BSC4467

Course Syllabus

Instructor

Dr. Xin Wang

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Office: Microbiology and Cell Science, MCS 1152

Office Hours: 9-10 am on Friday on Zoom or by appointment

General Course Information

Delivery Method: Online, asynchronous

Credits: 3 credit hours

Prerequisites: MCB 3020 or 3023 (or equivalent)

Course Description and Purpose

Synthetic biology applies basic genetic/metabolic principles to engineer biological cells to attain new functions. Synthetic biology research is a cutting-edge area that marries knowledge from biology, chemistry, physics, and engineering principles. It is still in the infancy of development, yet synthetic biology has already brought breakthroughs in human medicine, industrial and pharmaceutical development, environmental protection, and crop improvement. This course will introduce design principles and applications of biological cells. Topics include synthetic pathway design, artificial photosynthesis, repurposing genetic codons, genome synthesis and editing, and genetic circuit design, among others.

Course Learning Objectives

You will gain fundamental knowledge of synthetic biology and will be able to:

- Clearly describe the construction principle of biological cells.
- Draw out central metabolic pathways by applying redox reaction principles.
- Design synthetic pathways by leveraging new enzymes.
- Clearly describe the principles that control metabolic pathway fluxes.
- Describe in detail key techniques used for genetic codon expansion, genome engineering and editing, and genetic circuit design.
- Critically analyze research literature using course contents and describe research designs in depth.

Course Requirements

Course Materials and Assignments

All required course materials will be available through the Canvas e-Learning site. 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 and are listed below.

Materials/Supply Fees

There is no supply fee for this course.

Minimum Technology Requirements

The University of Florida expects students entering an online program to acquire computer hardware and software appropriate to their degree program. Most computers are capable of meeting the following general requirements. A student's computer configuration should include:

- Webcam
- Microphone
- Broadband connection to the internet and related equipment (cable/DSL modem)
- Microsoft Office Suite installed (provided by the university)
- Chrome

Technical and Digital Information Literacy Skills

Minimum Technical Skills

To complete your tasks in this course, you will need a basic understanding of:

- Operating a computer and using word processing software
- Using the Canvas learning management system
- Using email with attachments
- Creating and submitting files in commonly used word processing program formats
- Using presentation programs

Minimum Digital Literacy Skills

Furthermore, you should be able to:

- Use online libraries and databases to locate and gather appropriate information
- Use computer networks to locate and store files or data
- Use online search tools for specific academic purposes, including the ability to use search criteria, keywords, and filters
- Analyze digital information for credibility, currency, and bias (e.g., disinformation, misinformation)
- Properly cite information sources
- Prepare a presentation of research findings

Weekly Course Schedule

Dates (Week)	Topics
Orientation	Introduction to the Course
Module 1	Introduction to Synthetic Biology
Module 2	Principles of Biosynthesis
Module 3	Central Metabolism — Ketoacids
Module 4	Carbon Rearrangement Reactions for Glycolysis Redesign
Module 5	Carbon Rearrangement Reactions and Application
Module 6	Terpenes and Artemisinin Biosynthesis
Module 7	General Principles of Energy Generation in Cells
Module 8	Energetics and Diversity of Electron Transport Chains
Module 9	Photosynthesis
Module 10	Central Dogma
Module 11	Expanding Genetic Codons
Module 12	Genome Synthesis and Recoding
Module 13	Multiplex Automated Genome Engineering (MAGE)
Module 14	Genetic Circuit Design
	Final Exam

Critical Dates and Deadlines

No late submissions will be accepted except for extenuating circumstances.

Module 6: Exam 1

Module 7: Review paper first submission due

Module 7: Semester project: paper selection due

Module 10: Semester project: oral presentation due

Module 11: Review paper final submission due

Module 12: Semester project: questions to peers due

Module 13: Semester project: responses to peers due

Module 15: Final exam

Exam Administration — Honorlock

All exams (midterm and final) will be administered through **Honorlock**using Canvas in e-Learning with students using personal computers. Honorlock is an online proctoring service that allows students to take exams on-demand 24/7. There are no scheduling requirements or fees. The exam may be taken at any location approved by Honorlock during the scheduled exam window on Canvas. Appointments are not needed with Honorlock

You will need a laptop or desktop computer with a webcam, a microphone, and a photo ID. The webcam and microphone can be either integrated or external USB devices.

Honorlock requires that you use the **Google Chrome** browser and that you must add the **Honorlock extension to Chrome**.

For further information, FAQs, and technical support, please visit **Honorlock**.

Evaluation of Learning/Grades

Assignment(s)	Percent of Course Total
Bonus quizzes	Up to 10%
Review paper writing	15%
Midterm exam	25%
Semester project: Research paper presentation	10%
Homeworks and discussions	20%
Final exam	30%

Exams

There will be two exams in the form of short answers. They require critical thinking skills and knowledge from the content learned in lectures.

Discussions, Quizzes, Homework

Bonus Quizzes: There will be non-proctored quizzes for certain lecture modules, worth up to 10% of your total grade. The quiz can be accessed through Module Homework in Canvas. The purpose of the quizzes is for you to refresh your knowledge on certain concepts you have learned in this class or previous classes.

Discussion Groups and Homework: The purpose of the discussion group is to encourage student-student interaction and peer learning. The discussion is on current literature that follows lectures of certain modules. There will also be homework assignments that ask you to answer questions related to the research literature. This will serve as a starting point for discussion that is graded as your participation points. Students are encouraged to ask and answer other related questions in the discussion group. The instructor will monitor the discussion on Canvas.

Presentation: Each student will participate in groups to present a manuscript from the primary literature that was published within the last 5 years. The presentation will be 10-15 minutes in length and must adequately describe the methods and results conveyed in at least three figures from the manuscript or its supplemental data. **You will need to make a video and upload it to Canvas.** Each presentation will be reviewed by two of your peer groups. Grades will be assigned based on the input of your classmates and the view of the instructor.

Review Paper Writing: There are two submissions for a review paper during the semester (regarding microbial metabolism). You will be notified of topics to write about ahead of time through Canvas. This is to gauge your understanding of the class topics and your critical thinking abilities. Detailed instructions for the paper writing can be found on Canvas.

Grading Policy

I will do my best to grade your work **within a week after the assignment's due date**.

Final letter grades will be assigned based on the number of points earned, as follows:

Grade	Percent
A	92-100%
A-	90-91%
B+	88-89%
B	83-87%
B-	80-82%
C+	78-79%
C	73-77%
C-	70-72%
D+	68-69%
D	63-67%
D-	60-62%
F	<60%

See the current **Grades and Grading Policies** for more information.

University Policies and Student Resources

In lieu of listing university-wide policies and support resources directly in this syllabus, students are directed to the UF Syllabus Policy page for the most up-to-date information on academic policies, grading, attendance, accommodations, and wellness services:

👉 **https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/**

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 on the **GatorEvals Providing Constructive Feedback webpage**. 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 the **GatorEvals website**. Summaries of course evaluation results are available to students on the **GatorEvals Public Results webpage**.

Student Data and Privacy

There are federal laws protecting your privacy with regard to grades earned in courses and on individual assignments. For more information, please see the **Notification to Students of FERPA Rights**.

AI Usage Policy

AI as an Educational Enhancement

We encourage the use of artificial intelligence (AI) technologies to both engage with course material and enhance the learning experience. AI tools can provide significant educational benefits by facilitating personalized learning support and expanding access to a vast array of informational resources. Students are permitted and encouraged to utilize AI to explore concepts, answer questions, and deepen their understanding of complex topics covered in this course. Importantly, the goal of integrating AI should not be merely to complete assignments but to genuinely engage with the material and strengthen your problem-solving skills. This approach will foster a deeper and more practical understanding of synthetic biology, enhancing your overall educational journey.

Academic Integrity and AI Detection

While AI is an invaluable resource for learning, it is crucial that all work submitted as part of this course reflects your own understanding and intellectual effort. Submitting AI-generated content as your own, such as essays or direct AI outputs, will be considered plagiarism. To maintain academic integrity, we utilize AI detection tools such as Turnitin to identify AI-generated text. Manual checks by instructors will also be conducted to ensure the authenticity of your work. Engage with AI responsibly, ensuring that your submissions genuinely represent your personal knowledge and critical thinking. For further details on the consequences of plagiarism and academic dishonesty, please refer to the **University of Florida's Student Honor Code and Student Conduct Code**. Violations may lead to severe penalties, including grade reductions, failing the course, or more serious disciplinary actions under the University's honor code.

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: Microsoft Office 365 Software is free for UF students through the **UF Information Technology website**.

Other Free Software: Other free software is available on the **Software Licensing Services at UF website**. To check for availability of the media and technical requirements, contact the UF Computing Help Desk at 352-392-HELP(4357).

Tips for Success

Taking a course online can be a lot of fun! Here are some tips that will help you get the most of this course while taking full advantage of the online format:

- Schedule "class times" for yourself. It is important to do the coursework on time each week. You will receive a reduction in points for work that is turned in late!
- Read ALL of the material contained on this site. There is a lot of helpful information that can save you time and help you meet the objectives of the course.
- Print out the Course Summary located in the Course Syllabus and check things off as you go.
- Take full advantage of the online discussion boards. Ask for help or clarification of the material if you need it.
- Do not wait to ask questions! Waiting to ask a question might cause you to miss a due date.
- Do your work well before the due dates. Sometimes things happen. If your computer goes down when you are trying to submit an assignment, you'll need time to troubleshoot the problem.
- To be extra safe, back up your work to an external hard drive, thumb drive, or through a cloud service.

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.

Security | General Guidelines | Email | Zoom

Remember that your password is the only thing protecting you from pranks or more serious harm.

- Don't share your password with anyone.
- Change your password if you think someone else might know it.

- Always log out when you are finished using the system.

University Honesty Policy

University Policy on Academic Conduct

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: **“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”** You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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."**

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see the **Student Honor Code and Student Conduct Code webpage**.

Plagiarism

The **Student Honor Code and Student Conduct Code** state that:

"A Student must not represent as the Student’s own work all or any portion of the work of another. Plagiarism includes but is not limited to:

- Stealing, misquoting, insufficiently paraphrasing, or patch-writing.
- Self-plagiarism, which is the reuse of the Student’s own submitted work, or the simultaneous submission of the Student’s own work, without the full and clear acknowledgment and permission of the Faculty to whom it is submitted.
- Submitting materials from any source without proper attribution.
- Submitting a document, assignment, or material that, in whole or in part, is identical or substantially identical to a document or assignment the Student did not author."

Additional Comments Regarding Academic Integrity

Students are encouraged to discuss material from the course with each other, 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

Privacy and Accessibility Policies

For information about the privacy policies of the tools used in this course, see the links below: Delete the items that don't apply to your course.

- Adobe
  - **Adobe Privacy Policy**
  - **Adobe Accessibility**
- Honorlock
  - **Honorlock Privacy Policy**
  - **Honorlock Accessibility**
- Instructure (Canvas)
  - **Instructure Privacy Policy**
  - **Instructure Accessibility**
- Microsoft
  - **Microsoft Privacy Policy**
  - **Microsoft Accessibility**
- Perusall
  - **Perusall Privacy Policy**
  - **Perusall Accessibility**
- Harmonize
  - **Harmonize Privacy Policy**
  - **Harmonize Accessibility**
- Sonic Foundry (Mediasite Streaming Video Player)
  - **Sonic Foundry Privacy Policy**
  - **Sonic Foundry Accessibility** (PDF)
- Vimeo
  - **Vimeo Privacy Policy**
  - **Vimeo Accessibility**
- YouTube (Google)
  - **YouTube (Google) Privacy Policy**
  - **YouTube (Google) Accessibility**
- Zoom
  - **Zoom Privacy Policy**

- **Zoom Accessibility**

Disclaimer

This syllabus represents the Instructor’s current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.