Spring 2024 CIV_ENV 495: Environmental Metabolomics
Tu, Th: 9:30-10:50 am, M120

Instructor
Prof. Ludmilla Aristilde
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Office hours:
Wednesday mornings (10-11 am, Virtual via Canvas)

Course Grading:			
	Quizzes (4)	440	(44%)
	Case Study 1	200	(20%)
	Case Study 2	200	(20%)
	Participation (Journal Club)	130	(13%)
	Attendance (In class)	30	(3%)
	Total	1000	

Course Description and Objectives:
Metabolomics involves the high-resolution investigation of small molecules (metabolites) that represent the state of metabolism (the network of metabolic reactions) in a biological system. This course covers the principles of metabolomics and its application in environmental science and environmental bioengineering, related to carbon cycling in natural systems and waste carbon conversion in engineered recycling.

Learning Goals:
- To understand the basic principles of metabolomics
- To become familiar with key techniques in chemical characterization
- To learn how to design metabolomics experiments
- To evaluate metabolomics data to understand biological processes in natural systems
- To evaluate metabolomics data to design the engineering of biological processes in biotechnology applications

Course Plan:
Week 1: 3/29
Class Introduction; Overview of Syllabus
Introduction to Metabolomics
Relationship to other Omics Techniques
Survey of Interest in Metabolomics

Week 2: Virtual on Tuesday 4/2; no lecture on Thursday
Metabolomics Techniques
Nuclear Magnetic Resonance
Gas-Chromatography-Mass Spectrometry
Liquid Chromatography-Mass Spectrometry

Week 3: 4/9; 4/11
Journal Club 1
Metabolomics and Natural Organic Matter in Aquatic and Soil Systems
Case Study 1 out

Week 4: 4/16; 4/18
(Quiz 1)
Metabolomics of Soil Microbial Activities
Journal Club 2

Week 5: 4/23; 4/25
Metabolomics, Metabolic Pathways, and Stable Isotopes
Journal Club 3

Week 6: 4/30; 5/2
(Quiz 2)

Case Study 1 Workshop
(May 2) *Presentation of Case Study 1*
Case Study 1 due on May 3 at 4:30 pm *(changed to May 6 at 12:30 pm)*

Week 7: 5/7; 5/9
Metabolomics of carbon waste to biofuels
Journal Club 4
Case Study 2 out

Week 8: 5/14; 5/16
(Quiz 3)
Metabolomics of carbon waste to valuable commodity chemicals
Metabolomics of carbon waste to plastics replacements

Week 9: 5/21; 5/18
Journal Club 5
Journal Club 6

Week 10: 5/28; 5/30
(Quiz 4)
Case Study 2 Workshop
(May 30) *Presentation of Case Study 2*
Case Study 2 due on June 3 at 12:30 pm

Course Materials:
No textbook is required for this course. If needed, supplementary handouts will be posted.

Assignments:
Case Study guidelines will be posted online. There will be two case studies and four quizzes, as indicated on the course outline. On the specified due date, Case Study assignments will be due online (on Canvas). You will be given about three weeks to complete each case study.
Quizzes count for **110 points each** and case studies count for **200 points each**. *Penalty*: a 10-point penalty for a late case study (an assignment turned in one min after the due time is considered late).
Quiz: Cheating or absence during a quiz will result in an automatic zero for the quiz grade. Evidence in cheating in a homework will result in an automatic zero for the homework.
Case study: You will be working in pre-arranged groups of 3 or 4.

Class Participation:
Class participation during Journal Club to demonstrate you have done the readings will be evaluated (**100 points**).
Attendance will account for **50 points**.

Code of conduct: Each student in this course is expected to abide by the Northwestern University Code of Academic Integrity.

Grade Disputes: If there is a dispute over the grading of a quiz or case study, I reserve the right to re-evaluate the entire work. A written explanation of the dispute will have to be turned in and the appropriate changes will be made and explained to the student. Any grade dispute should be turned in by the next class period after the assignment/ exam is returned to you.
Special Needs: Please notify me if you have or develop any documented disabilities or special circumstances that require attention. Appropriate accommodations will be made. Communication is key here. I am able to help only when I have knowledge of your special needs.

Emergencies: Documented medical or family emergencies are required to receive extensions on homework assignments. For missing case study or quizzes due to emergencies, your grade will be re-calculated to adjust for the missing assignments. No extensions/accommodations are given for either professional or athletic trips.