

Quantification of Biological Processes
ABE 4662

Class Periods: MWF Period 3 (9:35-10:25am)

Location: Frazier Rogers Hall Room 110 or Lab Room 283

Academic Term: Fall 2019

Instructor:

Dr. Melanie Correll

E-mail address: correllm@ufl.edu

Office location: 209 Rogers Hall

Telephone: 352-392-1864 x 209

Office hours: Tuesday 9:30 until 10:30 am, after class or by appointment.

Catalog Description

Credits: 3

Quantitative description and analysis of biological processes pertaining to microbes, plants, animals, and ecosystems. biological transport phenomena, bioenergetics, enzyme kinetics, metabolism, bioregulation, circulatory and muscle systems, and agroecosystems. Analytical and experimental laboratory for development of quantitative skills. (*Offered Fall*)

Pre-requisites/Co-requisites

ABE2062 or BSC2010/2011, EML3100, EGN3353 OR CWR3201, ABE3612C or EML4140

Course Objectives:

After taking this course students will be able to:

- Gain fundamental knowledge to understand quantitative descriptions and the analyses of biological processes.
- Demonstrate proficiency in the use of computational tools to analyze and model biological processes.
- Identify, formulate, and solve problems related to biological processes.
- Develop teamwork and presentation skills to report and solve problems related to biological processes.

Material and Supply Fees: none

Contribution of course to meeting the professional component for ABET:

This course contributes 3 credit hours toward meeting the minimum 48 credit hours of Engineering Topics in the basic-level curriculum for the Bachelor of Science Degree in Agricultural and Biological Engineering.

Relationship of course to ABET program outcomes:

From the list of (1) through (7) program outcomes listed below, this course addresses **3,5, with parts of 1 (applying principles of engineering, science and math to solve complex engineering problems).**

This course addresses the following ABET outcomes.

Outcome	Coverage*
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
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	High
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	High
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Low
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 part of the course outcomes that are addressed.***

Required Textbooks and Software

Title: Introduction to Computational Science

Author: Angela B. Shiftlet and George W. Shiftlet

Publication Date and edition: Princeton University Press, Copyright 2014

Hardcover 2014 ISBN 9780691160719 OR

E-book ISBN 9781400850556

E-book ISBN 9781400851485

Software: Vensim®, Python/Jupyter Notebooks, and R Programming (all are opensource).

Recommended Reading

Biological Process Engineering and other assigned reading material that will be provided by the instructor.

Author: Arthur T. Johnson, *Publication date and edition:* John Wiley and Sons, Inc Copyright 1999 *ISBN*

Number: 0-471-24547-X

Mathematical Models in Biology (An Introduction). Author: Elizabeth S. Allman and John Rhodes, *Publication date and edition:* Cambridge University Press, Copyright 2004 *ISBN Number:* 0-521-52586-1

Computer simulation in biology (A basic introduction). Author: Robert E. Keen and James D. Spain. *Publication date and edition:* Wiley-LISS, Copywrite 1992 *ISBN Number:* 0-471-50971-X (out of press used versions can be had)

Course Schedule (topics vary by semester and student interest, tentative schedule):

- Unit 1: Introduction to Computational Tools to Analyze or Model Biological Processes
- Unit 2: Constrained and Unconstrained Growth in Biological Systems
- Unit 3: Compartmental Models (Pharmacokinetics, drug delivery)
- Unit 4: Numerical Methods and Errors in Modeling Processes
- Unit 5: Enzyme Kinetics
- Project #1 - Presentations**
- Unit 6: Empirical Modeling and Data Analytics for Biological
- Exam #1 up to unit 6 material**
- Unit 7: Stochastic Models and Diffusion
- Unit 8: Cellular automata of Biological Systems
- Unit 9: Cellular Automata Visualization complex
- Project #2 Presentations**

- Unit 10: Matrix Methods Age-Class Transition Matrix
- Unit 11: Student Selected Unit
- Unit 12: Student Selected Unit

Project #3 Presentations

Final Exam – components of the semester but focused on the units 7-12

Attendance Policy, Class Expectations, and Make-Up Policy:

- Attending and participating in class is required (some material is only provided in class). (note: all students get one free pass to miss a day unexcused)
- Using notes, projects, reports, and/or codes from previous offerings of this course is considered cheating.
- Giving code or other materials provided in class to other students that missed class is considered cheating.
- Assisting other students on *troubleshooting* their code (this is cheating on exams or if indicated by instructor) but is helpful and Not Cheating (limit the amount of code you provide so they can learn).
- Letting the instructor know of a known missed absence ahead of time is expected.
- Getting materials from the instructor for excused absences is expected.
- Using professional attitudes and meeting deadlines is expected.
- Making an appointment (or using the office hours) for out-of-class assistance with instructor prior to the day that an assignment is due is expected.
- Putting your best effort in this course is expected.
- Completing the To Do Lists/Assessments in the Units with your BEST EFFORT is Expected
- Using supplemental material to cover areas you need to get to the level required by the unit is expected.
- Late assignments (for projects and homework, no late exams are accepted except in university excused absences) start with 10% deduction at 5 minutes after the due date/time and then this 10% deduction continues until 9:35am for the next class meeting (usually a Monday). Then at 9:36am on the next class date (usually a Monday) 20% deducted until 9:35am on the next class date (usually a Wednesday) after 9:36am on this second class date (usually a Wednesday) until the end of the third class day (usually a Friday) by end of this day (5pm) 30% will be deducted. No late homework beyond the third missed class (usually Friday) will be accepted unless arranged with Dr. Correll.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework (9-10)	10 each	40%
Projects (3)	100 each	30%
Exams (2 – mid term/final)	100 each	30%
Total:		100%

Grading Policy

Percent	Grade	Grade Points
93.5 - 100	A	4.00
89.5 - 93.4	A-	3.67
86.5 - 89.4	B+	3.33

83.5 - 86.4	B	3.00
79.5 - 83.4	B-	2.67
76.5 - 79.4	C+	2.33
73.5 - 76.4	C	2.00
69.5 - 73.4	C-	1.67
66.5 - 69.4	D+	1.33
63.5 - 66.4	D	1.00
59.5 - 63.4	D-	0.67
0 - 59.4	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 requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, 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 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: <http://www.counseling.ufl.edu/cwc>, 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

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. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling.
<https://www.crc.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://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.