least 30 of these university-level credits must be completed at UFV. Electives may be selected from any 100 or higher university-level course. Co-op course credit can be used towards the degree requirements but is limited to one course.
2. 44 upper-level credits with a minimum CGPA of 2.00, including a minimum CGPA of 2.00 in upper-level credits for each major or minor subject.
3. Declaration of a major/minor by the completion of 60 credits (see Notes).
4. MATH 111 and either MATH 112 or MATH 118
5. At least one of the following pairs:
    - BIO 111 and 112
    - CHEM 113 and 114

    - PHYS 111 and 112
6. Any two courses from the following: university-level ENGL, CMNS 125, or any CMNS course numbered 235 or higher.
7. Discipline requirements for at least one of a science honours, science major, or double science minor. **See above** for available honours, majors, and minors.

Note 1: Students who fail to declare a major/minor by the completion of 60 credits may be removed from the program. Students who are undecided should consult with an Advisor regarding their options.

Note 2: Students who wish to complete a major and a minor may need to complete more than 120 credits to complete their degree.

Declaration of majors, minors, and honours

Students may formally declare a Science major or minor if they meet all of the following requirements:

- A minimum CGPA of 2.00
- The declaration requirements of the specific subject discipline(s)

Bachelor of Science students are expected to declare a major or minor by the time they have completed 60 credits. In order to have access to discipline-reserved seating, where applicable, students must be admitted to the BSc and be formally declared. Students who are undecided should consult with an Advisor regarding their options.

Declaration requirements for each subject discipline are listed in those sections of the academic calendar.

The number of students requesting entry into any science honours, major, or minor may exceed capacity. Departments reserve the right to select competitively if necessary. The basis for selection will be the applicant’s GPA on required lower-level prerequisites;

students in the Bachelor of Science program will have priority. UFV cannot guarantee available seats in required program courses.

Available declaration options

Honours

- **Biology**
- **Chemistry**
- **Mathematics**
- **Physics**
- **Physical Geography** (unavailable until further notice)

Majors

- **Biochemistry**
- **Biology**
- **Chemistry**
- **Computing Science**
- **Mathematics**
- **Physical Geography** (unavailable until further notice)
- **Physics**

> Note: No major may be combined with a minor in the same discipline. The Biochemistry major cannot be combined with either the Biology minor or the Chemistry minor. The Mathematics major cannot be combined with the Mathematics minor (Statistics option).

Minors

- **Applied Statistics**
- **Biology**
- **Chemistry**

- **Computing Science**
- **Mathematics**
- **Mathematics (Statistics option)**
- **Physical Geography** (unavailable until further notice)
- **Physics**

Double minor

Students can choose to complete a double minor degree with the minors listed above. The Mathematics minor (Statistics option) cannot be combined with either the Applied Statistics minor or the Mathematics minor.

Science major or double minor with a non-science major, extended minor, or minor

Students completing the requirements for a science major or double minor may combine the major or double minor with an arts **major**, arts **extended minor** or **minor**, **Computer Information Systems minor**, **Kinesiology minor**, or **Business minor**, with the following exceptions:

- No major or minor may be combined with a minor or extended minor in the same discipline.
- Biochemistry major cannot be combined with the Biology extended minor.
- Mathematics minor (Statistics option) cannot be combined with the Mathematics extended minor.
- Computing Science major or minor cannot be combined with the Computer Information Systems minor or extended minor.
- Physical Geography major or minor cannot be combined with the Geography major, minor or extended minor.

Note: Students who wish to combine a science major or double minor with a non-science major or minor may need to complete more than 120 credits in order to complete the degree.

Co-operative Education option

The Co-operative Education option provides students with the opportunity to acquire paid, career-related work experience in conjunction with their studies in the Bachelor of Science and **Associate of Science** degree programs. See the **Co-operative Education** section for more details.

Transfer credit

Students who have completed university-level courses at other post-secondary institutions can apply for the BSc at UFV. A maximum of 90 credits may be transferred to UFV for the degree. However, not all courses may be applicable to specific science programs; please check with an Academic Advisor. Applicants with significantly more than 90 credits might consider completing their studies at their original institution. (See **Visiting students** in the Transfer Credit section of the calendar.)

Most of the lower-level courses (100- and 200-level) offered as part of the BSc program are transferable to all B.C. post-secondary academic institutions. Students enrolling in UFV upper-level courses with the intention of completing a degree at another institution should consult that institution for information regarding transferability of these courses.

Courses at other institutions

UFV BSc students who wish to take academic work at other institutions for credit toward the UFV BSc degree must obtain permission in advance from an Academic Advisor. A request for a Letter of Permission form may be obtained from the UFV Office of the Registrar. When approval has been granted, the Office of the Registrar will issue a Letter of Permission to the student. (Also see **Visiting students** in the Transfer Credit section of the calendar.)

A maximum of 90 transfer and/or course challenge credits may be applied to the BSc. All requirements for the BSc must be met.

Program continuance

All students accepted into the BSc program at UFV are expected to maintain acceptable standards of scholarship. Specifically, they are expected to maintain a minimum CGPA of 2.00 on all courses.

Undergraduate continuance

Students enrolled in undergraduate courses (courses numbered 100 or higher) must maintain an undergraduate Cumulative Grade Point Average (CGPA) of at least 2.00 to remain enrolled in Good Academic Standing at UFV. Students in Good Academic Standing will have no registration limits placed on them. Failure to meet the minimum CGPA requirement will result in restrictions on registration and may eventually lead to academic suspension from undergraduate studies at UFV. Students on Academic Warning or Academic Probation are limited to registering in 10 credits. For further details, see the **Academic standing and undergraduate continuance** section of the academic calendar. Academic standing is governed by UFV's **Undergraduate Continuance policy (92)**.

The academic standing of all students covered under this policy for courses where letter grades are assigned will be determined at intervals of nine credits at the start of students' academic careers and then at the end of every term after 27 credits have been completed. Students will be assessed after every term enrolled, but Academic Standing will only change at the intervals noted above. Students' academic standing will be permanently reflected on their student record and will appear on official and unofficial transcripts.

After each semester, students put on Academic Warning, Academic Probation, or Required to Withdraw status or who are continued on Warning or Probation will be notified by the Registrar.

Course repetition

Students are not permitted to register for the same course more than three times. Students wishing to register for a course for a fourth time should connect with the **Student Rights and Responsibilities Office**. No more than five upper-level course

duplications will be permitted on courses which apply to the BSc. Students with more than five upper-level course duplications will be required to withdraw from the program. Where a course has been repeated, only the higher grade is counted in the GPA calculation.

Auditing courses

Students may register as audit students or change to audit status only during the first three weeks of the semester. See the **Audit** section of the calendar for more information. Audited courses are not acceptable for meeting requirements for the BSc degree.

Course challenge

Course challenge is a method by which students may obtain credit for course material learned elsewhere (i.e., outside UFV). A maximum of 90 university-level credits may be obtained by the combined mechanism of course challenge and transfer credit. See the **Course challenge** section for more information.

Readmission

Students who have been required to withdraw from UFV under the **Undergraduate Continuance policy (92)** are subject to readmission and continuance requirements as listed in the UFV academic calendar. Students are normally only readmitted once to the same program.

Residency

To meet the residency requirement of the BSc, the following restrictions apply:

1. Of the 120 credits for the BSc, 30 must be completed at UFV.
2. Of the 44 upper-level credits for the BSc, 22 must be completed at UFV.
3. At least 50% of upper-level credits required for each honours, major, and minor subject must be completed at UFV.

Graduation requirements

It is the student's responsibility to ensure all program requirements are met. This should be done by regular consultation with an Academic Advisor.

Students must apply for graduation in the first month of their final semester. Visit the **Graduation webpage** for more information. The final deadline for students who wish to attend the June Convocation ceremony is April 1 of each year, with all program requirements completed by April 30.

Course listings

For complete details on courses see the **course descriptions** section.

Memo for Course Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei

Date: February 12, 2025

Subject: Proposal for revision of MATH 111

Note that even minor changes may result in comments from committees on all aspects of the course.

1. Summary of changes (select all that apply):
   - ☒ Six-year review
   - ☐ Number and/or course code
   - ☐ Credits and/or total hours
   - ☐ Title
   - ☒ Calendar description
   - ☒ Prerequisites and/or co-requisites
   - ☐ Frequency of course offering
   - ☒ Learning outcomes
   - ☒ Delivery methods and/or texts and resource materials
   - ☐ PLAR options, grading system, and/or evaluation methods
   - ☐ Discontinuation of course
   - ☐ Other – Please specify:

2. Rationale for change: *This course is overdue for review. The most significant change proposed is the revision of high school prerequisites. A recent prerequisite analysis examined student grades in MATH 111, categorized according to their prerequisite grades, over the last six years. The data provided by IR shows that only 1 in 3 students entering MATH 111 with only a B (or B+) in Precalculus 12 were successful in their first attempt at the course. This category of students makes up a significant portion of the MATH 111 population and we feel it is necessary to require more high school preparation to ensure an acceptable chance of success. The same data shows that students with a B (or B+) in Calculus 12, in addition to a B (or B+) in Precalculus 12, were successful at twice the rate. Here we are defining successful as earning a C or better, which is the necessary minimum grade to continue to MATH 112.*
   While the learning objectives and content of the course have not changed, we have made minor edits to these elements in the course outline. Course instructors have also taken steps to improve the accessibility of the course by moving to OER and favoring accessible software in favor of graphing calculators.
3. If there are substantial changes to the learning outcomes, explain how they align with the learning outcomes of the program(s) and contribute to students' ability to meet the Institutional Learning Outcomes (ILOs): *There are no substantial changes to learning outcomes.*

4. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs? *MATH 111 is required of all BSc. and ASc. students. The change in prerequisite means that more students will be required to upgrade their secondary school math before completing this requirement.*
5. Which program areas have been consulted about the change(s)? *The Dean and Associate Dean of Science have been consulted regarding the prerequisite change and the potential impact on enrolment of the BSc. and ASc. Planning is underway to develop alternate pathways in these programs for students who enter with less mathematical preparation.*
6. In what ways does this course (not just the proposed changes) contribute to Indigenizing Our Academy? Provide explicit examples of assignment design, topic selection, curriculum delivery, or other methods, which can be in response to one or more of the following: UFV Integrated Strategic Plan, Fulfilling Our Commitment to Aboriginal Peoples policy (BRP-200.05), the TRC Calls to Action, and/or the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).
   Note that MATH 111 and MATH 112 form an integrated two-term sequence of courses, with methods of delivery consistent between the two courses. In both courses, learners are engaged in active inclusive environments, where students are consistently required to learn by doing. Course instructors emphasize the importance of practice and self-assessment in meeting the learning objectives. Learning in ways that are experiential and reflective, and that require time and patience, are among the First Peoples Principles of Learning. In addition to considering Indigenous ways of learning, instructors also look for opportunities to present course concepts in the context of applications relevant to the local environment and people. Examples include models of population and sustainable harvesting, as well as construction of Bentwood Boxes.
7. How does the course reflect principles of equity, diversity, and inclusion, through assignment design, topic selection, curriculum delivery, or other methods?
   In addition to providing supportive classroom environments, MATH 111 and MATH 112 have been made accessible in recent years is through the use of materials accessible to all students The course uses open textbooks, and an open-source web-based homework system. Instructors rely on web-based tools to support learning through graphing and computation, rather than requiring students to individually purchase graphing calculators.

8. If applicable, discuss any special considerations for this course (credit value, class size limit, frequency of offering, resources required such as labs or equipment, field trips, etc.)

9. Estimate of the typical costs for this course, including textbooks and other materials (excluding tuition): *With the change to open and accessible textbooks and software, there are now no additional costs for this course beyond tuition.*

ORIGINAL COURSE IMPLEMENTATION DATE: May 1977
REVISED COURSE IMPLEMENTATION DATE:
COURSE TO BE REVIEWED (six years after UEC approval)**:**
Course outline form version: 26/01/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 111	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Calculus I **Course Short Title:** (To be assigned by OReg based on university standards.)	
Faculty: Faculty of Science	**Department (or program if no department):** Mathematics & Statistics

Calendar Description:

~~Covers d~~Differential calculus of a function of one variable, in the context of elementary functions (algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic). ~~.~~ Calculation and interpretation of limits and derivatives, applications including curve sketching, optimization, exponential growth, and related rates, and an introduction to antidifferentiation.~~Topics include: limits, continuity, differentiation of algebraic, trigonometric, inverse trigonometric, exponential and logarithmic functions, curve sketching, optimization, related rate problems, an introduction to antidifferentiation, polar coordinates, and parametric equations~~

Note: Students interested in the course are strongly recommended to take the Calculus Readiness Test (https://forms.gle/R2w5FLkAHreyviU69) prior to registration, to assess their readiness for the course and to consider MATH 110: Precalculus Math as an option for improving readiness.~~Students with credit for cannot take this course for further credit.~~

Prerequisites (or NONE):	One of the following: (A- or better in Calculus 12) or (A- or better in Precalculus 12) or (B or better in both Precalculus 12 and Calculus 12) or (B or better in one of Principles of Mathematics 12, ~~Precalculus 12,~~ MATH 095, or MATH 096) or (B or better in both MATH 092 and MATH 093) or (C+ or better in MATH 110) or (at least 70% on the MDPT). Note: MATH 094 is a prerequisite for MATH 095.
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	60
[click to select]	
[click to select]	
[click to select]	
[click to select]	
Total hours	**60**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: **No**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**
Faculty Council approval	**Date of meeting:**
Undergraduate Education Committee (UEC) approval	**Date of meeting:**

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

~~(5-8 measurable learning outcomes (action verbs) that align with the level of the course, reflect Bloom's taxonomy, and demonstrate the integration of Indigenous epistemologies and pedagogies. Learning outcomes should also align with evaluation methods. For guidance, faculty and departments may consult with Teaching and Learning and refer to UEC's course development resources.))~~

Upon successful completion of this course, ~~Building upon their knowledge of functions and function notation, successful~~ students will be able to:

1. Ccommunicate mathematical results and computations using ~~correct~~ rigorous notation and terminology;~~• demonstrate proficiency with the basic concepts and language of differential calculus,~~
2. Aapply theorems and perform associated calculations to evaluate limits, including one-sided limits, limits involving infinity, and indeterminate forms;
3. ~~1.~~ Ddetermine if a function is continuous at a point by applying the definition of continuity;
4. ~~•~~ Ccalculate derivatives of basic algebraic functions using the limit definition;~~work with the derivative graphically and numerically, as well as algebraically,~~
5. ~~2.~~ Interpret derivatives as instantaneous rates of change, in numerical, graphical, and functional contexts;
6. Ccalculate derivatives of algebraic combinations and compositions of elementary functions (algebraic, trigonometric, inverse trigonometric, exponential, logarithmic)~~• explain techniques of differentiation for algebraic and transcendental functions~~;
7. Aapply the methods of calculus to determine key features of graphs, such as asymptotes, relative extrema, and points of inflection;
8. Aapply the methods of calculus to solve applied problems involving related rates of change, optimization, exponential growth, and linear approximations;
9. ~~3.~~ Ddraw conclusions about functions based on major calculus theorems such as the mean value theorem, the intermediate value theorem, and Fermat's theorem;
10. ~~4.~~ ~~•~~ Dddemonstrate proficiency with the use of graphing technology to explore mathematical concepts.~~,~~

~~• use their knowledge of the derivative to model and solve problems from various disciplines, and~~

~~• communicate their approach to and solution of such problems.~~

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	Assignments:	10%	[click to select]	%
Quizzes/tests:	50%	[click to select]	%	[click to select]	%

Details:

To pass the course, ~~Students~~ students must achieve at least 40% on the comprehensive final exam. ~~in order to receive credit for this course.~~

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures are interspersed with problem sessions; Mathematical software will be incorporated by various means. ~~Lectures are interspersed with problem sessions; evaluation includes assignments, midterms, and a three-hour comprehensive final. Graphing calculators will be used. In addition, mathematical software may be used.~~

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	~~Textbook~~OER book	Feldman, Rechnitzer, & Yeager~~Adler & Lovric~~	~~Calculus for the Life Sciences, 2nd Canadian ed. Nelson~~CLP-1 Differential Calculus	2016~~4~~
2.	Textbook	Stewart, Clegg, & Watson	Single Variable Calculus, Early Transcendentals, 98th ed. Cengage~~Brooks/Cole~~	2021~~16~~
3.	[click to select]			
4.	[click to select]			
5.	[click to select]			

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

~~A graphing calculator (without a computer algebraic system) will be required.~~

Course Content and Topics

Exact course content and ordering may vary slightly from year to year but will encompass the following:

I. Preliminaries:
1. brief review of functions, functional notations, and graphs*
2. review of special functions and their graphs*: power, polynomial, rational, exponential, inverse, logarithmic, trigonometric

II. Limits
1. methods and theorems for evaluation
2. one-sided limits
3. limits involving infinity
4. continuity; Intermediate Value Theorem

~~II.~~III. The Derivative:
~~1. introduction to derivatives and limits~~
~~2.~~1. interpretation of the derivative as a rate of change
~~3.~~2. geometric interpretation of first and second derivatives
~~4.~~3. definition of derivatives using numerical methods*
~~5.~~ formal definition of the derivative
~~6. limits and continuity~~
~~7.~~4. ~~local linearity*~~

~~III.~~IV. Differentiation of Special Functions:
1. power functions
2. exponential functions
3. product, quotient, chain rules
4. trigonometric functions, inverse trigonometric functions
5. implicitly-defined functions
6. logarithmic differentiation

~~IV.~~V. Applications of the Derivative:
1. linearization and differentials
~~1.~~2. curve sketching* and analysis of function behaviour; Mean Value Theorem
~~2.~~3. analysis of families of curves
~~3.~~4. optimization problems from various disciplines, which may include physics, chemistry, biology, population studies, economics
~~4.~~5. related rates problems from various disciplines
~~5.~~6. Newton's method*
~~6.~~7. L'Hôpital's rule

~~V.~~VI. Antiderivatives

~~VI.~~VII. Polar Curves and Parametric Functions*
1. polar coordinates and curves*, with applications
2. differentiation of polar curves
3. parametric functions* and applications
4. differentiation of parametric functions

*This content will be covered as time permits. Graphing software is particularly useful in exploring these concepts.

~~*While graphing calculators and/or technology are used throughout the course, they are particularly useful in helping students explore these concepts.~~

Memo for Course Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei, Department Head, Mathematics & Statistics

Date: February 12, 2025

Subject: Proposal for revision of MATH 112

Note that even minor changes may result in comments from committees on all aspects of the course.

1. Summary of changes (select all that apply):
   - ☒ Six-year review
   - ☐ Number and/or course code
   - ☐ Credits and/or total hours
   - ☐ Title
   - ☒ Calendar description
   - ☒ Prerequisites and/or co-requisites
   - ☐ Frequency of course offering
   - ☒ Learning outcomes
   - ☒ Delivery methods and/or texts and resource materials
   - ☐ PLAR options, grading system, and/or evaluation methods
   - ☐ Discontinuation of course
   - ☐ Other – Please specify:

2. Rationale for change: *This course is overdue for review. The learning objectives and content of the course have not changed, though minor edits to these elements in the course outline. Course instructors have also taken steps to improve the accessibility of the course in recent years by moving to OER and favoring accessible software in favor of graphing calculators.*

3. If there are substantial changes to the learning outcomes, explain how they align with the learning outcomes of the program(s) and contribute to students' ability to meet the Institutional Learning Outcomes (ILOs): *There are no substantial changes to learning outcomes.*

4. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs? *One of MATH 112 or MATH 118 are required of all BSc students. MATH 112 is currently required by ASc. students as well, though recently proposed changes will remove that requirement*
5. Which program areas have been consulted about the change(s)? *There has been no consultation. The changes to resources will not have an impact at the program level.*

6. In what ways does this course (not just the proposed changes) contribute to Indigenizing Our Academy? Provide explicit examples of assignment design, topic selection, curriculum delivery, or other methods, which can be in response to one or more of the following: UFV Integrated Strategic

Plan, Fulfilling Our Commitment to Aboriginal Peoples policy (BRP-200.05), the TRC Calls to Action, and/or the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).
Note that MATH 111 and MATH 112 form an integrated two-term sequence of courses, with methods of delivery consistent between the two courses. In both courses, learners are engaged in active inclusive environments, where students are consistently required to learn by doing. Course instructors emphasize the importance of practice and self-assessment in meeting the learning objectives. Learning in ways that are experiential and reflective, and that require time and patience, are among the First Peoples Principles of Learning. In addition to considering Indigenous ways of learning, instructors also look for opportunities to present course concepts in the context of applications relevant to the local environment and people. Examples include models of population and sustainable harvesting, as well as construction of Bentwood Boxes.

7. How does the course reflect principles of equity, diversity, and inclusion, through assignment design, topic selection, curriculum delivery, or other methods?
   In addition to providing supportive classroom environments, MATH 111 and MATH 112 have been made accessible in recent years is through the use of materials accessible to all students The course uses open textbooks, and an open-source web-based homework system. Instructors rely on web-based tools to support learning through graphing and computation, rather than requiring students to individually purchase graphing calculators.

8. If applicable, discuss any special considerations for this course (credit value, class size limit, frequency of offering, resources required such as labs or equipment, field trips, etc.)

9. Estimate of the typical costs for this course, including textbooks and other materials (excluding tuition): *With the change to open and accessible textbooks and software, there are now no additional costs for this course beyond tuition.*

UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1993
REVISED COURSE IMPLEMENTATION DATE:
COURSE TO BE REVIEWED (six years after UEC approval)**:**
Course outline form version: 26/01/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 112	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Calculus II **Course Short Title:** (To be assigned by OReg based on university standards.)	
Faculty: Faculty of Science	**Department (or program if no department):** Mathematics & Statistics

Calendar Description:

Integral ~~Calculus~~ calculus of a function of one variable, in the context of elementary functions (algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic). Definition, properties, and evaluation of definite integrals, with applications to problems such as ~~I~~ is concerned with finding the characteristics of change of a given quantity. In Calculus II, we examine the change in the reverse: if we know the way a quantity changes, can we determine what the quantity is? Topics include techniques of integration; application of the definite integral to various problems such as areas, volumes, and average value ~~of a function~~, ~~and other~~ problem~~s~~ ~~from the natural and social sciences,~~ ~~approximate~~ numerical integration~~n methods~~, improper integral~~s and their applications~~, an introduction to differential equations, polynomial approximations to functions, and sequences and series. Applications will frequently be contextualized within the natural and social sciences.

~~Note: Students with credit for cannot take this course for further credit.~~

Prerequisites (or NONE):	MATH 111 with a C or better.
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	60
[click to select]	
[click to select]	
[click to select]	
[click to select]	
Total hours	**60**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: ~~[click to select]~~Yes

Submit outline for (re)articulation: ~~[click to select]~~No
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**
Faculty Council approval	**Date of meeting:**

Undergraduate Education Committee (UEC) approval	**Date of meeting:**

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Building upon their knowledge of differential calculus, successful students will be able to:

1. Ccommunicate all results and computations using rigorouscorrect notation and terminology;
1. express the definite integral as a limit of Riemann sums;
2. linterpret the definite integral as an area, expressing it as a limit of Riemann sums;
3. explain the Fundamental Theorem of Calculus;
4. Eevaluate definite integrals using apply the Fundamental Theorem of Calculus in combination with other classical techniquesto evaluate definite integrals;
5. demonstrate proficiency in using various techniques of integration;
6. Uuse definite integrals to model and solve problems in a variety of situationsthe natural and social sciences;
7. Ttest the convergence of improper integrals;
8. identify separable first order differential equations;
9. Ssolve separable first order differential equations;
10. Mmodel simple real-world situations with first order differential equations;
11. explain the concepts of convergence and divergence of a sequence and of a series;
12. Duse various tests to determine convergence (absolute and conditional) and divergence of sequences, series, and power series;
13. recognize the function represented by a power series;
14. Cconstruct the power series representation of a function;
15. determine the radius of convergence of a power series;
16. Ddemonstrate proficiency with the use of graphing technology to explore mathematical concepts.carry out analyses and calculations both with and without technological support.

In the course of mastering the concepts and techniques of this first year calculus course, the student should develop an appreciation of what mathematics is and how the skills honed through the study of mathematics are useful in other disciplines.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	Assignments:	10%	[click to select]	%
Quizzes/tests:	50%	[click to select]	%	[click to select]	%

Details:

To pass the course, The weighting of the various components may vary from instructor to instructor and from year to year, although there must be at least two midterms, and the comprehensive final exam must be worth from 30% to 50% of the final grade. Sstudents must achieveobtain at least 40% on the comprehensive final exam to pass the course.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures are interspersed with problem sessions; evaluation includes assignments, midterms, and a three-hour comprehensive final. Graphing calculators will be used. In addition, mMathematical software may will be incorporated by various meansused.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Feldman, Rechnitzer, & YeagerStewart, J	Single Variable Calculus, Early Transcendentals, Brooks/Cole. 7th ed.CLP-2 Integral Calculus	2012 2017
2.	Textbook	Stewart, Clegg, & WatsonStewart, J	Single Variable Calculus, Early Transcendentals, 9th ed. CengageStudy Guide for Single Variable Calculus (Optional), Brooks/Cole. 7th ed.	2021 12
3.	Textbook[click to select]	Stewart, J	Student Solutions Manual for Stewart's Single Variable Calculus: Early Transcendentals (Optional), Brooks/Cole. 7th ed.	2012
4.	[click to select]			
5.	[click to select]			

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

A graphing calculator (without a computer algebraic system) will be required.

Course Content and Topics

Exact course content and ordering may vary slightly from year to year but will encompass the following:

I) Integrals:
   1) brief review of derivatives and antiderivatives
   2) areas and distances
   3) definite integrals
   4) indefinite integrals; Fundamental Theorem of Calculus~~s and net change theorem~~
   5) approximate integration* including Riemann sums, trapezoid and midpoint rules and, as time permits, Simpson's rule and/or error analysis
   6) improper integrals

II) Applications: constructing Riemann sums and evaluating integrals in a wide variety of settings, including
   1) area
   2) volume
   3) average value of a function
   4) further applications to be chosen from work, arc length, area of a surface of revolution, and other applications from the natural and social sciences

III) Techniques of Integration:
   1) integration by parts
   2) integration by substitution (including trigonometric substitutions)
   3) trigonometric integrals
   4) integration of rational functions by partial fractions

IV) Differential Equations:
   1) direction fields*
   2) Euler's method*
   3) separable equations
   4) applications to growth and decay problems*, including exponential, and logistic models
   5) modelling real-world situations with initial-value problems
   6) further applications, as time permits*: Newton's law of cooling and/or predator-prey systems

V) Infinite Sequences and Series:
   1) sequences and series
   2) series convergence tests (including divergence test, integral test, ratio test, alternating series test)
   3) absolute and conditional convergence
   ~~2)~~4) power series
   ~~3)~~5) Taylor series* and ~~applications and determining~~ intervals of convergence
   ~~4)~~6) polynomial approximations and, as time permits, error estimation

* While graphing ~~calculators~~ software ~~or other technology are~~ is used throughout the course, ~~they are~~ it is particularly useful in helping students explore these concepts.

Memo for Course Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei, Department Head of Math & Stats

Date: August 14, 2025

Subject: Proposal for revision of MATH 125

Note that even minor changes may result in comments from committees on all aspects of the course.

1. Summary of changes (select all that apply):
   - ☒ Six-year review
   - ☐ Number and/or course code
   - ☐ Credits and/or total hours
   - ☐ Title
   - ☐ Calendar description
   - ☒ Prerequisites and/or co-requisites
   - ☐ Frequency of course offering
   - ☒ Learning outcomes
   - ☒ Delivery methods and/or texts and resource materials
   - ☐ PLAR options, grading system, and/or evaluation methods
   - ☐ Discontinuation of course
   - ☐ Other – Please specify:

2. Rationale for change: *MATH 125 is due for a six-year review. Minor edits were made to the learning outcomes for clarification and to distinguish between similar learning outcomes in MATH 225. Minor changes were made to relax the prerequisites. The new prerequisites reflect the change to Policy 101 made several years ago regarding how letter grades are assigned to percentages.*

3. If there are substantial changes to the learning outcomes, explain how they align with the learning outcomes of the program(s) and contribute to students' ability to meet the Institutional Learning Outcomes (ILOs):

   No substantial changes have been made to the learning outcomes.

4. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs?

   MATH 125 is required by multiple Computing programs, including the CIS Diploma, BCIS, and BSc Computing Science. The changes proposed will not affect these programs.

5. Which program areas have been consulted about the change(s)? *None.*

6. In what ways does this course (not just the proposed changes) contribute to Indigenizing Our Academy? Provide explicit examples of assignment design, topic selection, curriculum delivery, or other methods, which can be in response to one or more of the following: UFV Integrated Strategic Plan, Fulfilling Our Commitment to Aboriginal Peoples policy (BRP-200.05), the TRC Calls to Action,

and/or the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Note that MATH 125 and MATH 225 form a two-term sequence of courses, with methods of delivery consistent between the courses. We identify how Indigenization of the course delivery has been given consideration in reference to https://www.fnesc.ca/first-peoples-principles-of-learning:

- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place): Students are encouraged to learn from and help each other in class by setting time aside to work on problems together.
- Learning involves recognizing the consequences of one's actions: Students are provided with online homework and encouraged to attempt questions from the textbook. Thus, they take responsibility for their own learning. Instructor is available for office hours to help. Learning is checked with weekly quizzes.
- Learning involves generational roles and responsibilities: Students and instructors work through examples together in class to model problem solving techniques and pass on insights to future practitioners.
- Learning is embedded in memory, history, and story: Instructors demonstrate and discuss how mathematical intuition comes from recalling previous examples.
- Learning involves patience and time: Instructors emphasize in class that mathematical intuition comes from practice and experience. There is no quick fix for learning.

7. How does the course reflect principles of equity, diversity, and inclusion, through assignment design, topic selection, curriculum delivery, or other methods?

   In addition to providing supportive classroom environments, MATH 125 has been made more accessible in recent years through the use of materials accessible to all students The course uses open textbooks, and an open-source web-based homework system. Most instructors provide pdfs of their own outlines or completed notes, and some provide screen recordings in an effort to support students whose first language is not English.

8. If applicable, discuss any special considerations for this course (credit value, class size limit, frequency of offering, resources required such as labs or equipment, field trips, etc.

9. Estimate of the typical costs for this course, including textbooks and other materials (excluding tuition): *Expected textbook cost is zero as instructors are currently using OER textbooks.*

ORIGINAL COURSE IMPLEMENTATION DATE: Sept 1995
REVISED COURSE IMPLEMENTATION DATE:
COURSE TO BE REVIEWED (six years after UEC approval)**:**
Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 125	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Introduction to Discrete Mathematics **Course Short Title:** ~~(To be assigned by OReg based on university standards.)~~	
Faculty: Faculty of Science	**Department/School:** Mathematics & Statistics

Calendar Description:

Serves as an introduction to some basic techniques in discrete mathematics, including methods of counting, recursion, and formal logic. The focus ~~of the course~~ will be on formulating problems into mathematical models and on methods applicable to the analysis of these models.

~~Note: Students with credit for cannot take this course for further credit.~~

Prerequisites (or NONE):	One of the following: (C+ or better in both Pre-calculus 11 and Geometry 12) or (C+ or better in both Pre-calculus 11 and Statistics 12) or (C+ or better in Principles of Mathematics 12) or (C or better in one of Foundations of Mathematics 12, Pre-calculus 12, ~~MATH 092, MATH 096, or MATH 124~~) or (C or better in both MATH 094 and MATH 095) or (B or better in Applications of Mathematics 12) or (MATH 092) or (MATH 096) or (MATH 124) or (MATH 110) or (a score of 17/25 or better on Part B of the MSAT together with a score of 34/50 on Parts A and B combined).
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	60
[click to select]	
[click to select]	
[click to select]	
[click to select]	
Total hours	**60**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **[click to select]**

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **[click to select]**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Yes

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: ~~[click to select]~~No
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:** June 16, 2025
Faculty Council approval	**Date of meeting:**
Undergraduate Education Committee (UEC) approval	**Date of meeting:**

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. Use basic counting techniques such as addition rule, multiplication rule, and inclusion/exclusion rule for 2 or 3 sets;
1. Use counting arguments to enumerate combinatorial objects and calculate discrete probabilities.
2. Calculate discrete probabilities.
32. Use techniques of formal logic to establish logical equivalence and verify validity of arguments.
43. Construct statements and arguments using logical connectives and quantifiers.
54. Apply (weak) induction to simple problems.
65. Manipulate and solve 1st and 2nd degree recurrence relations.
76. Model problems using recurrence relations.
87. Use set notation and perform set operations.
98. Prove basic set properties.
109. Identify basic properties and calculate basic parameters of simple graphs, including trees and rooted trees.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	Quizzes/tests/midterm:	50%	Assignments:	10%
[click to select]	%	[click to select]	%	[click to select]	%

Details: Students must obtain at least 40% on the final exam in order to pass this course.

(Provide a full assessment breakdown and any other relevant information.)

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lecture

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	TextbookOER	EppKoshy	Discrete Mathematics with Applications Discrete Mathematics with Applications, 4th Ed.	2010 2004
2.	[click to select]OER	Levin	Discrete Mathematics: An Open Introduction	2024
3.	[click to select]OER	Fortney	Discrete Mathematics for Computer Science	2021
4.	[click to select]Textbook	Epp	Discrete Mathematics with Applications, 5th Ed.	2019
5.	[click to select]			

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

(Use this section for supplies and materials for all sections of this course.)

Course Content and Topics

Typical Course Content and Topics

Counting:

a) induction

b) sums and products

c) permutations and combinations

d) binomial theorem

e) inclusion/exclusion arguments

f) introduction to probability

Recurrence Relations

a) solve 1st order recurrence relations using iteration

b) solve 2nd order linear homogeneous recurrence relations with constants coefficients using theorems

c) use to analyze and model problems

Set Theory:

a) basic terminology and symbols

b) proofs using element arguments and set law

c) Cartesian products

Logical Syntax/Semantics:

a) informal versus formal arguments

b) statement logic

c) logical equivalency

d) validity of arguments

e) Boolean algebras

f) predicates

g) quantified statements

Graphs and Trees:

a) definitions and basic properties for simple graphs

b) walks, closed walks, trails, paths, circuits, simple circuits

c) trees and their properties

d) rooted trees and their properties

Memo for Course Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei, Department Head of Math & Stats

Date: August 14, 2025

Subject: Proposal for revision of MATH 225

Note that even minor changes may result in comments from committees on all aspects of the course.

1. Summary of changes (select all that apply):
   - ☒ Six-year review
   - ☐ Number and/or course code
   - ☐ Credits and/or total hours
   - ☐ Title
   - ☐ Calendar description
   - ☒ Prerequisites and/or co-requisites
   - ☐ Frequency of course offering
   - ☒ Learning outcomes
   - ☒ Delivery methods and/or texts and resource materials
   - ☐ PLAR options, grading system, and/or evaluation methods
   - ☐ Discontinuation of course
   - ☐ Other – Please specify:

2. Rationale for change: *MATH 225 is due for a six-year review. Minor edits were made to the learning outcomes for clarification and to distinguish between similar learning outcomes in MATH 125. Minor changes were made to relax the prerequisites based on data from Institutional Research demonstrating correlation between success in MATH 225 and MATH 125.*

3. If there are substantial changes to the learning outcomes, explain how they align with the learning outcomes of the program(s) and contribute to students' ability to meet the Institutional Learning Outcomes (ILOs):

   No substantial changes have been made to the learning outcomes.

4. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs?

   MATH 225 is required by BSc Computing Science. As these students must also take MATH 125, the change in prerequisites will make MATH 225 easier to access.

5. Which program areas have been consulted about the change(s)? *None.*

6. In what ways does this course (not just the proposed changes) contribute to Indigenizing Our Academy? Provide explicit examples of assignment design, topic selection, curriculum delivery, or other methods, which can be in response to one or more of the following: UFV Integrated Strategic

Plan, Fulfilling Our Commitment to Aboriginal Peoples policy (BRP-200.05), the TRC Calls to Action, and/or the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Note that MATH 125 and MATH 225 form a two-term sequence of courses, with methods of delivery consistent between the courses. We identify how Indigenization of the course delivery has been given consideration in reference to https://www.fnesc.ca/first-peoples-principles-of-learning:

- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place): Students are encouraged to learn from and help each other in class by setting time aside to work on problems together.
- Learning involves recognizing the consequences of one's actions: Students are provided with online homework and encouraged to attempt questions from the textbook. Thus, they take responsibility for their own learning. Instructor is available for office hours to help. Learning is checked with weekly quizzes.
- Learning involves generational roles and responsibilities: Students and instructors work through examples together in class to model problem solving techniques and pass on insights to future practitioners.
- Learning is embedded in memory, history, and story: Instructors demonstrate and discuss how mathematical intuition comes from recalling previous examples.
- Learning involves patience and time: Instructors emphasize in class that mathematical intuition comes from practice and experience. There is no quick fix for learning.

7. How does the course reflect principles of equity, diversity, and inclusion, through assignment design, topic selection, curriculum delivery, or other methods?

   In addition to providing inclusive classroom environments, MATH 225 makes use of an accessible open-source web-based homework system to support the learning of all students. Most instructors provide pdfs of their own outlines or completed notes, and some provide screen recordings in an effort to support students whose first language is not English.

8. If applicable, discuss any special considerations for this course (credit value, class size limit, frequency of offering, resources required such as labs or equipment, field trips, etc.

9. Estimate of the typical costs for this course, including textbooks and other materials (excluding tuition): *Expected textbook cost is $140.*

ORIGINAL COURSE IMPLEMENTATION DATE: Sept 1999
REVISED COURSE IMPLEMENTATION DATE:
COURSE TO BE REVIEWED (six years after UEC approval)**:**
Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 225	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Topics in Discrete Mathematics **Course Short Title:** ~~(To be assigned by OReg based on university standards.)~~	
Faculty: Faculty of Science	**Department/School:** Mathematics & Statistics

Calendar Description:

Introduces students to some of the most useful types of combinatorial structures: graphs, trees, generating functions, and recurrence relations, all of which play an important role in the mathematics of computers and computation.

~~Note: Students with credit for cannot take this course for further credit.~~

Prerequisites (or NONE):	One of the following: (C+ or better in either MATH 112 or MATH 118) or (MATH 125 and a C or better in either MATH 112 or MATH 118).
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number: ~~MATH 243~~

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	50
[click to select]	
[click to select]	
[click to select]	
[click to select]	
Total hours	**50**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **No**

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Annually**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Yes

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: **No**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:** June 16, 2025
Faculty Council approval	**Date of meeting:**
Undergraduate Education Committee (UEC) approval	**Date of meeting:**

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. ~~Clearly s~~State, interpret, and employ definitions and major theorems related to the content described below~~;~~
2. Use basic counting techniques such as addition rule, multiplication rule, and general inclusion/exclusion rule;
3. Analyze and count permutations and combinations;
4. Construct generating functions and apply them to counting problems;
5. Solve first order linear and second order linear ~~homogeneous~~ recurrence relations, both homogeneous and nonhomogeneous;
6. Construct chromatic polynomials for graphs;
7. Apply some standard graph theory algorithms (Dijkstra's shortest path, maximum matching, minimum weight spanning tree, etc) to solve practical problems.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	45%	Quizzes/tests/midterm:	40%	Assignments:	15%
[click to select]	%	[click to select]	%	[click to select]	%

Details: Students must obtain at least 40% on the final exam in order to pass this course.

(Provide a full assessment breakdown and any other relevant information.)

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lecture

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Grimaldi	Discrete and Combinatorial Mathematics, 5th Ed	2010
2.	~~[click to select]~~Textbook	———Rosen	———Discrete Mathematics and Its Applications, 8th Ed	2018
3.	[click to select]			
4.	[click to select]			
5.	[click to select]			

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

(Use this section for supplies and materials for all sections of this course.)

Course Content and Topics

Typical Course Content and Topics

1. Counting
   a. The addition rule and multiplication rule
   b. The inclusion and exclusion rule
   c. Combinations and permutations
2. Generating Functions
   a. Definition and examples
   b. Partitions of integers
3. Recurrence Relations
   a. The first-order linear recurrence relation
   b. The second-order linear ~~homogeneous~~ recurrence relation
   c. The method of generating functions
4. Graph Theory and Applications
   a. An introduction to graph theory
   b. Basic structures: paths and cycles
   c. Graph colouring and chromatic polynomials
   d. Trees
   e. Algorithms: shortest path, minimal spanning trees and maximal matchings

Memo for Course Changes

To: Science Faculty Council, Undergraduate Education Committee

From: Ben Vanderlei, Department Head of Math & Stats

Date: August 14, 2025

Subject: Proposal for revision of MATH 355

Note that even minor changes may result in comments from committees on all aspects of the course.

1. Summary of changes (select all that apply):
   - ☒ Six-year review
   - ☐ Number and/or course code
   - ☐ Credits and/or total hours
   - ☐ Title
   - ☒ Calendar description
   - ☐ Prerequisites and/or co-requisites
   - ☐ Frequency of course offering
   - ☒ Learning outcomes
   - ☒ Delivery methods and/or texts and resource materials
   - ☐ PLAR options, grading system, and/or evaluation methods
   - ☐ Discontinuation of course
   - ☐ Other – Please specify:

2. Rationale for change: *MATH 355 is due for a six-year review. The description, learning outcomes, and resources have been updated to reflect how the course is currently being taught.*
3. If there are substantial changes to the learning outcomes, explain how they align with the learning outcomes of the program(s) and contribute to students' ability to meet the Institutional Learning Outcomes (ILOs):

   No substantial changes have been made to the learning outcomes.
4. Is this course required by any program beyond the discipline? If so, how will this change affect that program or programs?

   MATH 355 is not a required course in any program.
5. Which program areas have been consulted about the change(s)? *None.*

6. In what ways does this course (not just the proposed changes) contribute to Indigenizing Our Academy? Provide explicit examples of assignment design, topic selection, curriculum delivery, or other methods, which can be in response to one or more of the following: UFV Integrated Strategic Plan, Fulfilling Our Commitment to Aboriginal Peoples policy (BRP-200.05), the TRC Calls to Action, and/or the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

In alignment with the commonly held understandings by Indigenous nations of how we interact and learn about the world, this course is learner centred, inquiry and experiential-learning based, recognizes awareness of all people in equal measure (through the common language of mathematics), and supports a variety of learning styles (through class discussion, written assignments, and class presentations, for example).

As reflected in the First People's Principles of Learning, these approaches reflect a respectful and holistic approach to teaching and learning. Learning in mathematics in general, and in Number Theory in particular, encompasses all of the 7E's as laid out in Science First Peoples Teacher Resource Guide: Engaging and Exploring (Experiencing), Evaluating (through critique and computations), Explaining (through proofs), Elaborating (applying ideas and theories to new situations), and Environment and Elders (via the awareness of origins, and sometimes the development, of the topics at hand).

7. How does the course reflect principles of equity, diversity, and inclusion, through assignment design, topic selection, curriculum delivery, or other methods?

   Diverse mathematical traditions and perspectives are valued in this course, participation from all individuals is encouraged, and collaborative learning is promoted. Number theory has a rich history spanning cultures from across the globe, such as ancient Indian, Arabic, and Chinese civilizations, and offers the opportunity to engage with the global roots of mathematical discovery. Inclusivity is assured by emphasizing the contributions of often underrepresented groups in mathematics. The nature of this course builds theory from fundamental properties of numbers which are accessible to all, and by encouraging diverse problem-solving approaches we ensure that all students are valued and empowered to contribute, hence creating a supportive, inclusive and equitable environment in this course.

8. If applicable, discuss any special considerations for this course (credit value, class size limit, frequency of offering, resources required such as labs or equipment, field trips, etc.

   It would be desirable to limit the class size to 24 because for this course to be most successful for students it needs to be a writing-intensive course, but that is only possible with a smaller class size.

9. Estimate of the typical costs for this course, including textbooks and other materials (excluding tuition): *Expected textbook cost is $80.*

ORIGINAL COURSE IMPLEMENTATION DATE:
REVISED COURSE IMPLEMENTATION DATE:
COURSE TO BE REVIEWED (six years after UEC approval)**:**
Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 355	**Number of Credits:** ~~———~~3 Course credit policy (105)
Course Full Title: Number Theory and Applications **Course Short Title:** ~~(To be assigned by OReg based on university standards.)~~	
Faculty: Faculty of Science	**Department/School:** Mathematics & Statistics

Calendar Description:

An introduction to the fundamental properties of the integers and their consequences, with applications in computation, cryptography, and communications. Topics include primes and GCDs, congruence~~,~~ (modular arithmetic), and its applications (divisibility tests~~,~~ hashing functions, check digits), number-theoretic functions ~~factorization methods,~~ and cryptology.

Prerequisites (or NONE):	MATH 265
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

~~[click to select]~~Lecture/seminar	~~———~~5 0
[click to select]	
[click to select]	
[click to select]	
[click to select]	
Total hours	**50**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **No**

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every other year**

Maximum enrolment (for information only)**:** **2436** ~~36~~

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

~~———~~Yes

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: ~~No~~**Yes**

Submit outline for (re)articulation: **No**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:** ~~———~~June 16, 2025
Faculty Council approval	**Date of meeting:**
Undergraduate Education Committee (UEC) approval	**Date of meeting:**

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. ~~Precisely~~ Define~~design~~ the central concepts ~~and results~~ of elementary number theory such as prime numbers, gcd, ~~Fundamental Theorem of Arithmetic, the Chinese Remainder Theorem, and Euler's Theorem.~~ modular arithmetic, arithmetic functions.
2. State key theorems such as the Division Algorithm, the Prime Number Theorem, Fundamental Theorem of Arithmetic, the Euler's Totient Theorem, Chinese Remainder Theorem, and Fermat's Last Theorem.
3. Apply core theorems and algorithms (for example the Chinese Remainder Theorem, Euclidean Algorithm) to prove related properties.
4. Construct rigorous proofs, illustrative examples, and relevant counterexamples concerning ~~these~~core number-theoretic ~~concepts and their interrelations.~~ concepts and their interrelations.
5. Apply the theory of congruences to ~~other~~ solve problems such as ~~(for example,~~ constructing divisibility tests, solving linear Diophantine equations, ~~polynominal~~ polynomial congruences, and systems of linear congruences~~)~~.
6. Precisely define and implement applications of the ideas above to ~~techniques~~ areas such as cryptology and error correction.
7. Perform ~~all the necessary~~ computations by hand (demonstrating understanding of underlying principles~~in principle~~) ~~and~~ or ~~in a~~ utilizing computer algebra ~~environment~~ systems (such as Maple, Mathematica, or SageMath).

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	~~Quizzes/tests/midterm:~~Assignments:	~~10~~15%	[click to select]	%
Quizzes/tests/midterm:	~~30~~45%	~~Assignments:~~[click to select]	~~20~~%	[click to select]	%

Details:

Students must achieve at least 40% on the final exam in order to receive credit for this course

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

This course ~~will be~~is primarily lecture based, with some computational support provided by a computer algebra system ~~such as Maple or Sage~~. This course is well-suited to student presentations, if feasible (depending on class size).

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	JK Strayer~~Kenneth H Rosen~~	Elementary Number Theory, Waveland Press~~Elementary Number Theory and its Applications, Addison Wesley~~	~~2011~~ 2002
2.	Textbook	GA Jones & JM Jones	Elementary Number Theory (SUMS series book), Springer	1998
3.	Textbook	Kenneth H Rosen~~JK Strayer~~	Elementary Number Theory and its Applications, Addison Wesley~~Elementary Number Theory, Waveland Press~~	~~2002~~ 2011
4.	[click to select]			
5.	[click to select]			

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

~~(Use this section for supplies and materials for all sections of this course.)~~

Course Content and Topics

- Fundamental properties of the integers; divisibility and factorization (prime numbers, gcds, Euclidean algorithm, Fundamental Theorem of Arithmetic, factorization methods, linear Diophantine equations)
- Congruences (linear congruences, Chinese reminder theorem, polynomial congruences, systems of linear congruences)
- Applications of congruences (divisibility tests, hashing functions, check digits)
- Special congruences (Fermat's and Euler's Theorem, Wilson's Theorem, pseudoprimes (applications to primality testing)
- Number-theoretic functions (Multiplicative functions, Euler's phi-functions, Mobius Inversion, perfect numbers, Mersenne

primes)
- Cryptology (block ciphers, exponentiation ciphers, public key cryptography, knapsack ciphers)
- Computer algebra systems for number theory (Maple, Mathematica,, ~~Yacas~~, SageMath, Maxima, PARI/GP, Yacas)
- Additional topics as time permits such as: Gaussian integers and norms (sums of squares), quadratic reciprocity, continued fractions, primitive roots (order of an integer, existence of primitive roots, primality tests)