**PLB 856: Plant Molecular and Omic Biology**

**Syllabus - Spring 2021**

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| **Instructors** | **Department** | **Email** |
| Robert Last\* | Biochemistry and Molecular Biology/Plant Biology | lastr@msu.edu |
| Hideki Takahashi\* | Biochemistry and Molecular Biology | htakaha@msu.edu |
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\*Contact Hideki Takahashi (htakaha@msu.edu) and Rob Last (lastr@msu.edu) with general questions.

**Brief Description of Course:**

The intention of the course is to provide a survey of plant molecular biology, molecular genetics, genomics and cell biology, emphasizing recent research advancement and technology development in these disciplinary areas.

**Prerequisite:**

College-level genetics course (equivalent to PLB/IBIO/ZOL 341) and an understanding of molecular biology and gene expression are ***essential*.** Please do not enroll in the course if you do not have this background. Please contact Hideki Takahashi (htakaha@msu.edu) and Rob Last (lastr@msu.edu) if you have any doubts about the suitability of your preparation.

**Credits:** 3-0

**Class Session:** 3:00-4:20 PM on every Tuesday/Thursday

**Zoom Meeting:** <https://msu.zoom.us/j/97516626071>

Meeting ID: 975 1662 6071

Passcode: omics856

**Course Materials:** D2L (<https://d2l.msu.edu/d2l/loginh/>)

Use your MSU NetID and password (case-sensitive) to log in.

**Assignment Folder:** Google Drive (<https://googleapps.msu.edu/>)

Use your MSU NetID and password (case-sensitive) to log in.

**Course Grade:**

The grade is based on two exams (50% of grade total; split between the midterm and the final according to the number of class periods devoted to each), writing article summaries and presentation for in-class group discussion (10% of grade total), out-of-class homework assignments (8% of grade total), and writing and presentation of a research proposal (32% of grade total).

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| Midterm Exam | 25 % |
| Final Exam | 25 % |
| Article Summaries & Presentation | 10 % |
| Homework | 8 % |
| Research Proposal (writing) | 25 % |
| Research Proposal (oral presentation) | 7 % |

**Class Format/Daily Preparation:**

Sessions of the class typically will consist of lectures by the instructors combined with a discussion of reading materials. For each week, two to four key articles will be posted as pdf files at the D2L web site, by the previous Friday. ***Please read these articles before joining class sessions.*** These articles are designated for thorough understanding and in-depth discussion of lecture topics.

Students should prepare by making sure that they can answer the following key questions:

* What was the goal of the research, including the problem being addressed?
* Which figure(s) or table(s) presents the most critical data in the study? Why?
* What were the strengths and weaknesses of the paper?
* What would *you* do next?

The instructors will provide lecture notes by or soon after lecture time through D2L. These notes will provide copies of some of the figures and tables that may be mentioned from the articles other than the assigned reading materials.

**Exams:**

The two exams will have an open-book, take-home format: notes, books, articles, and online information may be consulted, but students are expected to complete their exams independently, without discussion with others until after all exams are turned in.

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|  | Available on D2L | Due in Google Drive | Instructor |
| **Midterm Exam** | March 2, 5:00 PM | March 4, 5:00 PM | Last |
| **Final Exam** | April 22, 5:00 PM | April 24, 5:00 PM | Takahashi |

* The exams will be made available to students through D2L as indicated on the schedule.
* Submission: Upload your complete exam response to your assignment folder in Google Drive.

**Writing Assignments and In-Class Presentations:**

1. **Article Summaries and Presentation**

Four times during the semester, the instructors will assign a group of students to read and present a key research article relevant to the topics taught in class. The objective of this group assignment is to provide students with opportunities to gain critical thinking skills to read, analyze and summarize the points described in a research article. All students should come to the class after reading the article and be ready to participate in in-class discussions.

This assignment will include the following activities:

* Before class: A group of students will be assigned to read and discuss what is written in the article and prepare a 10-15 minute presentation to be shared during the class time. The presentation should highlight the rationale, major findings, technical advance (if relevant) and future outlook.
* In class: The same group of students presenting the article will lead the discussion in breakout sessions following their presentation.
* After class: **All students in class will write a one-page summary of the article**. Make sure to describe the four key questions mentioned above for the Daily Preparations. It should be written using a 11-12 point standard 'with serif' font (Times New Roman 12 point is a good choice) and single line spacing.
* Your one-page summary of the article will be due the next day of the class session.
* Upload your document to your assignment folder in Google Drive.

1. **Homework**

There will be four take-home assignments each consisting of basic questions related to the lecture topics.

* The homework will be made available to students through D2L as indicated on the schedule.
* Upload your homework to your assignment folder in Google Drive.

1. **Research Proposal**

The assignment is to write an original research project proposal on a specific topic in plant molecular biology/molecular genetics and genomics.

* ***The proposal should include the molecular genetics and genomics aspects of the problems you choose to address*** (as opposed to being focused only on the biochemistry, quantitative genetics, molecular breeding or physiology aspects of the problem). It should be related to a topic pertinent to the course. However, it does not have to be on a topic specifically covered in class.
* You should focus on a basic biology problem, though you may extend it with a perspective on translational possibilities. For instance, you could write a proposal in relation to mechanisms of plant disease resistance; molecular genetics of plant development; molecular and physiological responses to the environment (e.g., light, temperature, water, UV); etc.
* The proposal should NOT be directly related to the research project you are conducting for your graduate degree, are likely to perform as a student, or were involved in the past. For instance, if you would happen to be working on regulation of gene expression in response to low temperature, you should not write a proposal on that same or similar topic. You could, however, write a proposal on ABA-regulated gene expression and signaling or, of course, any of the other topics.
* The proposal should be original and creative. Students may not use a paper written for another course, nor conceptualized by someone else.
* You are strongly encouraged to start researching your topic as soon as the course begins, including discussions with Drs. Last and Takahashi before or after class times.
* Your proposal should be written using a 11-12 point standard 'with serif' font (Times New Roman 12 point is a good choice) and single line spacing, numbering all pages.
* The general format of the proposal should be as follows:

**A. Summary with Specific Aims** (1 page max.). State the broad, long-term objectives of the proposed line of research and describe concisely and realistically what the specific research described in the proposal is intended to accomplish. Specific aims should be listed as a short list (typically only 3-4 aims total).

**B. Background and Significance** (2 pages max.). Summarize what is known about the chosen area of research critically evaluating the existing knowledge and specifically identifying the gaps the project is intended to fill. State concisely the importance of the research and relate the specific aims to the broad, long-term objectives of the project. Please cite key references in this and the next section, preferably in a “first author, date” style.

**C. Experimental Design and Methods** (4 pages max.). Outline the experimental design and the procedures to be used to accomplish the specific aims of the project. Include discussion on how you will interpret the data. Discuss the potential difficulties and limitation of the proposed procedures and present alternative approaches to achieve the aims where appropriate. On a separate page (not included in the 4 page max count), give a tentative sequence or timetable for the investigation.

**D. References.** List the literature cited in the text, including titles and full list of authors.

**E. Graduate and Past Research Projects** (1 paragraph). Briefly summarize the research you are conducting for your graduate degree.

* Your research proposal should be submitted in three phases:

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| **Phase I** | Title, Summary and Specific Aims (1 page) are due on **February 16**.  You will choose a time to have detailed discussions about your choice of topic and your abstract with both instructors on February 23 or 25. |
| **Phase II** | Background and Significance (2 pages) are due on **March 16**.  Include the edited version of Title, Summary and Specific Aims. |
| **Phase III** | Full proposal is due on **April 13.**  Submit the final version of your proposal including the sections for Phase I and II fully edited. |

* Upload your documents to your assignment folder in Google Drive.

1. **Oral Presentation of Research Proposal**

The last class periods (currently planned on April 20 and 22) are reserved for each student to give a 10-minute presentation describing the research proposal to the rest of the class.

* Electronic slides (PowerPoint) should be used to aid the presentations.
* The quality of both the oral presentation and the written report will be graded by the instructors.
* We recommend no more than 10 slides for a 10-minute presentation.
* This year the class will run online. We recommend you to consider recording your presentations and upload them to your assignment folder in Google Drive.
* The order of the presentations will be randomly selected and announced one day prior to the first session. All students should be prepared to talk live on Zoom or share their recordings on April 20.

**Other Recommended Activities:**

* Throughout the semester, several seminar series will be hosting scientists who will present lectures on pertinent topics. Some may be mentioned in class, and posted on the D2L site or provided by email. We encourage you to mention seminars in class so that other students may learn of them.
* If you are a BMB student in the Molecular Plant Sciences (MPS) Program and would like to obtain more information on topics in molecular genetics and genomics that are not covered in PLB 856, you may consider attending lectures in BMB 801 “Molecular Biology”. The course is offered in Fall semesters. Please contact the course instructors David Arnosti (arnosti@msu.edu) and Bill Henry (henryrw@msu.edu) for details or advice.

**Course Assessment**:

Michigan State University and the instructors take seriously the opinion of students in the evaluation of the effectiveness of instruction, and MSU has implemented the SIRS (Student Instructional Rating System) process to gather student feedback. This course utilizes the “online SIRS” system. You will receive an e-mail sometime during the last two weeks of class asking you to fill out the SIRS online form at your convenience. Please note the final grade for this course will not be accessible on STUINFO during the week following the submission of grades for this course unless the SIRS online form has been filled out. You will have the option on the online SIRS form to decline to participate in the evaluation of the course – we hope, however, that you will be willing to give us your frank and constructive feedback so that we may instruct students better in the future.