



## **ALES 291 / MATH 120 MATHEMATICS FOR THE LIFE SCIENCES**

In Winter 202, MATH 120, *Mathematics for the Life Sciences*, is being offered at Yukon College concurrent with the University of Alberta's ALES 291, *Mathematics for the Life Sciences*, as part of the Northern Environmental and Conservation Sciences, B.Sc. Program. All students registered in Math 120 or ALES 291 must adhere to requirements outlined in this course syllabus. University of Alberta students must also be aware of, and adhere to, the University's Code of Student Behaviour, referenced in the outline; Yukon College students must be aware of, and adhere to, Yukon College's Academic Regulations, also referenced in the outline.

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<b>INSTRUCTOR:</b>	Dr. Tim Topper, Ph.D. Professor Emeritus
<b>OFFICE HOURS:</b>	Mondays, Wednesdays and Fridays 12-12:30 pm or by appointment.
<b>OFFICE LOCATION:</b>	N.A.
<b>E-MAIL:</b>	ttopper@yukoncollege.yk.ca

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**DAYS & TIMES:** Mondays, Wednesdays and Fridays 10:30 am-12:00 pm Jan 6-  
April 15,  
**and** 10:30 am-12:00 pm Tuesday April 14.

**Location TBA**

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### **COURSE DESCRIPTION**

This course provides a survey of finite mathematics and calculus focussing on the concepts and modelling techniques used in the life sciences. To this end it covers common families of functions (polynomial, logarithmic and exponential) and their derivatives and integrals, linear programming, simple and conditional probability and Bayes theorem, and network analysis. The topics are illustrated using problems drawn from the life sciences.

## **STUDENT LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course students will be able to do the following:

- Take everyday situations, translate them into mathematical representations (equations, graphs, tables, or network diagrams), manipulate these representations, and interpret the results in terms of the original situation.
- Solve linear programming problems graphically, and using the simplex method.
- Categorize quantities' variations as being polynomial, exponential, logarithmic or 'other'.
- Find the derivatives and integrals of polynomial, exponential and logarithmic functions and solve problems requiring their application.
- Apply Bayes theorem.
- Solve a variety of networking problems, e.g. critical path, shortest route, maximal flow, using both graphical and matrix representations.

## **COURSE FORMAT (3-0-1.5)**

The course content is covered through lectures and tutorials. Class time will be roughly divided 2:1 between lectures and tutorials. Students with a sound mathematical background can expect to spend between one and three hours in preparation and study for every hour spent in class.

## **COURSE PREREQUISITES AND/OR CO-REQUISITES**

For students taking the course as Math 120: Pre-Calculus 12 or Foundations of Mathematics 12 or MATH 060.

For students taking the course as ALES 291: Registration in Yukon College/University of Alberta BSc in Environmental and Conservation Sciences degree program, **and** one of Pre-Calculus 12 or Foundations of Mathematics 12 or MATH 060.

## **REQUIRED TEXTBOOKS/MATERIALS**

A variety of online resources will be used in place of a printed textbook.

## **COURSE WEBSITE**

The course will use the College's Moodle system to provide material online including: assignments, photos of the blackboards from class, any presentation slides used in class, links to supplementary online materials, and students' grades via the gradebook.

## **YUKON COLLEGE ACADEMIC STANDARDS AND REGULATIONS**

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

## **Plagiarism**

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

## **UNIVERSITY OF ALBERTA ACADEMIC INTEGRITY AND CODE OF STUDENT BEHAVIOUR**

### **Academic Integrity**

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at [www.governance.ualberta.ca](http://www.governance.ualberta.ca)) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

### **Code of Student Behaviour**

All students at the University of Alberta are subject to the Code of Student Behaviour, as outlined at:

<http://www.governance.ualberta.ca/en/CodesofConductandResidenceCommunityStandards/CodeofStudentBehaviour.aspx> Please familiarize yourself with it and ensure that you do not participate in any inappropriate behavior as defined by the Code. Key components of the code include the following statements.

30.3.2(1) No Student shall submit the words, ideas, images or data of another person as the Student's own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.

30.3.2(2) c. No Student shall represent another's substantial editorial or compositional assistance on an assignment as the Student's own work.

## PROFESSIONALISM AND CLASSROOM RULES OF ENGAGEMENT

Students are expected to attend all lectures, be engaged and courteous in all course activities, and to be on time for class. Cell phones can be useful for looking information up during class, but please do not speak on or to them during class. Laptops are encouraged for note taking and in-class work. The guiding principle is that you are responsible for your own learning, but also responsible not to interfere with your classmates' learning.

## COURSE REQUIREMENTS/EVALUATION

### Homework

Mathematics can only be learned by doing it. To this end, problems will be assigned in most classes *and solutions to them will be made available*. Students should be certain to do these problems promptly or they risk being unable to understand the material in the next class.

### Quizzes (30%)

There will be a brief quiz *most* weeks. Many questions on the quizzes will be drawn from the assigned problems, thus completing the homework should lead to good quiz results. *Missed quizzes cannot be made up*, but the lowest quiz result will be discarded. Quiz results are worth 30% of the final mark in the course.

### Assignments (30%)

There will be *weekly* assignments over the course of the term worth 30% of the final mark. *Late assignments are not accepted*, but the lowest assignment mark will be discarded. Where the homework problems are intended to assist the student in *learning* new material and are not marked, the assignments are meant to reinforce and *extend* the student's understanding of material that has already been *learned* (i.e. they are more interesting).

### Final Examination (40%)

A final examination which will cover the entire course, and be worth 40% of the final mark, will be held on April 24 from 9:00 am to 12:00 pm.

Students taking the course as ALES 291 must ensure that they are familiar with the University of Alberta's Academic Regulations governing missed and deferred final exams (<http://www.registrar.ualberta.ca/calendar/Regulations-and-Information/Academic-Regulation/23.5.html#23.5>).

## Evaluation

The course grade will be determined as follows:

	<b>Percent</b>
Quizzes	30%
Assignments	30%
Final exam	40%
Total	100%

## Assignment of grades

The total numerical score will be converted to a grade on the University of Alberta's letter grading system (for students enrolled in ALES 291) or on Yukon College's letter grading system (for students enrolled in MATH 120).

## ELECTRONIC DEVICES

Students will **require** a scientific calculator, but it must **not** include graphing capabilities. More detail will be provided in the first class.

## RECORDING OF LECTURES, LABS, ETC.

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

## YUKON FIRST NATIONS CORE COMPETENCY

Yukon College recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see [www.yukoncollege.yk.ca/yfnccr](http://www.yukoncollege.yk.ca/yfnccr).

## ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): [lac@yukoncollege.yk.ca](mailto:lac@yukoncollege.yk.ca).

## EQUIVALENCY/TRANSFERABILITY:

Math 120 transfers for 3 credits of first year math at many BC colleges and universities. You can see the complete list at <http://www.bctransferguide.ca>

Successful completion of MATH 120/ALES 291 fills the requirement for a first year math course in the University of Alberta B.Sc. ENCS Program, Northern Systems Major.

## TENTATIVE SCHEDULE AND TOPIC OUTLINE

Week	Content
1	<b>Linear Models: Introduction</b>
2	<b>Linear Models: Systems of Equations</b> Solving systems of linear equations and inequalities algebraically, graphically and using matrices.
3	<b>Linear Models for Optimization</b> Linear programming: Graphical Solution
4	Linear programming: The Simplex Method
5	<b>Nonlinear Models</b> Quadratic, Exponential and Sinusoidal models.
6	<b>Modelling change: Derivatives</b> Average rate of change. Instantaneous rate of change. Rules for differentiation: basic, products, quotients, the chain rule.
7	Applications of the Derivative: Function sketching Optimization problems
8	<b>Modelling Accumulation: Integrals</b>
9	<b>Modelling Uncertainty: Probability</b> Simple and conditional probability. Combinatorics.
10	Bayes' Theorem.
11	<i>Reading Week</i>
12	<b>Modelling Structure: Graph theory</b> Diagrammatic representation. Matrix representation.
13	Euler circuits and paths; minimal spanning trees. Hamiltonian circuits and paths; shortest routes. Shortest route algorithm.
14	<b>Synthesis</b> Matrix multiplication applied to graphs. Markov processes.
15	<b>Review and Exam Preparation</b>
16-17	<b>Examination Period</b>