Microbial Applications of Synthetic Biology

MCB 4xxx + 6xxx, Fall-2017

Instructor

Dr. Christopher Reisch - creisch@ufl.edu

Microbiology and Cell and Science, Office – MCS 1162

Preferred methods for communication with the instructor regarding the course is through email.

Please resolve technical issues by contacting the UF helpdesk (e.g. http://helpdesk.ufl.edu; (352) 392-HELP (4357); *helpdesk*@ufl.edu · HUB 132).

Delivery Method/Meeting time

Online

Credits

3-Credit hours

Course Description

This course will introduce the concept of synthetic biology, which is loosely defined as the construction and reconstruction of biological systems, and its practical applications in research and industry. Advanced molecular biology tools for DNA assembly, the construction of biological pathways and circuits, genome editing, and strategies for transcriptional control will be examined in the course.

Course Objectives/Goals/Learning Outcomes

Students enrolled in this course will be able to:

1. Define synthetic biology and understand its importance in the 21st century
2. Understand and describe biological parts and their function on the systems level.
3. Understand advanced molecular biology techniques that facilitate the building of biological parts and systems.

4. Consider ethical decisions and containment strategies in synthetic biology

Prerequisites

MCB 3020 or 3023 with a grade of C or better. An undergraduate course in biochemistry is recommended.

Course Material and Assignments

All required course materials will be available through the Canvas e-Learning site (http://elearning.ufl.edu/). Instructions for and submission of assignments will also be through Canvas.

Required Textbooks

There is no required textbook.

Required reading materials will be posted to Canvas.

Weekly Course Schedule

Date (week)	Topic	
1	Introduction to Synthetic Biology, Molecular Biology, and Biochemistry	
2 - 3	Biological Parts – Promoters, Regulators, Genes, Terminators, Proteins	
4	Controlling Gene Expression and Protein Production,	
5	Artificial Gene Circuits, Noise in Gene Expression, **Test 1**	
6	BioSensors – Construction and Application	
7	Recombinant DNA technologies, Cloning techniques and strategies	
8 - 9	Genome Editing - Transposons, Recombinases, Zinc Fingers, TALEN's, CRISPR/Cas9	
10	DNA synthesis and Assembly, **Test 2**	
11	Metabolic Engineering – Techniques and Applications,	
12	Accelerated Evolution Systems - MAGE, PACE,	

13	Synthetic Cells - Recoded *E. coli* and JCVIsyn1-3.0	
14	Containment strategies, Ethical considerations	

[Exam Dates/Calendar/Critical dates and deadlines]

Week 5 - Test 1
Week 6 - Proposal Abstracts Due
Week 9 – Proposal Outline Due
Week 10 – Test 2
Week 14 - Proposal Due
Final – Test 3

Exam Administration - ProctorU

All exams will be administered through ProctorU using Canvas in E-learning with students using personal computers. The exam may be taken at any location approved by ProctorU during previously announced times.
For students to sign up for a ProctorU account go to:
http://www.proctoru.com/forstudents.php

Evaluation of Learning/Grades

3 Exams (100 pts each) –   300 points
Discussion, Quizzes, Homework –   100 points
Written Proposal –   100 points
Exams

There will be 3 exams administered throughout the semester at approximately 5 week intervals. All material covered during class will be subject to testing. Tests are conceptually cumulative because understanding of topics covered early in the course will be required to understand materials covered later in the course.

Discussion, Quizzes, Homework

Throughout the semester there will be quizzes, discussions, and homework assigned for grades that will total 100 points.

Proposals

Each student will be responsible for writing a research proposal that aims to investigate a novel idea in the field of synthetic biology that is of scientific or industrial interest. The proposal for students in the 4xxx level course will be 3 pages single-spaced, while the 6xxx level students are expected to write 6 pages with more detailed experimental approaches. Grading rubrics will be provided in class.

Grading Policy

Final letter grades will be assigned based on the number of points earned, as follows:
A = 470-500 points
A- = 450 – 469 points
B+ = 435 – 449 points
B = 415-434 points
B- = 400-414 points
C+ = 385-399 points
C = 365-384 points
C- = 350-364 points
D+ = 330-349 points
D = 300-329 points
E = 0-299 points
More information on grades and grading policies is here:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Class Attendance and Make-Up Policy

Excused absences are consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, 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.

Campus Resources

Resources are available on campus for students having personal problems or lacking clear career and academic goals, which interfere with their academic performance. These resources include:

Health and Wellness

- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx, 392-1575;
- Sexual Assault Recovery Services (SARS) at the Student Health Care Center, 392-1161.

- For emergencies call: University Police Department, 392-1111 (or 9-1-1 for emergencies). 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. http://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. http://teachingcenter.ufl.edu/
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. http://writing.ufl.edu/writing-studio/

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. 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/.

Class demeanor
Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Opinions held by other students should be respected in discussion, and conversations that do not contribute to the discussion should be held at minimum, if at all.

Netiquette guide for online courses
It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.
http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf

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.

Additional comments regarding academic integrity:

Students are encouraged to discuss material with each other from the course, help each other understand concepts, study together, and even discuss assessment questions with each other once the quiz window is closed. However, the following is considered academic dishonesty, and I expect that no student will ever do any of the following:

- Have another person complete a quiz in this course
- Copy another student's quiz in this course
- Collaborate with anyone during a quiz in this course
- Discuss the questions and answers of a quiz with other students while the quiz window is still open
- Manipulate and/or distribute any materials provided in this course for any purpose (including course lecture slides).
- Use any materials provided by a previous student in the course

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.

Microsoft Office 365 Software is free for UF students

http://www.it.ufl.edu/gatorcloud/free-office-365-downloads/

Other free software is available at:

http://www.software.ufl.edu/

To check for availability of the media and technical requirements, contact the UF Computing Help Desk at (352)392-HELP(4357).

University of Florida Complaints Policy and Student Complaint Process

Most problems, questions and concerns about the course will be resolved by professionally communicating with the instructor or the TAs.

The University of Florida believes strongly in the ability of students to express concerns regarding their experiences at the University. The University encourages its students who wish to file a written complaint to submit that complaint directly to the department that manages that policy.

If a problem really cannot be resolved by communicating with the instructor or the TAs you can contact
- Residential Course:
  https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.
- Online Course: http://www.distance.ufl.edu/student-complaint-process.

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        If this does not help the University encourages the students who wish to file a written complaint to submit that complaint directly to the department that manages that course. If a problem really persists and cannot be resolved by communicating with the instructor and the department, contact… for
Residential Course: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.
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This said, professionalism is a two-way-street. Unprofessional behavior of students includes, among other things: lack of communication, blaming other people or external factors, lying, affecting others negatively in a group or in the class, not accepting criticism and not being proactive in solving problems or seeking help. Furthermore, faculty often have family and other obligations to tend to. Over the weekend, replies to your inquiries or questions maybe delayed.
        If a student is lacking professionalism repeatedly, the instructor has the rights to file formal complaint against the student through the Dean of Student office.