



# ENGG\*6790 Special Topics in Environmental Engineering

## ST: Environmental Fluid Mechanics

Winter 2022

Section(s): 02

School of Engineering

Credit Weight: 0.50

Version 1.00 - January 06, 2022

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## 1 Course Details

### 1.1 Calendar Description

A course of directed study involving selected readings and analyses in developing knowledge areas of environmental engineering.

### 1.2 Course Description

Environmental Fluid Mechanics (EFM) is a graduate course designed for future scientists and engineers to develop the fundamental and applied knowledge needed to understand, analyze, and design flow processes that occur in the environment: e.g. flows for the atmosphere, oceans, rivers, built environment, and engineering applications. Physical and mathematical properties of fluid flow are investigated. These include equations of motion, statistical description of turbulent flows, mean flow equations, wall flows, scales of turbulent motion, and time and frequency domains. Practical aspects of measuring and analyzing fluid flow are also investigated. These include fundamentals of measurement, in-situ techniques, sonic and ultrasonic techniques, and electromagnetic techniques.

### 1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

LEC Mon  
02:30PM - 05:20PM  
MCKN, Room 306

### 1.4 Final Exam

There is no final exam.

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## 2 Instructional Support

### 2.1 Instructional Support Team

**Instructor:** Amir Aliabadi  
**Email:** aaliabad@uoguelph.ca  
**Telephone:** +1-519-824-4120 x54862  
**Office:** RICH 2515  
**Office Hours:** To be announced in class

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## 3 Learning Resources

### 3.1 Required Resources

**Turbulence: A Fundamental Approach for Scientists and Engineers (Textbook)**  
 Turbulence: A Fundamental Approach for Scientists and Engineers  
 Amir A. Aliabadi, 2021, Amir A. Aliabadi Publications, Guelph

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Gain oral communication skills by studying and presenting research articles in environmental fluid mechanics via the seminar presentations.
2. Gain critical and creative thinking skills in analyzing environmental fluid mechanics data using programming by completing the computer assignments.
3. Gain critical and creative thinking skills while solving problems for the term tests.

### 4.2 School of Engineering - Graduate Degree Learning Outcomes

Successfully completing this course will contribute to the following:

| #   | Outcome                          | Learning Outcome |
|-----|----------------------------------|------------------|
| 3   | Communication Skills             | 1                |
| 3.1 | Oral Communication               | 1                |
| 5   | Critical and Creative Thinking   | 2, 3             |
| 5.1 | Independent Inquiry and Analysis | 2                |

| #   | Outcome         | Learning Outcome |
|-----|-----------------|------------------|
| 5.2 | Problem Solving | 3                |

## 5 Teaching and Learning Activities

### 5.1 Lecture

**Topics:**

The weekly program stated below is approximate and subject to minor variations.

Week 1: Introduction and Equations of Fluid Motion  
 Week 2: Statistical Description of Turbulent Flows  
 Week 3: Fundamentals of Measurements  
 Week 4: Mean Flow Equations  
 Week 5: In-Situ Techniques  
 Week 6: Term Test 1  
 Week 7: Wall Flows  
 Week 8: Sonic and Ultrasonic Techniques  
 Week 9: Scales of Turbulent Motion  
 Week 10: Electro-Magnetic Techniques  
 Week 11: Time and Frequency Domains  
 Week 12: Seminars  
 Week 13: Seminars  
 Week 14: Term Test 2

## 6 Assessments

### 6.1 Marking Schemes & Distributions

The passing grade for the course is 65%.

Computer Assignment 1 with report, 10%, Sunday 11:59 pm, January 30, 2022  
 Computer Assignment 2 with report, 10%, Sunday 11:59 pm, February 13, 2022  
 Computer Assignment 3 with report, 10%, Sunday 11:59 pm, February 27, 2022  
 Computer Assignment 4 with report, 10%, Sunday 11:59 pm, March 13, 2022  
 Computer Assignment 5 with report, 10%, Sunday 11:59 pm, March 27, 2022  
 Term Test 1, 20%, Monday, February 28, 2022  
 Term Test 2, 20%, Monday, April 4, 2022  
 Seminar Presentation, 10%, Last Two Weeks

Computer assignments will be due at specified dates and times. In these assignments environmental fluid mechanics data should be analyzed using programming. A report should be submitted on CourseLink dropbox summarizing the analysis, providing the results in visual and tabular form, providing discussions in response to questions in the assignments, and providing the completed scripts in the appendix of the report. The report should be submitted as a single file, preferably in PDF format. Late submissions will be assessed but with a 20% mark penalty if submitted within 48 hours of the due date and time. Assignments will not be accepted more than 48 hours after the date and time they are due. Student submissions may be analyzed using TurnItIn software, or other tools to identify non-original work. All students must submit their own, original writing.

Two term tests will be administered in class (during lecture hours) or in take-home format. Your primary opportunity to practice for the term tests is to attempt the problems provided in the text.

The seminar presentations occur in class. Students should find a research paper in the field of environmental fluid mechanics and present the paper to class. The key findings of the paper, scientific strengths, weaknesses, and writing style should be critiqued in the form of a journal club. A rubric is made available for the assessment of the seminar presentations.

If students miss a test due to grounds for granting academic consideration or religious accommodation, the instructor will determine a mark based on your performance in the entire course. No makeup tests will be administered.

## 6.2 Assessment Details

### **Computer Assignment 1: Python Programming (10%)**

**Learning Outcome: 2**

### **Computer Assignment 2: One Point Turbulent Statistics (10%)**

**Learning Outcome: 2**

### **Computer Assignment 3: Balloon (10%)**

**Learning Outcome: 2**

### **Computer Assignment 4: Sodar (10%)**

**Learning Outcome: 2**

### **Computer Assignment 5: Discrete Fourier Transform (10%)**

**Learning Outcome: 2**

### **Term Test 1 (20%)**

**Learning Outcome: 3**

### **Term Test 2 (20%)**

**Learning Outcome: 3**

### **Seminar (10%)**

**Learning Outcome: 1**

## 7 School of Engineering Statements

### 7.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

### 7.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

### 7.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

## 8 University Statements

### 8.1 Email Communication

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

### 8.2 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. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions  
<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

### 8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses  
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes  
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses  
<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

### 8.4 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.

### 8.5 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.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 8.6 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.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 8.7 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.

## 8.8 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>

## 8.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 8.10 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).

## 8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campusess/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campusess/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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