

**ABE 4662**  
**Quantification of Biological Processes**  
**Class Periods: MWF Period 3 (9:35-10:25am)**  
**Location: Online in CANVAS synchronous with Zoom**  
**Academic Term: Fall 2020**

*Notes for the Online Course:*

- Complete all readings and watch the introduction to Unit posted on Canvas prior to attending synchronous Zoom sessions each week.
- **Attend a 50 minute synchronous session online during your regularly scheduled period via Zoom. This 50 minute period will be assigned to you on Canvas by your instructor and you will receive the Zoom link in Canvas.**
  - This period will be streamed live by the instructor.
  - You are expected to participate in the live format. Microphones may be unmuted as needed to participate in class discussions, ask questions, and answer instructor questions. Additionally, the chat feature may be employed to interact with instructors and your peers.
  - Synchronous sessions will be recorded, but only made available to students with absences in line with university attendance policies.  
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.
- Complete all assignments on Canvas by scheduled due dates.

***Instructor:***

Dr. Melanie Correll

E-mail address: correllm@ufl.edu

Office location: 209 Rogers Hall

Telephone: 352-294-6722 (8-5pm, M-F, work)

Office hours: Tuesday 9:00 until 10:30 am, after class, or by appointment (most students do this).

***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.***

<b>Outcome</b>	<b>Coverage*</b>
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	Low
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	Low
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	Med
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

***\*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® <https://vensim.com/free-download/> , Anaconda with Python/Jupyter Notebooks (<https://www.anaconda.com/products/individual>) (all are open source).

### **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, Copyright 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 (week 1): Introduction to Computational Tools to Analyze or Model Biological Processes
- Unit 2 (week 2): Constrained and Unconstrained Growth in Biological Systems
- Unit 3 (week 3): Compartmental Models (Pharmacokinetics, drug delivery, SIR models)
- Unit 4 (week 4): Numerical Methods and Errors in Modeling Processes
- Unit 5 (week 5-6): Enzyme Kinetics

#### **Project #1 – Presentations and Report**

- Unit 6 (week 6-7): Empirical Modeling and Data Analytics for Biological Systems
- Unit 7 (week 8): Stochastic Models and Diffusion

#### **Mid Term Exam #1 up to Unit 6 material**

- Unit 8 (week 9): Cellular Automata of Biological Systems
- Unit 9 (week 10-11): Cellular Automata Visualization complex

#### **Project #2-Presentations and Report**

- Unit 10 (week 11): Matrix Methods Age-Class Transition Matrix
- Unit 11 (week 12): Student Selected Unit
- Unit 12 (week 13-14, final exam week): Student Selected Unit

#### **Project #3 Presentations and Report**

Final Exam Week - **Final Exam – components of the semester but focused on the Units 7-12 (exam will be due on the University Scheduled time for exams)**

### **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, other absences that meet the university attendance policy will be provided any missing materials. <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.)
- 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** on homework and projects (limit the amount of code you provide so other students can learn how to troubleshoot).
- 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***

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

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
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 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/>

### ***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](mailto:rbielling@eng.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:** <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](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 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](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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