DEPARTMENT OF MATHEMATICS AND STATISTICS

York University

<u>Course</u>: Extended Problems, Conjectures, and Proofs, Math 2200 3.0 <u>Course Webpage</u>: Found on eClass, titled Extended Problems, Conjectures, and Proofs, Math 2200 3.0.

<u>**Term**</u>: Winter 2022

Instructor Name and Email: Andrew McEachern, andrewm6@yorku.ca

Prerequisites / Co-requisites / Exclusions: Please consult

https://mathstats.info.yorku.ca/supplemental-calendar/ to ensure you have the required prerequisites for the course, and that getting a credit course does not exclude from another credit.

Real Prerequisites:

Before you take this course, you should know that it is expected that you have a decent foundation in working with functions and using algebra to solve multistep equations. These equations can involve algebraic expressions such as the quadratic formula, the square root, complex fractions, trigonometric, exponential, and logarithmic components. You should be comfortable using graphs of functions to answer questions. You should know how to determine if two algebraic expressions are equivalent. You should have a foundation in working with trigonometric functions and solving trigonometric equations. You should be able to work with exponential and logarithmic equations. You should know what a polynomial or rational function is. You should know what the root of a function is. You should be comfortable with derivatives and integrals. You should have a basic foundation in linear algebra, and be comfortable working with matrices, determinants, eigenvectors, et cetera.

If your knowledge is lacking in some of the things mentioned above, you may find it difficult to succeed in this course.

Office Hours:

Office Hours: Please see the eClass page for details

Lecture Time and Location:

Lectures are will be in the Life Sciences Building, room 106.

Lectures are every Monday and Wednesday, from 3:30 PM to 4:50 PM.

<u>Tutorials:</u>

Tutorials will take place every Monday from 5:30 PM to 6:20 PM.

Tutorial 1 will happen in the Chemistry Building, room 120.

Tutorial 2 will happen in the Victor Phillip Dahdaleh Building, room 0004.

Tutorials will be opportunities to further explore the course material, to work together, or separately, on homework assignments. The teaching assistants who run the tutorials will have activities designed to assist you in deepening your knowledge.

Students who attend tutorial will receive a bonus participation grade worth up to 5% to be added to your final grade. Just being physically present will be enough to earn this grade. If you miss tutorials, you will receive a proportion of the 5% equal to the proportion of tutorials you attend throughout the year.

Expectations:

Email: Use email for confidential matters, or to book an appointment with me. I will check email during normal business hours and will respond to every email I receive within four business days.

Office Hours:

If you have math- or course-related questions, please attend office hours, and I will answer them then.

Forum:

There will be a forum for administrative questions. Please post all questions that are not of a sensitive nature about the course here. Students can answer each other's questions, and I and teaching assistants will periodically monitor the forum and answer questions too.

Communications: Make sure you are subscribed to Course Announcements in eClass! You are responsible for being actively and regularly on eClass to ensure that you have the latest information about the course.

Time Management: For a 3-credit course (whether online or in a traditional classroom), the expected workload is 3 hours of in-class time each week with an additional 6 hours of work per week in preparation, practice problems, and assignments.

If you find you are working less than 5 hours a week, then you are probably not devoting enough time to the course. If you find you are working more than 10 hours a week, then you might be missing some prerequisites for the course.

Also see: <u>https://lss.info.yorku.ca/time-management-resources/</u>

Expanded Course Description

This course will be a presentation and investigation of a variety of topics from various fields of pure and applied mathematics. Students will engage with the material by attending lecture and doing specified readings, develop conjectures and proofs of their own, and share those proofs with the instructor and other students as a way to further their ability to make conjectures and then prove them.

This course consists of two in-class lectures each week, and weekly tutorials.

Active participation in the lectures and tutorials, and completion of the assigned homework is expected of all students.

Tentative topics list, and not necessarily in this order:

- 1. Graph theory.
- 2. The Page Rank algorithm.
- 3. Game theory.
- 4. Cryptography.
- 5. Group theory.
- 6. The mathematics behind evolutionary algorithms and neural nets.
- 7. Dynamical Systems.
- 8. Number theory.

<u>Course Text / Resources</u>

Course Textbook: Free electronic textbooks in pdf form are available under the Textbooks section on the eClass page.

Specific papers or chapters of textbooks will also be provided for directed readings.

A list of readings in the textbooks will be given in the Textbooks section on the eClass page.

LECTURES:

You should attend lectures. Asking questions is essential to the learning experience, and you should ask questions during the lecture whenever you are not clear about something. Students who attend lecture do better than those who do not, on average. Quizzes and tests will take place during the lecture.

HOMEWORK:

Homework will be assigned in class. The homework is not graded, instead it will be read by teaching assistants and you will be given formative feedback to help improve your skills in proof and explanation. There will be a homework assignment roughly every two weeks.

<u>Evaluation</u>

The final grade for the course will be based on the following items weighted as indicated:

- Quizzes: 20%, Weekly, except Weeks 5 and 10
- Test 1: 15% in Week 5
- Test 2: 15% in Week 10
- Tutorial: 5% *bonus*
- Final Exam: 50% in the final examination period, the date will be announced at some point during the semester.

The date and time of exams in the Final Examination period is set by the Registrar and will be announced later. Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.

QUIZZES:

Quizzes will take place during lecture on Monday each week during the last twenty minutes of class. Each quiz will be on, or related to, the material covered in class and on assignments. They will be handwritten and submitted to the instructor, and graded and returned on the following Monday, where a solution will be presented. The worst two quiz marks will be dropped when calculating the final grade. There are no quizzes on the weeks when there is a test.

If you miss three or more quizzes for any reason, the weight of those missed quizzes that aren't dropped will be transferred to the final examination. There are no makeup or alternative quizzes.

TESTS:

There will be two tests in the class, each worth 15% of your final grade.

Test 1: Wednesday, February 9th, in class. Test 2: Wednesday, March 16th, in class.

Tests will be on the material presented in class and on assignments in the weeks beforehand. Test 1 will be on material from Weeks 1 through 4, and Test 2 will be on material from Weeks 5 through 9.

If you miss a test for any reason, the weight of that test will be transferred to the final examination. There are no makeup or alternative tests.

FINAL EXAM

The final exam will be held during the examination period given at <u>https://registrar.yorku.ca/enrol/dates/fw21</u>

More details about the final examination, date, structure, etc, will be released at some point in March.

Grading and Missed Tests or Exams

Grading: The grading scheme for the course conforms to <u>https://calendars.students.yorku.ca/2020-2021/grades-and-grading-schemes</u> Each assignment, test, or exam will bear a number grade which will be scaled according to its weight in the final grade in the course. For example, if your midterm is worth 20% of the final grade and you get 32/40 on the midterm, then this will be scaled to 16/20 for calculation of the final grade.

Missed Tests: A student who becomes ill, has a personal/family emergency, or a religious observance will have the weight of the test added to the final exam.

Missed Exam: A student who becomes ill, has a personal/family emergency, or a religious observance may ask for a later date for their final exam or to submit their outstanding coursework. To do this, students must request deferred standing, no later than one week after the missed examination or the last day of classes. For details, please see http://myacademicrecord.students.yorku.ca/deferred-standing.

IMPORTANT COURSE INFORMATION FOR STUDENTS

Please see the Policies and Regulations at <u>https://calendars.students.yorku.ca/2020-</u> 2021/policies-and-regulations and information at <u>https://calendars.students.yorku.ca/2020-</u> 2021/academic-and-financial-information

RESPECT:

When using the eClass forum or when asking questions during a lecture, you must remain courteous and respectful. Remember that eClass is simply an electronic version of a regular classroom, so the University's <u>Student Code of Conduct</u> and the <u>Code of Rights and Responsibilities</u> apply.

Violation of the Student Code of Conduct will result in a complaint of a breach of community standards, and sanctions could include fines, restrictions, and suspension.

ACADEMIC INTEGRITY

I am proud of honest students who work hard to get a good grade and I support them by asking for severe penalties on cheating. Cheating is the attempt to gain an improper advantage in an academic evaluation.

Forms of cheating include:

1. Copying another person's answer to a test question (for example, via texting or chat);

2. Consulting or getting help from another person

3. Using an unsanctioned online source during a test (for example, Chegg, Course Hero etc.);

4. Helping others to cheat.

The Math and Stats Department has people who are expert in the detection of cheating in this online environment. If you are found to have cheated, they can seek the most severe penalties available. According to the Senate, these penalties could include failure of the course, notation on your transcript, or suspension from the University. If you cheat, you may need to plan for a job where your employer doesn't care that there is a notation on your university transcript indicating that you cannot be trusted.

For more details, see <u>York's Academic Honesty Policy</u> and information on <u>Academic Integrity for</u> <u>Students</u>.

Academic integrity benefits everyone in our community. It not only helps you reach the real goal of this class-learning, but also allows for the university and program to be perceived positively by others. When students are dishonest, they lose out on valuable learning that will help them perform well in their career.

TECHNOLOGY USE AND PRIVACY

Several platforms will be used in this course (e.g., eClass, Canvas, Zoom, etc.) through which students will interact with the course materials, the course director and TAs, as well as with one another.

Students shall note the following:

• Technology requirements and FAQs for eClass can be found here – <u>http://www.yorku.ca/moodle/students/faq/index.html</u>

PROCTORING

This course may require the use of online proctoring for the final examination, in the event a final examination will be online. I may use an online proctoring service to deliver the exam, which would be administered through eClass. Students are required to have access to minimum technology requirements to complete the final examination. If an online proctoring service is used,

students will need to become familiar with it at least five days before exam(s). For technology requirements, Frequently Asked Questions (FAQs) and details about the online proctoring service visit <u>https://registrar.yorku.ca/proctortrack-faq</u> Students are required to share any IT accommodation needs with the instructor as soon as they are able.

York University obtained legal advice on this issue and determined that Proctortrack fully complies with the privacy laws of Ontario and Canada. Some of the information on the internet about Proctortrack and privacy is inaccurate.

IMPORTANT DATES

The term start and end dates, holidays, exam periods, and add/drop deadlines, are posted at <u>https://registrar.yorku.ca/enrol/dates/fw21</u>

See also: https://secretariat.info.yorku.ca/files/CourseInformationForStudentsAugust2012-.pdf

STUDENT ACCESSIBILITY SERVICES:

It is the student's right to request and receive academic accommodations on the basis of a disability. Student Accessibility Services provides academic accommodation and support to students with disabilities in accordance with the Ontario Human Rights Commission's Policy on accessible education for students with disabilities and York University Senate Policy on Academic Accommodation for Students with Disabilities. Contact <u>Student Accessibility Services</u> for more information.

RESOURCES

LEARNING SKILLS SERVICES

Learning skills are about learning how to learn and improving your effectiveness and efficiency as a learner. See <u>https://lss.info.yorku.ca</u> for details and a calendar of events. These workshops are for everyone and I highly recommend them.

COUNSELLING SERVICES

Many students face a variety of personal challenges throughout the term which may have a negative effect on their academic performance. In such cases, students can make use of York's <u>Student Counselling and Development</u> services. A Personal Counselor can help manage a student's coursework under difficult circumstances.