

APPLIED MATH FOR ENVIRONMENTAL SCIENTISTS

or

QUANTITATIVE TOOLS FOR ENVIRONMENTAL SCIENTISTS

OCE4930 3 Semester Hours

Syllabus and Course Outline, Spring Semester, 2020

CLASS MEETING TIMES: Mo,We: 9:30 – 10:45

Location: TBD

Instructors: Dr. Mike Stukel mstukel@fsu.edu

Office hours: Stukel – Wed 1:30-3:30 PM – 6089 EOA

Textbooks:

We will be using problem sets designed specifically for this course. I will also post reading material online. However, it will be very useful for you to have access to textbooks covering trigonometry, linear algebra, and calculus (derivatives, integrals, and differential equations). Very little has changed in our understanding of these topics over the past several decades. Hence I highly recommend that you either 1) use old textbooks that you already own, 2) buy cheap, used, decades-old textbooks that you can find online, or 3) find old textbooks in the library. These options are also much for the environment than purchasing new textbooks.

Purpose/Objectives At the end of this class students:

Quantitative methods are important tools in environmental and earth sciences and many other disciplines. It is my belief that these tools are best learned through applied applications. At the end of this course students will be prepared to apply concepts from trigonometry, linear algebra, calculus, and differential equations to solve problems in earth and environmental sciences.

Mathematical topics covered will include:

- Matrix algebra
- Solving systems of equations
- Trigonometric functions
- Eigenvalues and Eigenvectors
- Derivatives (ordinary and partial)
- Integrals (Ordinary and multi-dimensional)
- Numerical integration
- Ordinary differential equations

Environmental and earth science topics covered in this course will be diverse, but will include:

- Pesticide movement through watersheds
- Solving systems of chemical reactions
- Population viability analysis for endangered species
- Predator-prey relationships
- Interannual variability in biogeochemical fluxes
- Measuring climate change and uncertainty

This course will use a ‘flipped classroom’ format, with lectures recorded and viewed outside of class, to ensure that class time is devoted to active, problem-based learning. The course will combine several components:

- Video toolboxes covering important mathematical topics that **should be viewed outside of class prior to each schedule class period.**
- Short online quizzes following each toolboxes to test basic comprehension
- **In-class collaborative** work (small groups) to solve **environmental problem sets** using topics covered in toolboxes.
- A midterm and final exam

Week	Dates	Topic	Toolboxes
1	Jan. 6	Intro / Vector Algebra	Toolbox 1.1
	Jan. 8	Matrix Algebra I	Toolbox 1.2
2	Jan. 13	Matrix Algebra II	Toolbox 1.3
	Jan. 15	Functions	Toolbox 2.1
3	Jan. 20	MLK Day (No Class)	
	Jan. 22	Functions II	Toolbox 2.2
4	Jan. 27*	Functions III	Toolbox 2.3
	Jan. 29	Trig Functions and the Unit Circle	Toolbox 3.1
5	Feb. 3	Matrix Inverses	Toolbox 4.1
	Feb. 5	Determinants	Toolbox 4.2
6	Feb. 10*	Introduction to Coordinate Systems	Toolbox 5.1
	Feb. 12	The Spherical Coordinate System	Toolbox 5.2
7	Feb. 17	NO CLASS	
	Feb. 19	NO CLASS	
8	Feb. 24	Eigenvalues and Eigenvectors I	Toolbox 6.1
	Feb. 26	Eigenvalues and Eigenvectors II	Toolbox 6.2
9	Mar. 2*	Review for Midterm	
	Mar. 4	Midterm Exam	
10	Mar. 9	Introduction to Derivatives	Toolbox 7.1
	Mar. 11	Derivatives II	Toolbox 7.2
Spring Break	Mar. 16-20		
11	Mar. 23	Derivatives III	Toolbox 7.3
	Mar. 25	Chain Rule for Derivatives	Toolbox 7.4
12	Mar. 30*	Partial Derivatives I	Toolbox 8.1
	Apr. 1	Partial Derivatives II	Toolbox 8.2
13	Apr. 6	Anti-derivatives and Integrals	Toolbox 9.1
	Apr. 8	Integrals II	Toolbox 9.2
14	Apr. 13	Numerical Integration	Toolbox 9.3
	Apr. 15	Ordinary differential equations	Toolbox 10.1
15	Apr. 20*	Review	
	Apr. 22	Final Exam	

Final Exam is on Apr. 22 at 9:30 am (normal classtime)

All final exam schedules are available at this weblink:

http://registrar.fsu.edu/registration_guide/spring/exam_schedule/

Course Evaluation by Point System: Class attendance is required.

Your grade will be determined from 5 weighted components

- Class attendance & participation (20% of grade)
- Online toolboxes (20% of grade)
- Online mini-quizzes (10% of grade)
- Problem Sets (30% of grade)
- Midterm (10% of grade)
- Final (10% of grade)

- A=>90% A->=85%
 B+=>80% B>=76% B->=72%
 C+=>70% C>=67% C->=63%
 D+=>60% D>=57.5% D->=55%

Class attendance and participation are mandatory. This course is designed in a “flipped classroom” format. This is designed to allow active, problem-based learning. Participation is crucial and mandatory.

Policy on missing class. Again, attendance is mandatory and crucial to success in this course. University policy states that excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness. EXCUSED ABSENCES WILL ONLY BE GIVEN FOR THE ABOVE REASONS WITH DOCUMENTATION.

Policy on tardiness. In this class we will devote most of our in-class time to working in groups. It is thus unfair to students who show up on time if their group members are late to class. For this reason, I have a strict tardiness policy. Any student who is more than 5 minutes late (by my watch) will receive only 50% credit for attendance. There will be no excuses. Those 5 minutes are the only leeway that I will grant. I understand that it can be difficult to park on campus – but to be fair to your fellow students, just make sure to arrive early enough to find parking.

Policy on making up quizzes. There will be quizzes on Canvas following each toolbox. These quizzes are designed to ensure that you master the skills necessary to undertake the problem sets in class. For this reason, it is mandatory that you take them on time. Quizzes completed late will receive only 50% credit.

Policy on final grades. All grades are final and not subject to negotiation.

TOOLBOXES (tentative, subject to change).

Tentative toolboxes are shown in the syllabus. However, specific instructions for toolboxes will be given during the preceding lecture (and posted to the online course

management system). Complete the toolboxes (and online mini-quizzes) before coming to class.

Reasonable Accommodation

Students with disabilities needing academic accommodations should:

1. Register with and provide documentation to the Student Disability Resource Center (SDRC).
2. Bring a letter to the instructor from the SDRC indicating you need academic accommodations. This should be done within the first week of class. (This syllabus and other class materials are available in alternative format upon request.)

Academic Honor Code see <http://fda.fsu.edu/Academics/Academic-Honor-Policy>

Students are expected to uphold the Academic Honor Code published in The Florida State University Bulletin and the Student Handbook and on line at the above web address. The Academic Honor System of Florida State University is based on the premise that each student has the responsibility:

- (1) to uphold the highest standards of academic integrity in the student's own work;
- (2) to refuse to tolerate violations of academic integrity in the University community, and
- (3) to foster a high sense of integrity and social responsibility on the part of the University community.

University Attendance Policy: Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

Academic Honor Policy: The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at: <http://fda.fsu.edu/Academics/Academic-Honor-Policy>)

Americans With Disabilities Act: Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the: Student Disability Resource Center 874 Traditions Way 108 Student Services Building Florida State University Tallahassee, FL 32306-4167 (850) 644-9566 (voice) (850) 644-8504 (TDD) sdrc@admin.fsu.edu; <http://www.disabilitycenter.fsu.edu/>

Free Tutoring from FSU For tutoring and writing help in any course at Florida State University, visit the Academic Center for Excellence (ACE) Tutoring Services' comprehensive list of tutoring options - see <http://ace.fsu.edu/tutoring> or contact tutor@fsu.edu for more information. High-quality tutoring is available by appointment and on a walk-in basis. These services are offered by tutors trained to encourage the highest level of individual academic success while upholding personal academic integrity.

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change without advance notice.