

## Syllabus

CMSE 202: Computational Modeling Tools and Techniques. Section 001 – 4 Credits

Spring Semester 2020, MW 12:40-2:30, 315 Bessey Hall

Instructor: Julian Liber; [liberjul@msu.edu](mailto:liberjul@msu.edu); He/him

### Who are you instructors?

Julian Liber is a Master's student in the Plant Biology department. His work focuses on endosymbiosis in plant and fungi, as well as developing and using computational techniques to understand organisms and their interactions. He is also passionate about teaching and outreach, to encourage and educate the next generation of scientists and citizens.

**Office:** 3200 Molecular Plant Sciences

**Office Hours:** Wednesday and Thursday 8-10 AM, or by appointment made over email.

**Phone Number:** 567-698-7495

### About the Course

#### Course description:

Continuation of introduction to computational modeling focusing on standard methods and tools used for modeling and data analysis. Topics may include statistical analysis, symbolic math, linear algebra, simulation techniques, data mining.

**Prerequisites:** CMSE 201

#### Course Overview:

This course will be formatted as a flipped classroom, with heavy emphasis on problem-solving and application of techniques to projects. Each topic may be covered over 1-3 class periods and may be associated with a homework assignment.

#### Instructional Objectives:

The expected outcomes of this course are...

- Proficiency in using Python to read, interpret, and analyze data
- Ability to construct and use models and simulations
- Familiarity with managing coding projects with version control
- Understanding of available tools and resources for computational modelling projects
- Capability to communicate results via plots and visuals

These outcomes also align with these [Undergraduate Learning Goals](#):

Analytical Thinking

The MSU graduate uses ways of knowing from mathematics, natural sciences, social sciences, humanities, and arts to access information and critically analyzes complex material in order to evaluate evidence, construct reasoned arguments, and communicate inferences and conclusions.

- Acquires, analyzes, and evaluates information from multiple sources.
- Synthesizes and applies the information within and across disciplines.
- Identifies and applies, as appropriate, quantitative methods for defining and responding to problems.
- Identifies the credibility, use and misuse of scientific, humanistic and artistic methods.

### Effective Communication

The MSU graduate uses a variety of media to communicate effectively with diverse audiences.

- Identifies how contexts affect communication strategies and practices.
- Engages in effective communication practices in a variety of situations and with a variety of media.

### **Required Course Materials:**

Students will require a computer capable of running MacOS, Windows, or Linux. Some Chromebooks may be acceptable. Students will have access to loaner laptops available for in-class work. Software for classwork is free and will be installed with the assistance of the instructors.

Please bring a charging cord to class. Some computational tasks will drain your battery quickly.

We will be using the Anaconda Python distribution ([install here](#)), and JupyterHub (in browser).

### **Attendance Policy:**

Students will be allowed to miss 2 in-class sessions, which will be removed from the in-class work point total. Additional absences must be approved by the instructor prior to the start of the class period, and fall under the policy of the [Office of the University Ombudsperson](#) except in special circumstances.

While class attendance is very likely to improve your success in the class, please talk to the instructor about any circumstances which may prevent your attendance to develop a plan to promote your learning and well-being.

### **Grade Evaluation:**

<b>Assignment</b>	<b>Total Points</b>	<b>% of Grade</b>
<b>Pre-Class</b>	5 * 30 pts = 150	15%
<b>In-Class</b>	15 * 28 pts = 420	42%
<b>Homework</b>	30 * 7 pts = 210	21%
<b>Project</b>	120 pts	12%

<b>Take-home Exam</b>	100 pts	10%
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### Grading Scale:

4.0	> 90 %
3.5	85 – 89 %
3.0	80 – 84 %
2.5	75 – 79 %
2.0	70 – 74 %
1.5	65 – 69 %
1.0	60 – 64 %
0.0	< 60 %

Grades will not be rounded, but the threshold for the next grade up is the whole number. For example, a final percentage of 89.6 % will receive a 3.5 grade. Grades may be increased in exceptional events, but will never be graded down.

### Course Assignments

1. Pre-Class Assignments: Typically one or multiple videos accompanied by some brief exercises and questions. These are due before class starts, and are graded for completion and effort. 5 pts each.
2. In-Class Assignments: Activities which will be performed in groups, which include exercises to be graded on effort. Incomplete work may receive full credit based on the day's progress. Individual assignments need to be submitted by each group member 15 pts each.
3. Homework Assignments: In-depth activities or small projects which are completed individually and outside of class. 30 pts each.
4. Project: An independent project determined by the student on topics related to the class. Must be approved by the instructor. This will be presented in-person or as a tutorial. 10 pts for project plan, 100 pts for repository, and 10 pts for presentation or tutorial.
5. Take-home Exam: This will consist of problem-solving exercises similar to the homework assignments but is more comprehensive. The exam will be completed independently from other students, but with online resources and previous assignments as necessary. 100 pts.

### Class Schedule – Subject to change

- Each homework is due on Fridays at 11:59 PM.
- Pre-class assignments are due at the start of each class.
- In-class assignments are due at 6 PM the day of the class.

<b>Date</b>	<b>Subject</b>	<b>Due dates</b>
Mon Jan 6	Introduction, Syllabus, Game	
Wed Jan 8	Python and Command Line	

Mon Jan 13	Version Control, Git	
Wed Jan 15	Errors, Debugging	HW 1 due 1/17
Mon Jan 20	<b>MLK Jr. Day – No Class</b>	
Wed Jan 22	Random Numbers	
Mon Jan 27	Compartmental Models Day 1	
Wed Jan 29	Compartmental Models Day 2	HW 2 due 1/31
Mon Feb 3	Packages and Installation	
Wed Feb 5	Object Oriented Programming, ABM Day 1	
Mon Feb 10	Agent-Based Models (ABM) Day 2	
Wed Feb 12	MCMC	HW 3 due 2/14
Mon Feb 17	Machine Learning Day 1	
Wed Feb 19	Machine Learning Day 2	
Mon Feb 24	Machine Learning Day 3	
Wed Feb 26	Project Discussions	HW 4 due 2/28
Mon Mar 2	<b>Spring Break – No Class</b>	
Wed Mar 4		
Mon Mar 9	Graph Theory Day 1	
Wed Mar 11	Graph Theory Day 2	
Mon Mar 16	Image Analysis, FFT	
Wed Mar 18	Mapping, Geography Tools	HW 5 due 3/20
Mon Mar 23	TensorFlow Day 1	
Wed Mar 25	TensorFlow Day 2	Project Plan due 3/27
Mon Mar 30	Data Acquisition, Text Parsing	
Wed Apr 1	Command Line Programs, Text Parsing	HW 6 due 4/3
Mon Apr 6	HPC Use, Package Development	
Wed Apr 8	Student Choice Day	
Mon Apr 13	Quantum Computing Day 1	
Wed Apr 15	Quantum Computing Day 2	HW 7 due 4/17
Mon Apr 20	Project Presentations	
Wed Apr 22	Project Presentations	Project Repo due 4/24
Fri May 1	Exam due 5/1	

### Academic Integrity

Both the student and the instructor will comply with the university's [academic integrity policy](#). Students will submit their own, original work within the compliance of the [plagiarism policy](#). While code can often be reused and borrowed, you must give credit to original sources and use others' code minimally. When working with a group, each member is responsible for completing unique, independent work. **Collaboration is permitted on all assignments except for the final exam.**

### Communication

Students will be expected to check and read emails to their MSU email (ends in @msu.edu). Email will also be the preferred method to contact the instructor. Please include the class code in the subject line and your name in the email. Emails sent during the work week (M-F, 8AM-5PM) will generally be answered with a few hours, while those sent during off hours will usually be responded to within 24 hours.

Course information will be posted on the course's Desire 2 Learn (D2L) site, accessed at <https://d2l.msu.edu/>. Assignments will be submitted to the site.

### **Classroom Expectations**

It is expected that all students will be courteous and respectful of their classmates and instructors. If students are not, they may be asked to leave and receive disciplinary action based on the situation.

This classroom is heavily dependent on technology, i.e. the use of laptops. However, the off-topic and/or distracting use of electronic devices is discouraged and may result in docked points from in-class assignments.

### **Accessibility**

Any student in need of accommodation, whether or not they have received a VISA, should contact the instructor as early as possible to work out a plan for helping the student succeed. Students who may need a VISA should contact the Resource Center for Persons with Disabilities at <https://www.rcpd.msu.edu/>, or by calling (517)-884-7273.

### **Limits to Confidentiality**

Your instructors are mandatory reporters. They “have reporting obligation when the employee becomes aware of relationship violence, stalking, or sexual misconduct that involves a member of the University community (faculty, staff, or student) or occurring at a University event or on University property.”

The full policy is at <https://oie.msu.edu/resources/mandatory-reporters.html>.

### **Student Resources**

#### **Mental Health**

College students often experience issues that may interfere with academic success such as academic stress, sleep problems, juggling responsibilities, life events, relationship concerns, or feelings of anxiety, hopelessness, or depression. If you or a friend is struggling, we strongly encourage you to seek support. Helpful, effective resources are available on campus, and most are free of charge.

- Drop by Counseling & Psychiatric Services (CAPS) main location (3rd floor of Olin Health Center) for a same-day mental health screening.

- Visit <https://caps.msu.edu> for online health assessments, hours, and additional CAPS services.
- Call CAPS at (517) 355-8270 any time, day or night.
- 24-Hour MSU Sexual Assault Crisis Line (517) 372-6666 or visit <https://centerforsurvivors.msu.edu/>

### **Food Insecurity or Hunger**

If accessing food is a challenge to you or your family, MSU provide a food bank service. More information at <http://foodbank.msu.edu/>.

### **Student Parents**

If you are a student parent and could use support, MSU has resources at <https://studentparents.msu.edu/>

### **Part of a migrant worker family**

You may have services available for the university. Learn more at <http://mss.msu.edu/>.

### **LGBTQ+**

MSU has available resources at <https://lbgtrc.msu.edu/>. Additionally, the resources center is in the Student Services Building in Room 302

### **Experience(d) foster care, homelessness, or out of home placement**

The FAME program may be able to provide assistance. More information at <https://fame.socialwork.msu.edu/About-FAME>.

Additional resources can be found at <http://studentaffairs.msu.edu/>

Attributions: This syllabus contains content from Dr. Julie Libarkin, Dr. Devin Silvia, and CAPS