

University of Guelph  
Department of Integrative Biology  
**IBIO\*6000\*02 – Special Topics in Ecology and Behaviour**  
**Advances in Physical Ecology and Aquatic Science**  
Fall 2019

**Instructor** Dr. Joe Ackerman, Department of Integrative Biology  
SSC 2468 x58268; Email - [ackerman@uoguelph.ca](mailto:ackerman@uoguelph.ca)

**Time and Location:** TBA

**Course Objective:**

The objective of the course is to develop the ability to read and interpret research in physical ecology and aquatic science – specifically research related to the interaction of physical processes and aquatic ecosystems and organisms. We will do so by reading and interpreting the peer-reviewed literature in a graduate seminar format. Selected topics may include physical-biological interactions in planktonic and benthic systems, mass transfer relationships, dispersal ecology, and form – function relationships.

**Course Format:**

The course will begin with a brief overview of fundamentals. Thereafter, each weekly session will focus on one of the course topics listed below by providing (1) a “primer” on the approach/methodology used and then (2) leading a discussion involving a critical evaluation of selected readings provided in (1). All participants will contribute to the discussion pertaining to the literature.

**Assessment:**

Readings, discussion and participation	20%
Written and oral presentations	30%
Literature review	<u>50%</u>
	100%

**Written and oral presentations**

Students will present a review of their topic including a primer to be circulated to classmates. This will assist in reading the materials for discussion the following week. There should be 4-5 papers for discussion including one review article and papers describing results from experimental research. Topics from Part 1 of the course will introduce basic physical ecology concepts whereas those from Part 2 will present specific environmental flows. Part 2 should also include a numerical review of the published values of a given parameter/variable from a variety of sources.

**Learning outcomes**

1. Familiarity with basic principles of physical ecology and aquatic sciences

2. Functional ability to read and interpret scientific methods and results used in physical ecology.
3. Effective verbal and written communication of selected topics to facilitate the interpretation of research articles on those topics.
4. Effective leading of course discussion based on a selection of seminar readings.

### **Course Topics:**

#### **A – SCALING ISSUE**

Allometry, Dimensional Analysis, Temporal and Spatial Scales

#### **B- FLUID DYNAMICS**

##### (i) Static Fluids

Fluid properties

Density, Dynamic and Kinematic viscosity, Hydrostatic Pressure, molecular diffusion

##### (ii) Flowing Fluids

Flow Regimes:

Reynolds Number, Creeping flow, Laminar flow, Transitional flow, Turbulent Flow

Balance:

Conservation of Mass (continuity), Conservation of Momentum, Navier-Stokes Equation (Transport Eqn.)

Hydrodynamic Forces: Lift, Drag, Shear, Acceleration-reaction

Particles: Settling Velocity and Dispersal Models, Stoke's Eqn.

Flow near boundaries: Momentum Boundary layers, Wall Shear Stress

Transport processes: Advection, Turbulent Diffusion, Eddy viscosity

#### **C - SELECTED ENVIRONMENTAL FLOWS:**

##### (i) Water column Flows

Turbulence: shear, mixing, eddies

Interactions: Coagulation processes, fertilization

##### (ii) Flow in Canopies

Canopy flows: stem effects, turbulence, dispersal

Productivity: nutrient uptake, photosynthesis in aquatic plants

Dispersal: Aquatic plants

##### (iii) Flow in Streams/Rivers

River flows: flow regimes, roughness flows, turbulence

Dispersion/dispersal: patterns and processes in water

Pore-waters: infiltration, connectivity

##### (iv) Confined Flows

Tubes/tunnels: passive/active irrigation

Internal flows: patterns and processes in water

#### **D- METHODOLOGY:**

- (i) Flow visualization Particles, dyes
- (ii) Flow quantification: Velocimetry (manual methods, Acoustic Doppler velocimeter, Thermal anemometry, Laser Doppler anemometry, PIV, PLIV)
- (iii) Flow Chambers Open-channel flows, rotating chambers, oscillating chambers

Topics are subject to change based on student interest

## **Course and University Policies**

This course is governed by the procedures and policies outlined in the University of Guelph Graduate Academic Calendar (<http://www.uoguelph.ca/registrar/calendars/graduate/current/>), which should be consulted.

### 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, and be prepared to provide supporting documentation. See the graduate calendar for information on regulations and procedures for Academic Consideration:

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

Assignments that are submitted after the deadlines indicated on the assignment **will not be accepted** and the distribution of course marks **will not be altered** for any student unless Academic Consideration for illness or other compassionate grounds has been approved by the course instructor.

### 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.

More information can be found on the SAS website <https://www.uoguelph.ca/sas>

### Academic Misconduct

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 discourages misconduct. 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 detailed in the Graduate Calendar:

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

**E-mail 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.

**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.

**Recording of Materials**

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

**Grading**

Grading will follow the criteria outlined by the Graduate Calendar and as follows.

<b>Percentage Grade</b>	<b>Letter Grade</b>	<b>Description</b>
90-100	A+	<b>Outstanding.</b> The student demonstrated a mastery of the course material at a level of performance exceeding that of most scholarship students and warranting consideration for a graduation award.
80-89	A- to A	<b>Very Good to Excellent.</b> The student demonstrated a very good understanding of the material at a level of performance warranting scholarship consideration.
70-79	B	<b>Acceptable to Good.</b> The student demonstrated an adequate to good understanding of the course material at a level of performance sufficient to complete the program of study.
65-69	C	<b>Minimally Acceptable.</b> The student demonstrated an understanding of the material sufficient to pass the course but at a level of performance lower than expected from continuing graduate students.
0-64	F	An inadequate performance.

## Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: <http://www.uoguelph.ca/registrar/calendars/index.cfm?index>  
If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program.

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.

<http://www.learningcommons.uoguelph.ca/>

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.

<https://www.uoguelph.ca/counselling/>

- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.

<http://www.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

- The Student Accessibility Services (SAS) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/sas>