MATHEMATICS - BACHELOR OF SCIENCE

Overview

Mathematics is the study of numbers, shapes and relationships through the use of deductive reasoning, and includes both the elegance of pure theory and the application of this theory to all human endeavours. As a mathematics student, you will study topics from the fields of algebra, analysis, geometry and applied mathematics. You'll be rewarded for you hard work with sophisticated analytical tools, a highly developed ability in precise critical thinking, and a general knowledge of the main streams of mathematical thought and their applications to various disciplines.

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Bachelor of Science

Faculty of Arts and Science
MacEwan.ca/Science (http://MacEwan.ca/Science/)

The Bachelor of Science (BSc) is a foundational general degree that provides broad and widely applicable knowledge and abilities rather than a niche specialization. This broad base equips graduates with generalist knowledge and skills that give the flexibility and agility so highly valued in a dynamic world economy. It also offers students a solid foundation to specialize in future employment or further schooling.

The degree provides a breadth of study across various Arts and Science disciplines and sets the foundation for later years. The major and minor areas of study allow students to focus and gain in-depth expertise in complementary or entirely disparate disciplines; there is a wide array of possible combinations. Finally, options enable students to explore courses outside their disciplines or even within their program, enhancing their diversity of learning. The small classes, close interaction between instructors and students, opportunities for individual study, and faculty with a strong focus on teaching are signature strengths of this program.

General Program Information

The BSc requires students to complete 120 credits of non-duplicative coursework. The BSc emphasizes breadth and depth and has been designed for exceptional flexibility and customization. Students can complete a major and a minor, a double major, or a major and two minors. Students can choose a secondary major in an Arts or Science discipline, but the primary major must be in a Science discipline.

All newly admitted students enter the BSc program as "Undeclared." Undeclared means a student has not yet chosen their major(s) and minor(s). Students may declare at any time after being accepted to the BSc, and typically, they declare after completing a minimum of 45 credits. The Arts and Science Academic Advising Office will send information about majors and minors via email and newsletters; please contact the Advising Office if you require further assistance with this decision.

Science Disciplines

Discipline	Major	Minor	Honours
Applied Statistics	◉	-	◉
Biological Sciences	◉	◉	◉
Chemistry	◉	◉	-
Computer Science	◉	◉	-
Earth and Planetary Sciences	-	◉	-
Environmental Sciences	-	◉	-
Mathematics	◉	◉	◉
Mathematical Sciences	◉	-	-
Planetary Physics	-	◉	-
Physical Sciences	◉	-	-
Physics	-	◉	-
Psychology	◉	◉	◉
Statistics	-	◉	-

Arts Disciplines

Discipline	Major	Minor
Anthropology	◉	◉
Classics		◉
Creative Writing		◉
Economics	◉	◉
English	◉	◉
Film Minor for Arts and Science		◉
French		◉
Gender Studies		◉
History	◉	◉
Philosophy	◉	◉
Political Science	◉	◉
Sociology	◉	◉
Spanish		◉

Out of Faculty Minors

Discipline	Minor
Accounting Minor for Arts and Science	◉
Arts and Cultural Management	◉
Business Law	◉
Business Studies	◉
Digital Experience Design	◉
Finance Minor for Arts and Science	◉

Human Resources Minor for Arts and Science	◉
Marketing Minor for Arts and Science	◉

Laddering a Diploma into the Bachelor of Science

Students with an accredited diploma can ladder into the Bachelor of Science (BSc) and use some of their diploma coursework towards their degree requirements. If you have questions about the diploma laddering process, please visit www.macewan.ca/bscstudent or contact artsandscience@macewan.ca.

Preparing for Professional Studies

Students intending to enter professional programs at other universities can take their pre-professional programs in the Faculty of Arts and Science at MacEwan University. The university offers the first and second years of several pre-professional programs, including chiropractic medicine, dental hygiene, dentistry, medical laboratory science, medicine, optometry, pharmacy, and veterinary medicine. All courses in these pre-professional programs are credit courses, and, as such, they may apply to the degrees offered by MacEwan University.

Students are advised to consult the admissions requirements for the universities and programs of their choice and to select their MacEwan University courses accordingly. Completing pre-professional courses at MacEwan University does not guarantee admission to the subsequent professional program. Each professional program requires a separate application, and entry is competitive, not automatic.

Degree Requirements

Breadth Requirements

All Bachelor of Science degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for the major(s), minor(s), Honours, or options. BIOL, CHEM, EASC, or PHYS courses must include a laboratory component.

Breadth Element	Description	Credits
Biological or Earth and Planetary Sciences	BIOL or EASC (not including BIOL 101, BIOL 102, or BIOL 103)	6
Chemistry or Physics	CHEM or PHYS	6
English	ENGL 102 and 3 credits in university English (not including ENGL 111, ENGL 108, or ENGL 211)	6
Humanities	CLAS, COMP, HIST, HUMN, PHIL or a language other than English	6
Mathematical Sciences	One of MATH 114, MATH 120, or MATH 125, and 3 credits in MATH, STAT, or CMPT (not including MATH 160, MATH 170, or CMPT 104)	6
Social Sciences	ANTH, ECON, GEND, LING, POLS, PSYC, or SOCI	6

Bachelor of Science Degree

Program Element	Description	Credits
Primary Major	The Science major will range from 42 to 60 credits with a minimum 36 credits taken at the senior-level.[1]	42-60
Secondary Major or Minor(s)	Students have the option of completing a second Science or Arts major, or one or two minors. Minor courses must be completed at the senior-level.[1]	18-60
Options	Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses	Up to 60
	Total Degree Credits Including Breadth	120

[1]

Multi-disciplinary majors consist of 60-72 junior- and senior-level credits. Students majoring in mathematical or physical sciences may pursue a minor but are not required to do so.

Bachelor of Science Honours

Program Element	Description	Credits
Minimum Honours Requirements	Honours requirements are determined by each discipline.	63

Option Courses, Non-Compulsory Honours Courses, and/or a Minor	Students have the option of completing a minor from outside of the Honours discipline. Some disciplines may require a minor.	57
	Total Degree Credits Including Breadth	120

The minimum passing grade for a course at MacEwan University is a D unless otherwise noted next to the appropriate course in the program of study. In the Faculty of Arts and Science, students typically require a minimum grade of C- to use a course as a prerequisite. Please check course descriptions for more information.

Cross-Faculty Course Recognitions

Cross-Faculty course recognition represents an agreement between programs within MacEwan University and consists of a number of approved courses that have the potential to be recognized within another degree. These courses are not considered transfers or equivalents as the original course will show within a student's transcript and their Academic Planning and Progress Report (APPR). How the courses listed below might be used within a student's degree are determined by the student's program of study. They are dependent on a number of factors including year of declaration, year of completion, and individual program requirements.

Out-of-Faculty Course	Course Recognition	Course Used For
ACUP 117	ARTOP 1XX	Options; fulfills Humanities Breadth
ACUP 209	SCIOP 2XX	Options
ACUP 220, ACUP 303, and ACUP 304 (must complete all three courses)	COSL 200 (6 credits)	Options
ACUP 320	SCIOP 3XX	Options
AGAD 300	COSL 300	Options
AGAD 435	WINL 300	Options
ARTE 104	ARTOP 1XX	Options; fulfills Humanities Breadth
ARTE 214	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 224	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 234	ARTOP 2XX	Options; fulfills Humanities Breadth
ARTE 304	ARTOP 3XX	Options; fulfills Humanities Breadth
ARTE 314	ARTOP 3XX	Options; fulfills Humanities Breadth
ARTE 324	ARTOP 3XX	Options; fulfills Humanities Breadth
CORR 102	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 104	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 110	SOCI 225	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 120	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 202	ARTOP 2XX	Options
CORR 208	ARTOP 2XX	Options
CORR 214	COSL 200	Options
CORR 218	SOCI 321	Options or Sociology program requirements; fulfills Social Science Breadth
CORR 224	COSL 200	Options
CYCW 100	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
CYCW 108 and CYCW 112	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 115	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 114	ARTOP 1XX	Options
CYCW 201	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
CYCW 204	COSL 200	Options
CYCW 205	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 206	ARTOP 2XX	Options
CYCW 208	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 211	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 302	ARTOP 3XX	Options; fulfills Social Science Breadth
CYCW 303	ARTOP 3XX	Options; fulfills Social Science Breadth
CYCW 339	ARTOP 3XX	Options; fulfills Social Science Breadth
CYCW 340	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 350	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 360	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth
CYCW 361	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth

CYCW 466	ARTOP 4XX	Options
DESN 270	ARTOP 2XX	Options; fulfills Humanities Breadth
DESN 271	ARTOP 2XX	Options; fulfills Humanities Breadth
ECCS 110	PSYC 1XX	Options or Psychology program requirements; fulfills Social Science Breadth
ECCS 115	ARTOP 1XX	Options
ECCS 160	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
ECCS 180	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science breadth
ECCS 220	COSL 200	Options
ECCS 255	ARTOP 2XX	Options
ECCS 260	SOCI 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
ECCS 270	COSL 200	Options
ECCS 310	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth
ECCS 355	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth
ECCS 360	SOCI 3XX	Options or Sociology program requirements; fulfills Social Science Breadth
ECCS 425	SOCI 4XX	Options or Sociology program requirements; fulfills Social Science Breadth
ECDV 160	ARTOP 1XX	Options
ECDV 220	COSL 200	Options
ECDV 255	ARTOP 2XX	Options
ECDV 260	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
ECDV 270	COSL 270	Options
ECDV 280	PSYC 2XX	Options or Psychology program requirements; fulfills Social Science Breadth
FNCE 301	ECON 3XX	Options or Economics program requirements; fulfills Social Science Breath
HAPR 101	SCIOP 1XX	Options
HAPR 104	ARTOP 1XX	Options
HAPR 114	WINL 200	Options
HAPR 201	ARTOP 2XX	Options
HAPR 212	WINL 200	Options
HEED 110	ARTOP 1XX	Options
HEED 120	SCIOP 1XX	Options
HLSC 104	SCIOP 1XX	Options
HLSC 105	SCIOP 1XX	Options
HLSC 120	BIOL 1XX	Options or Biological Sciences program requirements
HLSC 124	BIOL 1XX	Options or Biological Sciences program requirements
HLSC 126	BIOL 1XX	Options or Biological Sciences program requirements
HLSC 128	BIOL 2XX	Options or Biological Sciences program requirements
HLST 150	SCIOP 1XX	Options
HLST 210	ARTOP 2XX	Options
HLST 290	SCIOP 1XX	Options
INFM 101	ARTOP 1XX	Options
INFM 202	ARTOP 2XX	Options
INFM 208	ARTOP 2XX	Options
INFM 209	ARTOP 2XX	Options
INFM 210	ARTOP 2XX	Options
INFM 260	COSL 200	Options
INTA 210	ARTOP 2XX	Options; fulfills Humanities Breadth
INTA 362	ARTOP 3XX	Options
MTST 120	BIOL 1XX	Options or Biological Sciences program requirements
MTST 122	BIOL 1XX	Options or Biological Sciences program requirements
MTST 125	BIOL 1XX	Options or Biological Sciences program requirements
MTST 126	BIOL 1XX	Options or Biological Sciences program requirements
MTST 161, MTST 162, MTST 260, MTST 261, MTST 262	COSL 200	Options
MUSC 104	ARTOP 1XX	Options
MUSC 123	ARTOP 1XX	Options; fulfills Social Science Breadth
MUSC 124	ARTOP 1XX	Options; fulfills Social Science Breadth
PEDS 100	BIOL 1XX	Options or Biological Sciences program requirements

PEDS 101	BIOL 1XX	Options or Biological Sciences program requirements
PEDS 103	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 109	SCIOP 1XX	Options
PEDS 200	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 203	SCIOP 2XX	Options
PEDS 206	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 207	BIOL 2XX	Options or Biological Sciences program requirements
PEDS 209	ARTOP 2XX	Options
PEDS 240	SCIOP 1XX	Options
PERL 104	ARTOP 1XX	Options
PERL 204	ARTOP 2XX	Options
PERL 207	ARTOP 2XX	Options
PSSC 102	ARTOP 1XX	Options
PSSC 112	ARTOP 1XX	Options
PSSC 121	SOCI 1XX	Options or Sociology program requirements; fulfills Social Science Breadth
PSSC 203	ARTOP 2XX	Options
PSSC 204	ARTOP 2XX	Options
PSSC 212	ARTOP 2XX	Options
PSSC 252	ARTOP 2XX	Options
PSSC 253	ARTOP 2XX	Options
PSSC 272	COSL 200	Options
PSSC 273	COSL 200	Options
SOWK 101	ARTOP 1XX	Options; fulfills Humanities Breadth
SOWK 111	ARTOP 1XX	Options
SOWK 112	ARTOP 1XX	Options
SOWK 203	ARTOP 2XX	Options
SOWK 204	SOCI 2XX	Options or Sociology program requirements; fulfills Social Science Breadth
TAST 101	ARTOP 1XX	Options
TAST 129 and TAST 130	COSL 200	Options
THAR 240	ARTOP 2XX	Options
THAS 101	ARTOP 1XX	Options
THAS 102	SCIOP 1XX	Options
THAS 115	ARTOP 1XX	Options
THAS 203	COSL 200	Options
THAS 210	COSL 200	Options
THAS 211	COSL 200	Options
THAS 214	COSL 200	Options

THAS 222	ARTOP 2XX	Options
THPR 205	ARTOP 2XX	Options; fulfills Humanities Breadth
THPR 206	ARTOP 2XX	Options; fulfills Humanities Breadth
THPR 214	COSL 200	Options
THPR 224	COSL 200	Options

Mathematics Requirements

Mathematics Major

Mathematics Honours

Mathematics Minor

Mathematics Major

The Bachelor of Science (BSc) in Mathematics program requires students to complete 120 credits of non-duplicative coursework. In addition to the Mathematics Major, students will complete one of the following:

- one minor,
- two minors, or
- a secondary Science major

Students are required to complete option courses as well as the major(s) and minor(s). All BSc degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for the major(s), minor(s), or options.

The Mathematics Major is 45 to 60 credits with a minimum of 36 senior-level credits and a minimum of six credits at the 400-level.

Note: Students majoring in Mathematics are required to complete CMPT 101 or CMPT 103.

Bachelor of Science - Mathematics Major

Code	Title	Credits
Specific Major Requirements		
MATH 114	Elementary Calculus I	3
MATH 115	Elementary Calculus II	3
MATH 120	Basic Linear Algebra I	3
or MATH 125	Linear Algebra I	
MATH 200	Fundamental Concepts of Math	3
MATH 214	Intermediate Calculus I	3
MATH 215	Intermediate Calculus II	3
MATH 225	Linear Algebra II	3
MATH 229	Abstract Algebra I	3
or MATH 241	Geometry	
MATH 310	Real Analysis	3
MATH 330	Ordinary Differential Equations	3
General Major Requirements		

Choose 15 to 30 credits from senior-level MATH. Students can also use STAT 265, STAT 266, STAT 312, and/or STAT 412 to fulfill the general major requirements.   15-30

Secondary Major or Minor(s)

Students have the option of completing a second Science major, or one or two minors. Minor courses must be completed at the senior-level.   18-60

Options

Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses.	0-60
Total Credits	**120**

Mathematics Honours

The Bachelor of Science (BSc) Mathematics Honours degree program requires students to complete 120 credits of non-duplicative coursework. The Mathematics Honours program is comprised of 81 to 84 credits with a minimum of 12 credits at the 400-level. Students are required to declare a minor subject as part of the Mathematics Honours requirements. Minors are comprised of 18 senior-level credits.

For admittance/acceptance into Mathematics Honours, students must present the following:

1. Completion of a minimum of 45 university-level credits applicable to the program of study, with a GPA of 3.0 or higher
2. 24 of the 45 credits must have been completed in the last 12 months
3. A minimum of six MATH credits completed at the senior-level
4. A minimum GPA of 3.3 across all senior-level MATH courses

Students accepted and enrolled in the Mathematics Honours program must maintain a minimum overall GPA of 3.0. As well, students must maintain a minimum GPA of 3.3 across all senior-level MATH courses and STAT 265, STAT 266, or STAT 322 (if completed) for each 12 consecutive months following acceptance into the Honours program. Failure to maintain a 3.3 Honours GPA will result in the student's program status reverting to a BSc Mathematics Major.

All BSc degrees require Breadth Requirements. Courses can satisfy both the breadth requirements and requirements for Honours, minor(s), or options.

Bachelor of Science - Mathematics Honours

Code	Title	Credits
Specific Honours Requirements		
MATH 114	Elementary Calculus I	3
MATH 115	Elementary Calculus II	3
MATH 120	Basic Linear Algebra I	3
or MATH 125	Linear Algebra I	
MATH 200	Fundamental Concepts of Math	3
MATH 214	Intermediate Calculus I	3
MATH 215	Intermediate Calculus II	3
MATH 225	Linear Algebra II	3
MATH 229	Abstract Algebra I	3
MATH 241	Geometry	3
MATH 310	Real Analysis	3
MATH 311	Theory of Functions of a Complex Variable	3
MATH 329	Abstract Algebra II	3
MATH 330	Ordinary Differential Equations	3
MATH 410	Analysis and Topology	3
MATH 499	Honours Thesis	3
General Honours Requirements		

Honours Requirements

Choose 18 to 21 credits from senior-level MATH. Students can also use STAT 265, STAT 266, STAT 312, and/or STAT 412 to fulfill the general Honours requirements.	18-21

Required Minor

Minor discipline chosen in consultation with the Mathematics Honours advisor	18

Option Courses

Students can complete up to 18 credits in out-of-faculty options, with no more than 3 credits in physical activity (PACT) courses.	36-39
Total Credits	**120**

Mathematics Minor

The Mathematics Minor requires 18 senior-level MATH credits with a minimum of six credits at the 300- or 400-level.

Note: Junior-level required courses MATH 114, MATH 115, and one of MATH 120 or MATH 125.

Code	Title	Credits
Minor Requirements		
Choose 18 credits from senior-level MATH. Students can also use STAT 265, STAT 266, STAT 312 and/or STAT 412 to fulfill the minor requirements.		18
Total Credits		**18**

Degree Regulations

Students are strongly encouraged to seek advice from the faculty advisors about program planning.

Academic Residency - Credit Requirements

In addition to the academic residency requirements of the University, upon admission to the Bachelor of Science (BSc), students must complete at MacEwan University:

- A minimum of 24 credits at the senior-level in the major discipline, with 12 of those senior credits completed at the 300- or 400-level. All 400-level requirements are to be completed at MacEwan University.
- If applicable, a minimum of nine credits in a minor at the senior-level, with at least three of those credits completed at the 300- or 400-level.

Students with a previous MacEwan University credential are required to complete a minimum of 45 credits upon admission to the BSc.

Students who hold a baccalaureate degree from another post-secondary institution must complete a minimum of 60 additional MacEwan University credits applicable to the BSc. Forty-five of these credits must be completed while the students is enrolled in the BSc. This credit requirement applies to students who began their studies at MacEwan University and completed a credential at another institution.

Students who interrupt their program and who must apply for readmission to the program will be required to comply with any new regulations upon resumption of their studies.

Breadth Requirements

Courses taken to fulfil the major, minor, or option requirements can also be used to satisfy breadth requirements.

Declaration of a Major and Minor

Students are advised to declare a primary major and minor, or primary major and a secondary major, or a major and two minors by the time they have completed 45 credits. Primary majors are selected from Science disciplines and consist of 42 to 60 junior- and senior-level credits; secondary majors can be from an Science or Arts discipline.

Multi-disciplinary majors consist of 60-72 junior- and senior-level credits. Except for students in an Honours program, a maximum of 60 credits may be completed from any one discipline for credit towards the degree. A major and minor cannot be in the same discipline and students may not declare more than one out-of-faculty minor. Students can re-declare their major(s) and/or minor(s) if required.

For students completing multiple majors or minors, the Faculty cannot guarantee a schedule of classes that will permit students to complete their degree in eight consecutive fall and winter semesters. Furthermore, depending on the configuration of the student's degree, meeting the requirements for the degree may require the completion of more than 120 credits for graduation. Students are strongly encouraged to consult with an academic advisor in the Faculty of Arts and Science Advising Office and a discipline advisor in their major and minor prior to this declaration. Students majoring in mathematical or physical sciences may pursue a minor but are not required to do so.

Restricted Enrolment Courses

The Faculty of Arts and Science strives to accommodate all students wishing to enrol in a given course when it is appropriate to their program: however, classes in some courses must, for academic reasons, be restricted in size. If such a course is found to be oversubscribed, priority in registration will be given to those students whose programs may require it (e.g., majors, Honours, and/or minors) and then to other students as space permits.

Graduation Grade Point Average

As part of the Graduation Grade Point Average regulation above, Bachelor of Science students must obtain an overall GGPA of 2.0 or higher, with a minimum GPA of 2.0 on all courses credited toward the major(s) and a minimum GPA of 2.0 on all courses credited toward the minor(s).

Graduation Requirements

Graduation requirements are governed by the date on which a student declares their major(s) and minor(s). Students who declare their major(s) and minor(s) on or before the published deadline are bound by the requirements of the current academic year. Those students who declare after this date are bound by the programs of study and degree requirements of the upcoming academic year as published in the MacEwan Academic Calendar.

Junior - and Senior-Level Courses

Courses numbered from 100 to 199 are considered junior-level and courses numbered from 200 to 499 are considered senior-level.

Major or Minor 300- and 400- Level Requirements

The 300- and 400-level requirements in the major or minor cannot consist solely of project, field placement, and/or individual study courses.

Maximum Independent Courses

The maximum number of credits for independent work (project, field placement, and/or individual study courses) excluding the Honours Thesis, is 15 credits. Specific disciplines may have further restrictions.

Maximum Junior-Level Courses

A maximum of 48 credits at the 100-level are permitted in completion of the B.Sc. degree. Additional courses at the 100-level are extra to the 120 credits required to complete the B.Sc. degree and will not be counted toward fulfilment of graduation requirements.

Minimum Science Courses

Students are required to complete successfully a minimum of 72 total credits from Science courses.

Minimum Passing Grade

A minimum grade of D or credit CR is required for all Science degree courses unless otherwise noted next to the appropriate course in the program of study.

Minimum Transfer Grade for Credit

A minimum grade of D is required on any transfer credit granted for the program. Unless otherwise stated, Arts and Science courses require a minimum grade of C- when the course is used as a prerequisite. Transfer credit decisions made by the university are final and cannot be appealed.

Out-of-Faculty Options Requirements

Students may take a maximum of 18 credits from courses offered by a MacEwan University Faculty or School other than Arts and Science. Students completing an out-of-faculty minor or laddering students who have met the minor requirements with a MacEwan University diploma must complete their degree requirements from courses offered within the Faculty of Arts and Science or from the list of *Cross-Faculty Course Recognitions* in the Academic Calendar. Courses deemed as *Cross-Faculty Course Recognitions* are used to fulfill in-Faculty courses within the BSc and do not count as out-of-Faculty options.

Progression of Studies

Students are responsible for ensuring they meet the prerequisite and/or co-requisite requirements as noted on all courses that may fulfill Bachelor of Science program requirements.

Honours Regulations

Overall Requirements

The Honours program of study consists of 63 to 84 credits as determined by the discipline. Students in the Honours program may choose to complete a minor outside of the Honours discipline. Some disciplines may require a minor.

Acceptance to Honours

For consideration of admittance/acceptance into Honours, students must present a minimum of 45 university-level credits applicable to the program of study, with a GPA of 3.0 or higher. They must complete 24 of the 45 credits in the last 12 months; however, exceptions to this rule may occur with the approval of the Honours discipline advisor. Individual departments may have additional requirements noted in their program of study.

Course Load

Students accepted into an Honours program must complete 24-credits in each twelve consecutive months they are in the program. Exceptions to this rule may occur with the approval of the Honours discipline advisor.

Grade Point Average

Students accepted and enrolled in the Science Honours program must maintain a minimum overall GPA of 3.0 across all courses in the degree. As well, students must maintain a minimum GPA of 3.3 across a set of courses designated by each discipline for each twelve consecutive months following acceptance into the Honours program. Failure to do so

will result in the student's program status reverting to BSc with a major in the previous Honours discipline.

Graduation Grade Point Average

In order to graduate, students must obtain an overall GGPA of 3.0 or higher, with a minimum GPA of 3.3 on all courses credited toward the Honours program of study.

Program Learning Outcomes

Faculty of Arts and Science Degree-Level Learning Outcomes

Thinking about knowledge is at the core of University education and learning within the Faculty of Arts and Science. Students develop capacities to "think-through" - to practice wonder, reflection, and engage in thoughtful inquiry and dialogue. Thinking-through involves questioning beyond the confines of one's immediate personal, social, and disciplinary surroundings. First, knowledge is acquired and understood. Learning moves beyond acquiring information and data to a formally disciplined manner of thinking about knowledge. Next, knowledge is interrogated by asking and answering questions, distinguishing between opinion and knowledge, and developing tools to assess reasons and evidence. Finally, knowledge is synthesized as students develop coherent arguments, and link ideas together beyond what is immediately apparent. Learning is a lifelong creative process of discovery and action that happens beyond the classroom and the degree. Our graduates interact with and contribute to their community by integrating and applying the research and communication skills and ways of knowing developed through their education. Learning outcomes capture the observable knowledge, skills, and abilities graduates acquire that are the foundation of learning.

Graduates will demonstrate their ability to "think-through" by:

    i. Analysing puzzles, problems, concepts, and theories.
    ii. Conceptualizing questions based on disciplinary knowledge.
    iii. Evaluating knowledge within and across disciplines in ways that acknowledge historical, cultural, and social contexts.

Graduates will demonstrate research and scholarship skills by:

    iv. Applying appropriate research skills and ethical principles.
    v. Interpreting results appreciating the value and limits of conclusions.
    vi. Recognizing how research involves an ongoing process of reflection, dialogue, and reassessment.

Graduates will demonstrate diverse skills for communication by:

    vii. Conveying complex ideas coherently in a variety of formats.
    viii. Appraising information in ways that consider context and audience.
    ix. Interpreting the ideas and arguments of others in ways that reflect their knowledge, judgement, and comprehension.

Graduates will demonstrate durable skills necessary for learning beyond their degree by:

    x. Collaborating with diverse groups.
    xi. Examining different perspectives and challenging biases and preconceptions.
    xii. Exploring the continuous impact and limitations of disciplinary knowledge and expertise.

Mathematics Major Program Learning Outcomes

1. Remembering
Define mathematical concepts clearly and concisely and support them with examples.

2. Understanding
Show proficiency in mathematical terms and concepts to follow and evaluate arguments by using different strategies. Have an awareness of questions to which mathematics can provide answers. Use a heuristic aspect of developing a mathematical concept before formalizing it with all the necessary proofs.

3. Creating and Applying
Make use of mathematical terminology in a variety of contexts where they arise. Develop a strategy to formulate and solve a mathematical problem. Use a critical integrated knowledge system to form a judgment and apply it in formulating a mathematical problem and use appropriate reasoning skills to solve the problem. Apply computational algorithms in theoretical or applied settings.

4. Analyzing
Analyze qualitatively diverse types of mathematical representations using various processes. Analyze a mathematical problem to discover strategies for optimization of solutions.

5. Evaluating
Prove ability in applying mathematical principles and processes in solving problems in mathematics, other disciplines, and in everyday life.

Mathematics Honours Program Learning Outcomes

1. Remembering
Explain mathematical concepts comprehensively and support them with proofs and examples.

2. Understanding
Demonstrate proficiency in mathematical terms and concepts to follow and evaluate arguments by using different strategies. Connect mathematical knowledge that promotes innovative ideas that advance knowledge on established results and past decisions. Use a heuristic aspect of developing a mathematical concept before formalizing it with all the necessary proofs.

3. Creating and Applying
Apply and develop mathematical concepts or algorithms in solving problems with varying degrees of difficulty. Apply appropriately critical integrated systems to form a judgement based on logical deduction, evaluation, reflection, explanation, and informed argument. Identify theoretical or applied situations which require the association of mathematical representations and apply specific algorithms in solving problems and modeling processes.

4. Analyzing
Examine conditions of existence or compatibility of mathematical systems and identify appropriate methods to solve them. Analyze qualitatively diverse types of mathematical representations using various processes. Formulate, model, represent, and solve related mathematical problems arising from various contexts and applications. Discover strategies for optimization of solutions.

5. Evaluating
Process quantitative, qualitative, structural, and contextual data contained in mathematical problems and interpret their solutions in the context where they arose. Use "outside-the-box" thinking based on

mathematical reasoning skills (analysis, evaluation, and synthesis) to inform abstract and creative thinking into novel ways of information processing and problem-solving. Maximize problem-solving by choosing appropriate strategies and methods (e.g., algebraic, vectorial, analytic, synthetic).

Mathematics Minor Program Learning Outcomes

1. Remembering
Define basic concepts related to numbers, measuring, structures, and operations.

2. Understanding
Show proficiency in basic mathematical terms and concepts to follow and evaluate arguments. Have an awareness of questions to which mathematics can provide answers.

3. Creating and Applying
Make use of mathematical terminology in a variety of contexts where they arise. Use mathematical tools learned by applying them in solving basic mathematics problems and to assist in finding solutions to problems from other disciplines.

4. Analyzing
Test for the validity of an answer to a mathematical problem by comparing different methods. Use fundamental mathematical analysis to verify solutions and use judgment to discern whether a solution is reasonable in the context where it arose.

5. Evaluating
Choose appropriate mathematical methods to approach a problem that shows direct mathematical evidence.

Student Plan

- The student plan provides a suggested course sequence with the minimum number of credits required for the major
- The suggested course sequence depends on course availability, the student's schedule, and the student's choice of minor(s) or secondary major
- It is highly recommended that students complete their Breadth Requirements by the end of year 2
- Students can also use STAT 265, STAT 266, STAT 312, or STAT 322 to fulfill general major requirements

Year 1	Credits
MATH 114	3
MATH 115	3
Choose 3 credits (1 course) from the following:	3
MATH 120	
MATH 125	
Choose 3 credits (1 course) from the following:	3
CMPT 101	
CMPT 103	
ENGL 102	3
Breadth Requirements	15
	30

Year 2	Credits
MATH 200	3
MATH 214	3
MATH 215	3
MATH 225	3
Choose 3 credits (1 course) from the following:	3
MATH 229	
MATH 241	
Breadth, Option, Minor(s), or Primary or Secondary Major Requirements	15
	30

Year 3	Credits
MATH 310	3
MATH 330	3
Choose 3 credits (1 course) from senior-level MATH	3
Options, Minor(s), or Primary or Secondary Major Requirements	21
	30

Year 4	Credits
Choose 6 credits (2 courses) from 400-level MATH	6
Choose 6 credits (2 courses) from senior-level MATH	6
Options, Minor(s), or Primary or Secondary Major Requirements	18
	30

Total Credits 120

Expected Course Offerings

Following is a list of expected course offerings for fall 2024 and winter 2025. While some might change, students can be assured that required courses will be available. Please refer to myStudentSystem for up-to-date course offerings.

Fall 2024

MATH 099	Precalculus Mathematics
MATH 114	Elementary Calculus I
MATH 115	Elementary Calculus II
MATH 120	Basic Linear Algebra I
MATH 125	Linear Algebra I
MATH 200	Fundamental Concepts of Math
MATH 214	Intermediate Calculus I
MATH 223	Introduction to Combinatorics
MATH 225	Linear Algebra II
MATH 241	Geometry
MATH 310	Real Analysis
MATH 325	Matrix Theory and Applications
MATH 329	Abstract Algebra II
MATH 330	Ordinary Differential Equations
MATH 350	Introduction to Graph Theory
MATH 495	Special Topics in Mathematics

Winter 2025

MATH 099	Precalculus Mathematics

MATH 114	Elementary Calculus I
MATH 115	Elementary Calculus II
MATH 120	Basic Linear Algebra I
MATH 125	Linear Algebra I
MATH 200	Fundamental Concepts of Math
MATH 215	Intermediate Calculus II
MATH 225	Linear Algebra II
MATH 229	Abstract Algebra I
MATH 311	Theory of Functions of a Complex Variable
MATH 320	Elementary Number Theory
MATH 335	Numerical Methods
MATH 410	Analysis and Topology
MATH 429	Introduction to the Theory of Modules
MATH 430	Applied Dynamical Systems

Admission Requirements

Applicants may be admitted to one of the following:

Regular Admission

To be evaluated through the Office of the University Registrar

Applicants must have a minimum overall average of 65 percent, with no course grade lower than 50 percent, in the following high school courses:

1. ELA 30-1
2. Mathematics 30-1
3. Two of Biology 30, Chemistry 30, Mathematics 31, Physics 30, or Computing Science-Advanced Career and Technology Studies (5 credits)
4. One subject from Group A, B, C or D

Notes:

- A maximum of one Group D subject may be presented. Group D subjects used for admission must be 5-credit or any credit combination of at least 5 credits (e.g., two 3-credit subjects).

Applicants with nine to 23 university-level credits must also present a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale. Applicants with 24 or more university-level credits will be considered under Previous Post-Secondary Work.

Mature Admission

To be evaluated through the Office of the University Registrar

Applicants must be Canadian Applicants, 20 years of age or older, and have been out of full-time high school at least one year by the beginning of the intake term. Applicants must have a minimum overall average of 60 percent, with no course grade lower than 50 percent, in the following high school courses:

1. ELA 30-1
2. Mathematics 30-1
3. Two of Biology 30, Chemistry 30, Mathematics 31, Physics 30, or Computing Science-Advanced Level Career and Technology Studies (5 credits)

Applicants with nine to 23 university-level credits must also present a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale.

Applicants with 24 or more university-level credits will be considered under Previous Post-Secondary Work.

Previous Post-Secondary Work

To be evaluated through the Office of the University Registrar

Admission in this category does not imply or guarantee the transfer of any coursework and/or credential unless a block transfer agreement (internal or external) is in effect and published in the calendar by the Office of the University Registrar. In addition, transfer of coursework does not imply or guarantee that an applicant will be admitted.

Applicants must have successfully completed the following:

- A minimum of 24 university-level credits, from a recognized institution, with a minimum Admission Grade Point Average (AGPA) of 2.0 on a 4.0 scale.
- The required mathematics and science courses listed under the Regular or Mature Admission category.

Additional Admission Criteria

All applicants must meet the following:

1. English Language Proficiency

To be evaluated through the Office of the University Registrar

Applicable to All Admission Categories

All applicants must meet an acceptable level of English language proficiency. We will require official documents such as high school or post-secondary transcripts or proof of successful completion of standardized language evaluation. Full details are available in MacEwan University's academic calendar or online at MacEwan.ca/ELP (http://MacEwan.ca/ELP/).

2. Other Admission Criteria

To be evaluated through the Office of the University Registrar

Applicable to All Admission Categories

Applicants who have been assigned two unsatisfactory academic records within the past five years will not be considered for admission or re-admission to the program until a minimum three years from the date of the assignment of the last unsatisfactory academic record. For the purpose of admission or re-admission, an unsatisfactory record is defined as a transcript with the notation 'required to withdraw' or equivalent.

Mathematics Courses

MATH 099
Precalculus Mathematics
3 Credits   Weekly (3-0-0)
This course reviews and extends the mathematical concepts needed to be successful in university level calculus. Topics include graphing, equations of lines, inequalities, review of elementary algebra, functions, and trigonometry. MATH 099 cannot be used to fulfill the requirements of the Bachelor of Arts, the Bachelor of Commerce, or the Bachelor of Science programs.
Prerequisites: Mathematics 30-1 or Mathematics 30-2.

MATH 100
Calculus I
3.5 Credits   Weekly (3-1-0)
This course provides an introduction to the fundamentals of calculus. The students learn about rectangular coordinates, analytic geometry, transcendental functions, inverse functions, limits, continuity, derivatives and applications, Taylor polynomials, integration and applications. Note: This course is restricted to Engineering students. Credit can only be obtained in one of MATH 100 or MATH 113 or MATH 114.
Prerequisites: Mathematics 30-1 and Mathematics 31.

MATH 101
Calculus II
3.5 Credits   Weekly (3-1.5-0)
This course provides a continuation of the study of Calculus. Students learn about techniques of integration, arc length, area of a surface of revolution, applications to physics and engineering, first order ordinary differential equations (separable and linear), infinite series, power series, Taylor expansions, polar coordinates, rectangular coordinates in R3, parametric curves in the plane and space (graphing, arc length, curvature), normal, binormal, tangent in R3. Note: This course is restricted to Engineering Program students. Credit can only be obtained in one of MATH 101 or MATH 115.
Prerequisites: Minimum grade of C- in MATH 100.

MATH 102
Applied Linear Algebra
3.5 Credits   Weekly (3-1.5-0)
This course provides an introduction to the fundamentals of linear algebra and some of their applications. The course content includes vectors and matrices; solutions of linear equations; equations of lines and planes; determinants; matrix algebra, linear transformations and their matrices; general vector spaces and inner product spaces; orthogonality and Gram-Schmidt process; eigenvalues and eigenvectors; and complex numbers. Note: This course is restricted to Engineering students. MATH 100 may be taken as a co-requisite with consent of the department. The course may not be taken for credit if credit has already been obtained in MATH 120 or MATH 125.
Prerequisites: A minimum grade of C- in MATH 100.

MATH 114
Elementary Calculus I
3 Credits   Weekly (4-0-0)
This course examines the fundamental concept of limits, differentiation and integration. Limits and differentiation of algebraic and trigonometric functions are studied along with applications including related rates, optimizing and curve sketching. This course concludes with a study of Riemann sums, the Fundamental Theorem of Calculus and substitution. Note: Students who have received credit in MATH 113 or MATH 100 may not take MATH 114 for credit.
Prerequisites: A minimum grade of 80% in Mathematics 30-1, or successful completion (50% or better) of Mathematics 31, or a minimum grade of C- in MATH 099, or successful completion of the MATH 114 gateway exam.

MATH 115
Elementary Calculus II
3 Credits   Weekly (3-1-0)
This course investigates the differentiation and integration of trigonometric, exponential and logarithmic functions. Indeterminate forms and improper integrals are studied, as well as the techniques and applications of integration. Note: Credit can only be obtained in one of MATH 115 or MATH 101.
Prerequisites: A minimum grade of C- in MATH 114.

MATH 120
Basic Linear Algebra I
3 Credits   Weekly (3-0-0)
This is an introduction to the basic notions and methods of linear algebra. Topics covered are: systems of linear equations, vectors in n-space, vector equations of lines and planes, dot product, cross product, and orthogonality, matrix algebra, invertibility of matrices, determinants, general vector spaces, basis and dimension, subspaces of n-space, rank, introduction to linear transformations, introduction to eigenvalues and eigenvectors, and applications. NOTE: This course cannot be taken for credit if credit has already been obtained in either of MATH 102 or MATH 125.
Prerequisites: Mathematics 30-1 or a minimum grade of 80% in Mathematics 30-2.

MATH 125
Linear Algebra I
3 Credits   Weekly (3-0-0)
This is an enriched introduction to the basic notions and methods of linear algebra. Topics covered are: systems of linear equations, vectors in n-space, vector equations of lines and planes, dot product, cross product, orthogonality, matrix algebra, invertibility of matrices, determinants, general vector spaces, basis and dimension, subspaces of n-space, rank, introduction to linear transformations, introduction to eigenvalues and eigenvectors, and applications. NOTE: The course covers the same basic topics as MATH 120, however it is a more rigorous course, and selected topics and applications are covered in more depth.
Prerequisites: Mathematics 30-1.

MATH 160
Higher Arithmetic
3 Credits   Weekly (3-0-0)
This course emphasizes the development of clarity in the understanding of mathematical ideas and processes, communication of these ideas to others, and application of these ideas to problem solving. Both inductive and deductive methods are explored in the study of elementary number theory, numeration systems, operations on integers and rational numbers, and elementary probability theory. Note: This course is offered to students who intend to pursue Elementary Education.
Prerequisites: Mathematics 30-1 or Mathematics 30-2 or successful completion of the gateway exam.

MATH 200
Fundamental Concepts of Math
3 Credits   Weekly (3-0-0)
This course provides an introduction to axiomatic systems and mathematical proof. These ideas are developed using examples taken primarily from set theory and number theory.
Prerequisites: A minimum grade of C- in one of MATH 114, MATH 120, or MATH 125.

MATH 214
Intermediate Calculus I
3 Credits   Weekly (3-1-0)
This course completes the study of single-variable calculus and introduces students to the basic concepts of multi-variable calculus. Topics in single-variable calculus include area and arc length of plane curves defined by parametric or polar equations, infinite series, and power series. Topics in multi-variable calculus include: vector functions and space curves, functions of several variables, and partial derivatives with applications.
Prerequisites: Minimum grade of C- in MATH 115, and in either MATH 120 or MATH 125.

MATH 215
Intermediate Calculus II
3 Credits   Weekly (3-1-0)
This course continues the study of multivariable calculus. Topics include: curves, tangent vectors, arc length; integration in two and three dimensions; polar, cylindrical and spherical coordinates; line and surface integrals, Green's, divergence and Stokes' theorems; first and second order linear differential equations.
Prerequisites: A minimum grade of C- in MATH 214.

MATH 223
Introduction to Combinatorics
3 Credits   Weekly (3-0-0)
This course is an introduction to Combinatorics covering permutations, combinations, binomial coefficients, the binomial theorem, the pigeonhole principle, inclusion-exclusion principle, generating functions, recurrences and applications to graph theory.
Prerequisites: A minimum grade of C- in any 100-level Mathematics course, not including MATH 160 or MATH 170.

MATH 225
Linear Algebra II
3 Credits   Weekly (3-0-0)
This course introduces the theory of vector spaces, inner product spaces, linear transformations and diagonalization. Specific topics of study include Euclidean n-space, spaces of continuous functions, matrix spaces, Gram-Schmidt process, QR-factorization, least squares method, change of basis, eigenspaces, orthogonal diagonalization, quadratic forms, matrices of transformations and similarity. Various applications are presented.
Prerequisites: A minimum grade of C- in either MATH 120 or MATH 125.

MATH 228
Algebra: Introduction to Ring Theory
3 Credits   Weekly (3-0-0)
This course is an introduction to the theory of rings including integral domains, division rings, ring homomorphisms, ideals, quotient rings, fields of quotients, rings of polynomials, irreducible polynomials, Euclidean domains and fields. Specific topics include the well-ordering axiom, the Binomial Theorem, the Euclidean algorithm, the Fundamental Theorem of Arithmetic, and the Chinese Remainder Theorem.
Prerequisites: Minimum grades of C- in either MATH 200 or MATH 241, and in either MATH 120 or MATH 125.

MATH 229
Abstract Algebra I
3 Credits   Weekly (3-0-0)
This course is an introduction to the theory of rings and groups, including integral domains, division rings, ring homomorphisms, ideals, groups, subgroups, cyclic groups and group homomorphisms.
Prerequisites: Minimum grades of C- in MATH 200 and one of MATH 120 or MATH 125.

MATH 241
Geometry
3 Credits   Weekly (3-0-0)
The course explores Euclidean Geometry as an axiomatic system, based on invariance under the group of isometries (rigid motions). The material includes congruence, parallelism, similarity, and the theory of measurements based on continuity axioms. The notion of circumference is introduced and treated rigorously. Problem solving is an important component of the course. The problems include proofs, finding loci, and constructions. Transformations in the Euclidean plane are used as a problem-solving tool.
Prerequisites: A minimum grade of C- in any 100-level MATH (https://calendar.macewan.ca/course-descriptions/math/) course, not including MATH 160 or MATH 170.

MATH 310
Real Analysis
3 Credits   Weekly (3-0-1)
This course presents a rigorous treatment of limit processes in one variable. Topics include real numbers, sequences, limits, continuous functions, differentiation, the Riemann integral, and the topology of the real number system.
Prerequisites: Minimum grade of C- in MATH 214 and in MATH 200.

MATH 311
Theory of Functions of a Complex Variable
3 Credits   Weekly (3-0-0)
This course provides an introduction to the fundamental concepts of single variable complex analysis. The main topics include analytic functions, complex power series, Cauchy's Integral Theorem, Cauchy's Integral Formula, the residue theorem and applications to improper real integrals and Fourier transforms.
Prerequisites: Minimum grade of C- in MATH 215.

MATH 320
Elementary Number Theory
3 Credits   Weekly (3-0-0)
Elementary methods in number theory are presented. The following topics are included: divisibility, linear Diophantine equations, prime numbers, the fundamental theorem of arithmetic, congruences, the Chinese remainder theorem, Fermat's little theorem, arithmetic functions, Euler's theorem, primitive roots, and quadratic residues.
Prerequisites: Minimum grade of C- in MATH 200; a minimum grade of C- in MATH 228 is recommended.

MATH 321
Fields and Modules
3 Credits   Weekly (3-0-0)
This course builds on the knowledge of rings and fields obtained in MATH 228, and introduces the student to basic module theory. Topics studied include finite fields, quadratic number fields and algebraic field extensions, the Fundamental Theorem of Algebra, modules, and Noetherian rings.
Prerequisites: Minimum grade of C- in MATH 225 and MATH 228.

MATH 325
Matrix Theory and Applications
3 Credits   Weekly (3-0-0)
This course develops the study of matrices and their applications by way of special classes of matrices and matrix structure theorems. The main application will be to optimization problems.
Prerequisites: Minimum grades of C- in MATH 225 and MATH 114.

MATH 329
Abstract Algebra II
3 Credits   Weekly (3-0-0)
This course continues the study of Abstract Algebra begun in Math 229 and studies rings of polynomials, divisibility, irreducibility, quotient rings, Euclidean domains, PIDs and UFDs, normal subgroups, quotient groups and the Sylow theorems.
Prerequisites: A minimum grade of C- in MATH 229.

MATH 330
Ordinary Differential Equations
3 Credits   Weekly (3-2-0)
This course provides techniques for solving ordinary differential equations and systems of first order equations and investigates the qualitative nature of solutions of dynamical systems. Topics covered include first order equations, linear equations of higher order and linear dynamical systems with constant coefficients.
Prerequisites: Minimum grades of C- in MATH 214, and in either MATH 120 or MATH 125.

MATH 335
Numerical Methods
3 Credits   Weekly (3-2-0)
This course presents numerical methods for solving problems in linear algebra, non-linear equations, interpolations, approximation of functions, differentiation and integration. The numerical algorithms are illustrated using an appropriate computer programming language and specific libraries.
Prerequisites: Minimum grades of C- in MATH 214, CMPT 101, and one of MATH 120 or MATH 125.

MATH 341
Modern Geometries
3 Credits   Weekly (3-0-0)
This course explores Euclidean and Non-Euclidean plane geometries from the viewpoint of Klein's Erlangen program, based on invariance under groups of transformations in the extended complex plane. Mobius geometry is introduced, and Euclidean, hyperbolic, and elliptic geometries are studied as its subgeometries. The differences in axiomatics and results of the Euclidean and Lobachevsky – Bolyai geometries are discussed based on the disc model of hyperbolic geometry. Elliptic geometry is considered as another Mobius subgeometry.
Prerequisites: Minimum grades of C- in MATH 241, and in either MATH 120 or MATH 125.

MATH 350
Introduction to Graph Theory
3 Credits   Weekly (3-0-0)
This course discusses graphs and digraphs, paths and cycles, trees, planarity, colouring problems and matching problems. In addition, graph algorithms and some applications to other disciplines are studied.
Prerequisites: Minimum grades of C- in either MATH 120 or MATH 125, and in either MATH 200 or MATH 222.

MATH 361
History of Mathematics
3 Credits   Weekly (3-0-0)
The course is a survey of the history of mathematics from ancient times through the development of calculus and the origins of modern algebra in the nineteenth century. It emphasizes the events that led to the development of modern and classic mathematics from a problem solving perspective. Biographies of famous mathematicians complement the abstract concepts of mathematics.
Prerequisites: Minimum grade of C- in any two 200-level MATH *(https://calendar.macewan.ca/course-descriptions/math/) courses.*

MATH 398
Independent Study
3 Credits   Total (0-0-45)
This course permits an intermediate-level student to work with an instructor to explore a specific topic from mathematics in depth through research or directed reading in primary and secondary sources. The student plans, executes and reports the results of their independent research or study project under the direction of a faculty supervisor. To be granted enrollment in the course, the student must have made prior arrangements with a faculty member willing to supervise his or her project. This course can be taken twice for credit.

MATH 410
Analysis and Topology
3 Credits   Weekly (3-0-0)
This course continues the study of Analysis begun in MATH 310 and examines differentiation and integration in Rn. Specific topics covered will include: implicit and inverse functions theorems, Fubini's theorem, differential forms, and the generalized Stokes' theorem.
Prerequisites: Minimum grade of C- in MATH 225 and MATH 310.

MATH 420
Groups and Galois Theory
3 Credits   Weekly (3-0-0)
This course is a treatment of symmetry, beginning with groups, then developing the ideas of Galois theory, and finishing with the quintic equation. Topics include groups, normal subgroups, quotient groups, Cayley's Theorem, the Class equation, permutations, group actions, the Sylow theorems, splitting fields, Galois extensions, the Main Theorem of Galois theory, Kummer extensions, cubic, quartic and quintic equations.
Prerequisites: Minimum grade of C- in MATH 321.

MATH 428
Introduction to Galois Theory
3 Credits   Weekly (3-0-0)
This course is an introduction to Galois Theory, covering topics such as algebraic extensions, algebraic closure, splitting fields, Galois extensions, the Galois group, the fundamental theorem of Galois theory and solvability of polynomial equations via radicals.
Prerequisites: A minimum grade of C- in MATH 329.

MATH 429
Introduction to the Theory of Modules
3 Credits   Weekly (3-0-0)
This course is an introduction into the theory of modules over rings and covers topics as modules, homomorphisms and isomorphisms, quotient modules, free modules, generators, tensor products, Noetherian rings and modules.
Prerequisites: A minimum grade of C- in MATH 329.

MATH 430
Applied Dynamical Systems
3 Credits   Weekly (3-1-0)
This course presents an introduction to dynamical systems related to ordinary differential equations in the continuous case, or to difference equations in the discrete case. Elementary existence and uniqueness theorems and stability are considered for linear and non-linear systems of ordinary differential equations. Periodic solutions, chaotic attractors, an introduction to bifurcation theory, basic notions of discrete dynamical systems, and deterministic chaos are discussed. Applications are chosen from biology, physics and other areas.
Prerequisites: Minimum grade of C- in MATH 310 and MATH 330.

MATH 436
Introduction to Partial Differential Equations
3 Credits   Weekly (3-2-0)
The goal of this course is to introduce the student to the mathematical modeling of classical physical systems such as vibrating systems, diffusive processes and steady state phenomena. The course starts with a rigorous introduction of the first-order and linear second-order partial differential equations (PDEs) followed by elements of Fourier analysis. The method of characteristics is used to find and interpret classes of solutions for the above models. The lab component will familiarize the student with formal and numerical manipulations of PDE's. The main scope of the lab is to enable the student to visualize and discuss solutions for classical models for PDE's.
Prerequisites: Minimum grades of C- in MATH 310 and MATH 330.

MATH 495
Special Topics in Mathematics
3 Credits   Weekly (3-0-1)
This course examines an advanced topic of specialization in mathematics. The instructor chooses the topic in any given semester. Students can take this course up to three times, provided the course topic is different.
Prerequisites: A minimum grade of B- in a 300-level MATH *(*https://calendar.macewan.ca/course-descriptions/math/*) course and consent of the department.*

MATH 498
Advanced Independent Study in Mathematics
3 Credits   Total (0-0-45)
This course permits a senior-level student to work with an instructor to explore a specific topic from mathematics in depth through research or directed reading in primary and secondary sources. The student plans, executes and reports the results of their independent research or study project under the direction of a faculty supervisor. To be granted enrollment in the course, the student must have made prior arrangements with a faculty member willing to supervise his or her project. This course can be taken twice for credit.

MATH 499
Honours Thesis
3 Credits   Total (0-0-45)
Under the direction of a faculty supervisor, registered students explore a specific topic in depth through research or directed reading. The student plans, executes, and reports the results of their independent research or study project under the direction of a faculty supervisor in a written Honours Thesis with oral defense. Note: This course is intended for students in the final year of their degree and is open only to students in the Mathematics Honours program.
Prerequisites: Consent of the Department.