CS 108L: Computer Science for All (CS4ALL)

Fall 2024

Instructor:	Prof. Amanda Bienz	**Email:**	bienz@unm.edu
Office:	Zoom Office Hours	**Office Hours:**	Mon 1pm–2pm
			Wed 12pm–1pm
Classroom:	SMLC B81	**Class Time:**	M/W/F 9-9:50am
Lab room:	SMLC B81	**Lab Time:**	Friday 2-2:50pm

Course Description: CS108L – Computer Science for All

Computer Science for All is an introduction to computational science and modeling. As a flipped course, a significant part of the course content is on-line. This style of pedagogy called a "flipped classroom" delivers most content (i.e., the lectures) during out-of-class times via videos and reading materials, which are expected to be reviewed by the deadlines given on the class website. In-class time is primarily used for hands-on activities, programming work, questions and other interactive learning.

The course is open to both college and high school students. College students who successfully complete the class receive 3 UNM credits. High schools students who successfully complete the class receive 1 high school credit and 4 UNM college credits. This course is listed as a Natural and Physical Science Core Course (Area 3). Therefore all high school and college students who earn a C or better in CS108L will have the 4 course credits apply toward the UNM Science Core.

Course Goals:

Students will gain experience not only in computer science and programming but also in designing, building, testing, debugging, and running experiments with computer models. Students will develop computational thinking skills and learn about complex adaptive systems.

Student Learning Outcomes:

In this course, the student will create original computer programs using Python Notebooks in Google CoLab and gain experience designing, building, testing, debugging and running experiments with computer models and complex adaptive systems.

- Learn how to run, write, and interpret results with Python Notebook programming, including

    - How to use variables and print to the screen

    - How to program with if/else conditional statments

    - How to program with loops (for and while loops)

    - How to plot and visualize data

    - Understand and use lists and arrays for storage

    - Understand how to create and use Python functions and objects and how to modify object member functions

- Learn how to run, write, interpret, and analyze results with agent based models, including

    - Agent based models with and without a spatial component for agent movement

– How to modify agent based models to add more complex dynamics

– How to store output and load input for agent based models

– How to visualize, interpret, and analyze results from experiments with agent based models

- Learn about data-driven modeling

– How to use classic data-driven models to analyze and predict based on data, considering techniques such as k-means clustering, linear regression, and statistical metrics (min, max, mean, and median)

- Learn how to use randomness in science and computing, including

– How to implement and use a classic random number generator with basic arithmetic

– How to use library random number generators

– How to use random sampling to compute useful quanities, e.g., approximte Pi or sample a population during a study

Grading: Grades are given based on the standard 10-point scale (90-100 A, 80-89 B, 70-79 C, D 60-69, F less than 60). There will be pluses and minuses, with cut-offs determined later. There will be no curve for the course.

The grades are broken down as follows:

- Daily Quizzes (20%)

- Weekly Homework Programming Assignments (50%)

- Midterm 1 (15%)

- Final Exam (15%)

Course Textbook: No course textbook required.

Prerequisites: None

Attendance Policy: It is expected that each student regularly attend class. The course follows UNM handbook D-170, https://handbook.unm.edu/d170/. Note, the handbook says "A student with excessive absences may be dropped from a course by the instructor with a grade of W/P or W/F." If you need to miss more than 3 classes during the semester, please contact the instructor.

All exams will be in-person. Cheating on an exam will be handled according to the academic integrity policy below. The date, time, and location of the in-person exams will be announced a week prior to the exam.

There are no makeup exams; however, I am sympathetic to a student who is unable to take a scheduled test due to a hardship. Please contact the instructor before the exam (if possible), should such a hardship occur.

Homework: Students will work on labs during each class. Each class's labs may build on the previous. If a student does not complete a lab during a given class section, it will be assigned as homework to be completed before the next class.

In addition, there will be a specific homework programming assignment given each week (usually on Friday), and due each Monday (usually at 11:59pm). The instructor will download all specific

homework programming assignments for that week from Canvas after the due date. Any missing homeworks will be considered late at this point and penalized accordingly.

Incomplete and Late Assignments: Late homeworks will be accepted up to 1 week after the due date. The late penalty is 5% per day late.

Academic Integrity: Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Accommodations for Disabilities: UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center at arcsrvs@unm.edu or by phone at 505-277-3506.

Support: Contact me at bienz@unm.edu or in office/check-in hours and contact Accessibility Resource Center (https://arc.unm.edu/) at arcsrvs@unm.edu (505) 277-3506.

Credit-Hours: This is a 4 credit-hour course. Class meets for three weekly 50-minute sessions of direct instruction plus for one weekly 50 minute lab over fifteen weeks. Please plan for a minimum of six hours of out-of-class work (homework, study, assignment completion, and class preparation) each week.

Sexual Harassment and Title XI: The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (https://loborespect.unm.edu), the Women's Resource Center (https://women.unm.edu), and the LGBTQ Resource Center (https://lgbtqrc.unm.edu). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see https://policy.unm.edu/university-policies/2000/2740.html and CEEO's website.

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you

with access to available resources and supportive measures and assist you in understanding your rights.

Communication policy: Please use your UNM email or the weekly student drop-in hours to communicate with your instructor.

In order to comply with the Family Educational Rights and Privacy Act of 1974 (FERPA), UNM students must correspond with me using their UNM email account and/or the communication feature of our class learning management system (i.e., UNM Canvas). To protect student privacy, I cannot respond with any information contained in educational records from emails received from non-UNM accounts. For information on FERPA, please visit this website.

COVID-19: UNM is a mask friendly, but not a mask required, community. If you are experiencing COVID-19 symptoms, please do not come to class. If you do need to stay home, please communicate with me at bienz@unm.edu; I can work with you to provide alternatives for course participation and completion. Let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

Support:
Student Health and Counseling (SHAC) at (505) 277-3136. If you are having active respiratory symptoms (e.g., fever, cough, sore throat, etc.) AND need testing for COVID- 19; OR If you recently tested positive and may need oral treatment, call SHAC.

LoboRESPECT Advocacy Center (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

Citizenship and/or Immigration Status: All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: http://undocumented.unm.edu/

Land Acknowledgement: Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.

Connecting to Campus and Finding Support: UNM has many resources and centers to help you thrive, including opportunities to get involved, mental health resources, academic support such as tutoring, resource centers for people like you, free food at Lobo Food Pantry, and jobs on campus. Your advisor, staff at the resource centers and Dean of Students, and I can help you find the right opportunities for you

Tentative Class Schedule

- **Weeks 1-2: Introduction to Python** During the first two weeks of the semester, students will be introduced to the following :

- Google Colab notebooks (Jupyter), logging in to Colab and running a basic file
- Introduce concepts of printing, variables, and basic if/else statement

- **Week 3-4: Introduction to Abstraction** During weeks 3 and 4, students will learn the following :

  - More in-depth look at if/else statements (Boolean logic, conditionals)
  - Loops and iterations: for loops and while loops
  - Lists and arrays for storage

- **Week 5-6: In-Depth look at objects** During weeks 5 and 6, students will learn the following topics:

  - In-depth, what is a function and what is an object?
  - How to access parts of an object (called data members and member functions)

- **Week 7 : Midterm 1 Week and Review**

  - Monday review, Wednesday midterm exam (March 6)
  - Friday turtle art fun lab

- **Week 8-11 : Agent-Based Modeling** During the second portion of the semester, students will learn agent-based modeling using Mesa.

- **Week 12 : Simple Data Modeling** During week 12, students will learn about fitting a line to data (linear regression) and gathering simple statistics from the data, such as the min, max, mean, and median.

- **Week 13 : K-Means Clustering** During week 13, students will learn the k-means clustering algorithm.

- **Week 14: Randomness in science and computing** Students will learn about the following:

  - Random number generators: simple random number generator using only basic arithmetic (linear congruential generator), and then use of high-quality library random number generators
  - Use of algorithms based on random sampling, e.g., Monte Carlo randomness to approximate Pi or random sampling in a population study

- **Week 15: Introduction to parallel computing** Students will learn about the following :

  - Introduction to using multiple computers together to compute a quantity (parallel computing)
  - How to take and add values from many different computers using computer-to-computer communication (reduction, using message passing programming package, MPI4PY)
  - Introduction to other message passing ideas, conceptual only, no labs

- **Week 16: Finals week**

Disclaimer: I reserve the right to make reasonable and necessary changes to the policies outlined in this syllabus. Whenever possible, the class will be notified in advance of such changes. An up-to-date copy of the syllabus can always be found on the course website. It is your responsibility to know and understand the policies discussed therein and to be up-to-date. If in doubt, please ask questions.