

# Course Outline Form: MATH 4440 – Winter 2023

## General Information

Course Title: **MATH\*4440 – Case Studies in Mathematics & Statistics W (3-0) [0.50]**

**Course Description:** This capstone course for the Mathematical Science major provides students with an opportunity to synthesize knowledge and utilize problem-solving skills accumulated over the course of their studies. The course will focus on case studies drawn from engineering, computer science, biology, life and physical sciences, medicine, and/or economics.

*Prerequisite(s):* At least 3.0 mathematics and/or statistics credits at the 3000 level or above

*Restriction(s):* Restricted to students in the Mathematical Sciences major

**Credit Weight:** 0.5

**Academic Department (or campus):** Mathematics & Statistics

**Campus:** Main Campus, Guelph

**Semester Offering:** Winter 2023

LEC Tue & Thu  
2:30 PM– 4 PM

**NOTE: All classes are in person, as this is a seminar type course.**

## Instructor Information

**Instructor Name:** Monica Gabriela Cojocar, Ph. D., Prof. Mathematics

**Instructor Email:** mcojocar@uoguelph.ca

**Office hours:** Online – TEAMS – schedule TBD in 1<sup>st</sup> week of class or in person – on request – MACN 549

**GTA Information:** This course has no TA's.

## **Course Content**

### **Specific Learning Outcomes:**

1. Critically review and summarize articles from the literature.
2. Properly cite sources and practice academic integrity.
3. Find and evaluate background, primary and secondary sources of information.
4. Collaborate effectively in small groups and provide effective feedback.
5. Select, implement, and interpret appropriate mathematical or statistical models and demonstrate an understanding of the limitations and uncertainties associated with these models.
6. Synthesize and integrate mathematical sciences knowledge with subject area knowledge.
7. Communicate results accurately and effectively in graphical, oral, mathematical, statistical and written form.
8. Critical reflection on topic(s); scientific paper writing skills.

### **Course Content Description:**

Students will be divided in several teams (no more than 4), blending mathematics and statistics majors. Each team will have an equal chance to be assigned among 4 specific projects: 2 in game theory and 2 in the area of population health.

All teams will have to use a collaborative platform to contribute slides/presentations, brief project updates, coding, and scientific paper writing. All teams will have to incorporate some mathematical modelling with coding and data studies in their respective projects. All team members will evaluate their members' contributions, alongside the Instructor. The aim for each team is to write a paper (in the format of a short journal contribution) on the project they have been assigned to work on.

All teams will be able to give feedback on all other teams' writings and presentations. If a team's work is judged sufficiently original and thoroughly correct, the winning team(s) will be encouraged to submit their work to the Canadian Journal of Undergraduate Research (<https://cjur.ca/>).

### **Course Evaluation and Term grades/assignments:**

**For clarity, the below table refers to:**

**Week 1 of classes = Week of Jan. 9, 2023**

**READING WEEK: Feb 20-25, 2023**

**Week 12 of classes = Week of April 3th, 2023**

Week 1: Possible projects and their respective backgrounds will be discussed 1<sup>st</sup> week of classes, in lectures, with the Instructor providing an overview of the problems, some guidance on current methods used in the literature and all students are asked to participate in the ensuing discussions.

Weeks 2 - 5 (5% of the final grade each week, each team = total of 20% final mark for each team):

There are 2 lectures a week for 4 teams: each team will have a 30-40min window a week to

- 1) Present an update on their current work
- 2) Ask questions related to their work and ask for help/ideas from other teams and Instructor.

A possible guide as to what work a team may undertake:

- literature review – where to find relevant material, how to read and pick the most relevant;
  - how to find free data for their specific needs; how to look for a computational platform; how best to assign skills in each team;
  - how to discern between good journals and not so good journals.
  - How to start the modelling process; what constitutes a good model for their project?
  - How to make use of data in their models: what others have been doing vs what could/would you do?
  - If no data is available, can you design a survey? If so, how can you gather answers?
  - Is there a role for public policy in your model?
  - What will be the “core references” for their proposed work?
- Etc.....

Week 6: Midsemester presentations (30% - all slides will be uploaded on Courselink in a Teams folder)

- 1) Each team summarizes their work in a slide presentation (10% - up to 5 slides)
- 2) Each team highlights: their found data sources, their collaborative platform, their coding platform/software (10% up to 5 slides)
- 3) Each team summarizes their current model building, numerical implementation stage(s) and open questions (10% up to 10 slides)

Mid-semester Instructor evaluation (10%):

Each team answers Q&A from class and Instructor after presentation (5%) and each team member submits their evaluation scores on their team mates and other teams – score sheets will be provided by Instructor (5% - students submit their eval scores on Courselink, in their respective Dropbox folder)

Week 7- 10 (5% of the final grade each week, each team = total of 20% final mark for each team):

There are 2 lectures a week for 4 teams: each team will have a 30-40min window a week to

- 1) Present an update on their current work
- 2) Ask questions related to their work and ask for help/ideas from other teams and Instructor.

These are the weeks that contain the most intense modelling and data use for each team, as well as numerical implementation issues, results visualization, etc.

Week 11: Teams are supposed to start writing their discovery in paper format – lectures this week will focus on writing styles and presentation of results: theoretical, numerical and data analyses results, etc. All teams are to prepare their drafts in Overleaf using LaTeX (no Microsoft Word writing is allowed, nor any other software). The Instructor will be generating the project folders for each team, ensuring direct access for comments as the writing process progresses.

Week 12 (10%): Teams should bring their writing to a close before the lectures of this week. A PDF file of each team's written work will be circulated to all students in class. All students can give feedback and ask questions on each of the written works, alongside the Instructor. The written works will be graded based on the extensive Q&A and feedback from class and Instructor (2<sup>nd</sup> scores sheet for written work will be circulated and students will submit it online, using Dropbox anytime within the first week of exams).

Online personal questionnaire (10%): this will be open for students through the first week of the exam period to complete via the Courselink Quiz facility, online. It will be a series of 10 questions with a "free format" answer regarding the student's experience in the course and if/how their specific knowledge base has expanded.

## **Course Resources**

Some Instructor's Notes and major literature references for each topic will be provided via Courselink. They are not completely self-contained, so the use of a textbook is highly recommended, but they can be used in conjunction with any textbook treating the same topics. All teams are expected to bring a lot of independent work and reading to their projects during the course.

## **Course Policies**

### **Email communication with Instructor:**

- Student emails will be replied to on a first-come basis, within regular working hours, in accordance with provincial regulations. If multiple emails concern an issue for the entire class, the Instructor will email the class list and/or post relevant info on the Courselink site under "Announcements". Students SHOULD USE their University of Guelph emails to communicate.

- Should a student need to communicate 1-1 with the Instructor on specific/personal concerns, they can submit a request to the Instructor at any time.

## **Grading Policies**

When peer review is requested, it will weigh 25% in each student's grade, while the Instructor's grade will weigh 75%.

For further grading procedures please refer to: <https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/grades/>

*Please note that these policies are binding unless academic consideration is given to an individual student.*

## **University Policies**

### **Email Communication**

As per university regulations, all students are required to check their uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

### **When You Cannot Meet a Course Requirement**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for [Academic Consideration](#).

### **Drop Date**

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

### **Copies of Out-of-class Assignments**

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### **Accessibility**

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

### **Academic Integrity**

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

*Please note:* Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is outlined in the Undergraduate Calendar.

### **Recording of Materials**

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

### **Resources**

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs. Academic Calendars <https://www.uoguelph.ca/academics/calendars>

### **Illness**

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g. final exam or major assignment).

**Mental Health Services:**

One out of every five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

***Counselling Services:*** Visit the Counselling Services website (<https://wellness.uoguelph.ca/counselling>) to get information on resources available to you, both online and in-person. You can also visit them at Health Services (J.T. Powell Building, ext 53244) where they offer individual and group counselling sessions by appointment or walk-in.

***Student Support Network:*** is located in the Wellness & Education Promotion Centre in the J.T. Powell Building and offers confidential, peer-based, drop-in support.

***Good2Talk:*** ([1-866-925-5454](tel:1-866-925-5454)) is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions and well-being.

***Here 24/7:*** ([1-844-437-3247](tel:1-844-437-3247)) specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

You are not alone and you will not be judged for asking for help.