

# Computational Methods in Environmental Engineering

ENV 3040C 12748 (section ONLN)

**Class Periods:** M,W Period 6-7 (12:50PM – 2:45PM)

**Location:** Zoom

**Academic Term:** Fall 2022

## **Instructor:**

Katherine Todd-Brown, PhD

[ktoddbrown@ufl.edu](mailto:ktoddbrown@ufl.edu)

352-294-6604

Office Hours: Fridays 10:40-11:30 (virtual) 11:45-12:35 (Rm 108 Phelps Lab)

## **Teaching Scholars:**

Please contact through the Canvas website

- Anna Langley <anna.langley@ufl.edu>, no office hours
- Paula Della Fave <dellafavep@ufl.edu>, no office hours

## **Course Description**

Numerical modeling techniques and their application to environmental engineering. Use of personal computers and spreadsheets to solve numerical models. Solution techniques include numerical methods and their implementation using R. 3 Credit hours

## **Course Pre-Requisites / Co-Requisites**

Prerequisite: MAC 2313 (Analytic Geometry and Calculus 3)

Corequisite: MAP 2302 (Elementary Differential Equations)

## **Course Objectives**

Students will be able to use programming to document and carry out data ingest, cleaning, and visualization. Students will be able to use data visualizations to support a narrative. Students will understand how to use numerical differences to define events in an observational record, and use numerical integration to solve differential equations.

## **Materials and Supply Fees**

Not applicable

## **Relation to Program Outcomes (ABET):**

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

### **Required Textbooks and Software**

- Open Source Software:
  - R (>4.0.3): A language and environment for statistical computing. R Core Team (2019). R Foundation for Statistical Computing, Vienna, Austria. URL: <https://www.R-project.org/>.
  - RStudio: Integrated Development for R. RStudio Team (2015). RStudio, Inc., Boston, MA URL <http://www.rstudio.com/>.
- Free software:
  - Zoom
- Additional course notes and material are developed by the instructor and will be made available on Canvas.

### **Recommended Materials**

- Venables, V. N., D. M. Smith, and the R Core Team (2020). An Introduction to R.
  - Available: <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
- Wickham, H. Advanced R. (2019). 2nd Edition. ISBN-13: 978-0815384571.
  - Available: <https://adv-r.hadley.nz/>
- Wilke, Claus. Fundamentals of Data Visualization. (2019) ISBN-13: 978-1492031086
  - Living doc available: <https://clauswilke.com/dataviz/>
- Wickham, Hadley and Garrett Grolemund. R for Data Science. (2017) ISBN-13: 978-1491910399.
  - Living doc available: <https://r4ds.had.co.nz>

### **Course Schedule**

Week 1-4: Representing information digitally  
 Week 5-8: Data cleaning and visualization  
 Week 9, 11-13 Modeling processes  
 Week 10: Human connection in data science  
 Week 14-15: Flex

### **Attendance Policy, Class Expectations, and Make-Up Policy**

- Communications and modality
  - This course will be delivered as a flipped classroom. Please come to class having listened to the lectures and ready to work through the in-class exercises.
  - Attendance is not required but it is expected; however, students are responsible for the material discussed in class. You will get the most out of this class if you participate in the in-class exercises.
  - Students and instructors are expected to respond to messages and announcements on Canvas within one business day.
  - This syllabus may change during the semester. If this happens, an announcement will be made on Canvas and in class. The changes will also be noted at the end of the syllabus in the change log section.
- Homework submissions

- Homework is due on Sunday at 8AM and will be returned graded to the student within one week.
  - All homework sets may be resubmitted up to two weeks past their original due dates without penalty. Due to this policy make-up or late submissions are unlikely to be granted except under exceptional circumstances (see UF attendance policy linked below).
  - Students may request a regrade at anytime provided a prior regrade showed more than a 5% change in grade.
  - Any homework that is submitted for regrading will be regraded in it's entirety. This means your grade may go up OR down.
- Compute and computers
    - Please set your zoom name to your preferred name. See the Canvas page for the zoom link.
    - All students should install the free software below. A local install is generally recommended instead of UFApps, contact instructor with questions.
      - R <https://www.r-project.org/> (current latest version 4.2.1)
      - RStudio Desktop <https://www.rstudio.com/> (current version v2022.07.0+548 or v1.4.1743)
  - Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:
    - <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

### **Evaluation of Grades**

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework Sets (3)	220	67%
Check in (4)	60	15%
Reading reflections (2)	48	18%
	328	100%

### **Grading Policy**

The following is given as an example only.

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
94- 100	A	4.00
90 - 93	A-	3.67
86 - 89	B+	3.33
83 - 85	B	3.00
80 - 82	B-	2.67
76 - 79	C+	2.33
73 - 75	C	2.00
70 - 72	C-	1.67
66 - 69	D+	1.33
63 - 65	D	1.00
60 - 62	D-	0.67
0 - 59	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Students Requiring Accommodations**

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator

- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **Software Use**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### **Student Privacy**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### **Campus Resources:**

#### Health and Wellness

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall, 846-1138.** Help brainstorming, formatting, and writing papers.

<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;<https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <https://distance.ufl.edu/state-authorization-status/#student-complaint>.