Molecular Techniques & Data Analysis Syllabus

ENTMLGY 6703 Spring 2022

Course Information

- **Course times and location:**
  - Lecture: Thursdays 11:10AM-12:30PM- Kottman 245 or Wooster Science 300 or Zoom
  - Lab: Fridays 12:45PM-4:45PM- Wooster Science 245
- **Credit hours:** 2
- **Mode of delivery:** Lectures = in person or Zoom live, Labs = in person

Instructors

- **Name:** Peter Piermarini
- **Email:** piermarini.1@osu.edu
- **Office:** Wooster Science 250

- **Name:** P. Larry Phelan
- **Email:** phelan.2@osu.edu
- **Office:** Wooster Science 252

Preferred means of communication:

- Our preferred method of communication for questions is email.

- Class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Course Prerequisites

Graduate status or permission of instructors

Course Description

This course will introduce students to basic molecular biology techniques required to conduct genomic, transcriptomic, and metabolomic studies. Hands-on experience in functional genomics including cDNA synthesis, quantitative PCR, and metabolite analysis (GC, HPLC, and MS) will be emphasized. The course will also cover data analysis (bioinformatics), including gene characterization and introduction to high-throughput sequencing strategies. Recent advances in insect molecular biology such as CRISPR will also be discussed where appropriate. Students are expected to attend lectures, perform assigned experiments, analyze data, participate in group discussions, complete assignments, and give oral presentations.

Course Schedule

Important Dates
Project Presentations	Feb 25
Final Exam	Mar 1

Week	Date	Topics, Readings, Assignments, Due Dates
		Intro to molecular biology
1	13&14-Jan	Lec: Central dogma of molecular biology, nucleic acids,
		Lab: RNA isolation, spectrophotometry, cDNA synthesis
2	20&21-Jan	**Functional genomics**
		Lec: Introduction to functional genomics
		Lab: Quantitative real-time PCR (qRT-PCR)
3	27&28-Jan	**Sequence searching of genomes**
		Lec: Sequence similarity search and functional prediction
		Lab: Web-based and standalone blast
4	03&04-Feb	**Gene expression (transcriptomes)**
		Lec: Introduction to RNA-Seq for studying gene expression
		Lab: Differential gene expression analysis
5	10&11-Feb	**Metabolomics I**
		Lec: Metabolomics & systems biology
		Lab: Metabolite separation & identification
6	17&18-Feb	**Metabolomics II**
		Lec: Interpretation of metabolomic data
		Lab: Sample preparation & metabolite quantitation
7	24&25-Feb	
		Lec: Molecular ecology
		Lab: Group project presentations (pizza provided)
	3-Mar	**FINAL EXAM 11:10AM-12:30PM**

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Learning Outcomes

By the end of this course, students should successfully be able to:

- understand the basic tenets of gene and metabolite expression and approaches for their study,

- integrate basic molecular techniques into their own graduate research project,

- apply various bioinformatic tools to analyze molecular data,

- appreciate the value of using and integrating "-omic" approaches (genomics, proteomics & metabolomics), and

- appreciate the value of collaborative research and cooperative learning.

How This Course Works

Overview: This 7.5-week course is designed for the graduate student wanting an introduction to modern molecular techniques and exploring how they might be able to incorporate them in their own graduate research program. Each week is comprised of a lecture, in which concepts and background related to a methodology are presented, and a lab, where students get hands-on experience with the technique. Special emphasis is placed on integrating -omic techniques, To achieve this, the labs will apply differ techniques to the same biological question. At the end of the course, groups will present different lab -omic results in a mini-symposium format and will discuss how the results inform the question.

Mode of delivery: Lectures will be presented from Wooster and students may attend in person in Wooster Science Building 300 or via Zoom in Kottman Hall 245 or from their personal computer. Labs are held in person in Wooster Science Building 245 for all students, although Columbus students may participate in Labs 3 and 4 via Zoom as these are web-based labs.

Credit hours and work expectations: This is a 2 credit-hour half-semester course. According to Ohio State bylaws on instruction (go.osu.edu/credithours), students should expect around 2 hours per week of lecture and 4 hours in lab in addition to 4 hours of homework per week (on average).

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, we have the following expectations for everyone's participation:

- **Attendance of all lectures:** If you will be absent, please tell me in advance.

- **Participation in lectures**: **at least once per week**
Your active engagement in class lectures not only helps you retain information better, it helps others in the class understand the material. Participation includes asking for

clarification in class, answering questions, contributing to class discussions, and posting comments to the CarmenCanvas discussion board.

Course Materials and Technologies

Textbook
- No textbook is required for this class. Required readings will be posted on Carmen ahead of some lectures.

Recommended/Optional Materials and/or Technologies
- References and open-source software apps to supplement lectures will be recommended appropriate to each topic.

Required Equipment
- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection.
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access (go.osu.edu/student-tech-access).

Required Software
Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the installing Office 365 (go.osu.edu/office365help) help article for full instructions.

CarmenCanvas Access
You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:
- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes, good for 365 days, that can each be used once.

- Install the Duo Mobile application (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- Navigating CarmenCanvas (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: go.osu.edu/it

- **Phone:** 614-688-4357 (HELP)

- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Points
Project presentations	40%
Final exam	40%
Class & lab participation	20%

See Course Schedule for due dates.

Descriptions of Major Course Assignments

Academic integrity and collaboration: Discussion among students concerning lectures and critical reviews is encouraged; however, written assignments should represent your own original work.

1. Final Exam

The final exam is administered as closed-book short answer and essay format.

2. Project Presentation

Students will develop a collaborative 15-20 min Powerpoint presentation with 3-4 group members. Each member of the group is expected to present a portion of the presentation. The presentations should consist of the following sections: Introduction, Materials and Methods, Results, and Discussion/Conclusions.

3. Class participation

As indicated above, we place high value on class participation. When actively engaged, you will learn more from the class and get more out it. We recognize that speaking in class is difficult for many students. We strive to create a class environment where everyone is comfortable to talk. Asking for clarification or other questions particularly helps classmates learn as well so this activity is valued and reflected in the grading rubric.

Late Assignments

All assignments and due dates are noted on Carmen; any changes will be announced via Carmen and/or email. Without an excused absence, a late assignment will be subject to 10% grade deduction during the first two hours, with additional 10% deductions accruing for every hour it is late. Notify me if you anticipate an issue with submitting your work on time.

Instructor Feedback and Response Time

Remember that you can call 614-688-4357 (HELP) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. We will reply to emails within **24 hours on days when class is in session at the university**.

- **Class announcements:** We will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.

- **Discussion board:** We will check and reply to messages in the discussion boards once mid-week and once at the end of the week.

- **Grading and feedback:** For assignments submitted before the due date, we will try to provide feedback and grades within **seven days**.

Grading Scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Other Course Policies

Discussion and Communication Guidelines

The following are our expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful, particularly as this class includes students at different stages of their graduate training.

- **Tone and respect**: We insist on maintaining a supportive learning community where everyone feels safe and where people can disagree amicably. Again, this is particularly true with the range of students participating. Remember that sarcasm does not always come across online.

- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

- **Synchronous sessions**: During our Zoom sessions we ask you to use the name by which you want to be called. During our full-group lecture time, you should keep your camera on to get the most out of lectures and discussions, and to limit the delay of turning your camera on when you are called on. You are always welcome to use the free, Ohio State themed virtual backgrounds (www.osu.edu/downloads/zoom-backgrounds.html). Remember that Zoom and the Zoom chat are our classroom space where respectful interactions are expected.

Academic Integrity Policy

See *Academic Integrity and Collaboration* (above) for guidelines about collaboration and academic integrity in the context of this class.

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Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's Code of Student Conduct (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so we recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If we suspect that a student has committed academic misconduct in this course, we are obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.
If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member."

This course adheres to The Principles of Community adopted by the College of Food, Agricultural, and Environmental Sciences. These principles are located on the Carmen site for this course; and can also be found at https://go.osu.edu/principlesofcommunity. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (https://equityandinclusion.cfaes.ohio-state.edu/). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at https://studentlife.osu.edu/bias/report-a-bias-incident.aspx.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand mental health resources (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at 614- 292-5766. **24-hour emergency help** is available through the National Suicide Prevention Lifeline website (suicidepreventionlifeline.org) or by calling 1-800-273-8255(TALK). The Ohio State Wellness app (go.osu.edu/wellnessapp) is also a great resource.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services (SLDS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services.

Disability Services Contact Information
- Phone: 614-292-3307
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: Baker Hall 098, 113 W. 12th Avenue

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.
- CarmenCanvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)