

Course Title: Plant Metabolomics IB512

Credit: 2 hours

Instructor: Amy Marshall-Colon

Contact: amymc@illinois.edu

Class hours/week: T/R 12:30 – 1:50 PM

Office hours: by appointment

### Course Description

Plants are sessile organisms that must respond dynamically to environmental signals. Key to their response and survival is the intricate network of metabolic pathways that result in the differential accumulation of metabolites. This course will familiarize students with the fundamentals of plant metabolomics research. Metabolomics is presented in relation to plant development, nutrition, and response to stress, among other topics. Students will use online tools to analyze, organize, and visualize metabolomics data. Course goals include a critical evaluation of a current topic in plant metabolomics and how metabolomics technology can enhance their own research objectives. Prerequisites: Graduate student status or consent of instructor. At least one upper level undergraduate course in biochemistry or its equivalent.

### Student Learning Outcomes

- i) Understand how metabolomics technology can enhance research in plant sciences.
- ii) Relate metabolomics technologies to your own research interests.
- iii) Critically evaluate research in plant metabolomics, such as that found in scientific journals.

### Prerequisites:

This is an advanced course in systems biology and requires basic familiarity with biochemistry and molecular biology. At least one upper level undergraduate course in biochemistry or its equivalent is required.

### Textbook

The Handbook of Plant Metabolomics. Print ISBN: 9783527327775; Online ISBN: 9783527669882; DOI: 10.1002/9783527669882 (available online for free through UIUC libraries)

### Journal articles

Readings from primary literature for discussion will be made available online on the associated Moodle course site.

### Academic Integrity

All students should follow University of Illinois "Code of Policies and Regulations Applying to All Students." The Code is available online at: <http://www.admin.uiuc.edu/policy/code/index.html>

According to the Student Code, 'It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.' Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: [http://studentcode.illinois.edu/article1\\_part4\\_1-401.html](http://studentcode.illinois.edu/article1_part4_1-401.html)

### Attendance Policy

Regular class attendance is expected of all students at the University as described by the student code: [http://studentcode.illinois.edu/article1\\_part5\\_1-501.html](http://studentcode.illinois.edu/article1_part5_1-501.html)

Missed quizzes cannot be made up; however, prorates will be given for valid excuses as outlined by the student code. Likewise, lab reports and final presentations must be turned in by the due date. You must let the instructor know during the first week of class if you plan on missing class due to scheduled meetings or religious observances. Failure to notify the instructor during the first week of class will result in unexcused absences. Late submissions will automatically lose 10% of the total points possible and continue to lose 5% for every subsequent day that it is late.

### Disability Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TTY), or e-mail a message to [disability@illinois.edu](mailto:disability@illinois.edu).

### Class Format

Class format consists of short lectures at the beginning of each class period presenting the principles and fundamental knowledge necessary to understand the topic, followed by a discussion session or other activity to reinforce lecture topic. Some class periods will be devoted to learning relevant laboratory techniques through field trips to campus facilities; during other class periods we will explore online tools and software for data collection, analysis, and visualization.

### Computer Requirement

Students are required to have a laptop computer to complete in-class computational assignments. If a student cannot bring her/his laptop then he/she must pair up with someone who has a laptop for in-class assignments and discussion.

### Grading

Quizzes	20 %
Lab Reports	20 %
Final presentation	50 %
Discussion Participation	10 %

### Quizzes (20%)

Quizzes will assess student comprehension of the literature and lecture material. Students with a valid reason for missing a quiz will be given an opportunity to take a make-up quiz at the discretion of the instructor. Valid reasons include only medical reasons (with a note from a doctor), tragedy in your immediate family, or religious observances and practices.

### Lab Reports (20%)

At the conclusion of each analytical methods unit (GC/LC-MS and NMR), students will write a lab report that describes biological questions that can be addressed with the technology; methods; results;

discussion of results including biological interpretation. Reports should 5 - 10 pages long, and can include figures and references. Late submissions will automatically lose 10% of the total points possible and continue to lose 5% for every subsequent day that it is late.

### Final Presentation (50%)

Students will give an oral presentation on a topic of their choosing that must include an area of metabolomics covered in the course. This can be on their own research or on peer-reviewed published studies. Presentations are 15 minutes long, and should include Introduction, Methods, Results, Discussion, Summary and Future Directions. Final projects will be presented during the last week of classes.

### Discussion Participation (10%)

Readings will be provided online in advance of discussion sessions. Students are expected to actively participate in classroom discussion sessions, and the instructor will award points based on level of participation.

### Course Calendar

NOTE: Class starts AFTER Spring Break

Week	Quiz	Lecture	Date	Unit	Topic
1		1	03/22	Introduction	Overview of course & Intro to metabolomics
		2	03/24		Analytical Methods in Metabolomics
2		3	03/29	Analytical methods in metabolomics: GC- and LC-MS	Group 1. Field trip to Metabolomics Facility: 264 Burrill Hall
		4	03/31		Group 2. Field trip to Metabolomics Facility: 264 Burrill Hall
3		5	04/05		Dr. Alex Ulanov: Data analysis
		6	04/07		Dr. Alex Ulanov: Data analysis
4	1	7	04/12	Primary Metabolism	LAB REPORT DUE Central carbon metabolism
		8	04/14		Nitrogen metabolism
5		9	04/19	Secondary Metabolism	Secondary metabolism: floral scent
		10	04/21		
6	2	11	04/26	Analytical methods in metabolomics: NMR	Tour of NMR Facility: Dr. Dean Olson
		12	04/28		NMR data analysis: Dr. Dean Olson
7			05/03	FINAL PRESENTATIONS	
			05/06	NMR LAB REPORT DUE	