

Welcome To CS 346 — Computational Modeling & Simulation I (Interdisciplinary Science) Colby College, Spring '20

Course: CS 346 — Computational Modeling & Simulation I (Interdisciplinary Science)
Lecture: T / R 2:30–3:45PM (...or so ...), meetings in Davis 117 ... It's complicated ...
Website URL: <http://cs.colby.edu/courses/S20/cs346>

Course Description

A programming-oriented introduction to techniques in computational modeling and simulation, motivated by applications to the natural and social sciences. Topics may include: dynamical system simulation; finite difference equations; numerical error in simulation; numerical methods for integration; Monte Carlo simulation; cellular automata; and agent-based modeling. Students complete projects in multiple application domains to develop interdisciplinary breadth; to understand explanatory models and methods underlying computational science; and to develop programming style and skills that support easily extended and maintained code.

Prerequisites: Computer Science 231, and Mathematics 122 or equivalent.

Your Professor: Eric Aaron

Website: <http://cs.colby.edu/eaaron>

Office: Davis 113

Office Hours (which may change if demands arise): M 2:30–4:00pm, Tu 1:30–2:30pm,

W 2:30–4pm, Th 1:30–2:30pm, and by email appointment (but may change)

Please feel free to come by and chat—I look forward to talking with you!

Phone/Voicemail: 207-859-5857

E-mail: eaaron@colby.edu

NB: The above email address is the best way to contact me.

Course textbook

- *Introduction to Computational Science* by Angela B. Shiflet and George W. Shiflet.

Grading: Your grades for the course will be computed based on

- Problem Sets and Projects (~~5 ± 1 expected~~) (2, and 1 optional): ~~50–75%~~ 55%
- Final Project / Assignment: ~~20–35~~ 30% (There will not be a Final Exam for the course.)
- Class participation, labs, other small assignments, etc.: 5–15%

The above percentages may be changed if administrative concerns demand it.

Desired Course Outcomes

- Students understand how differential equations, difference equations, cellular automata, and agent-based models can represent time-varying systems. Students can use these paradigms to create computational models of scientific phenomena.
- Students can implement computational models of scientific phenomena—based on differential equations, cellular automata, or agent-based modeling—in computer programs.
- Students understand the causes and importance of error introduced by computational modeling and simulation, and can employ techniques to manage or minimize such error.
- Students can create tests for code correctness and employ code testing, programming techniques, and programming style to create well-documented code that is validated and easily extended and maintained.
- Students gain experience in modeling systems across a range of sciences, understanding fundamental concepts and programming techniques that can apply broadly to computational modeling and simulation for interdisciplinary science applications.

Lectures, Labs, and Classroom Accountability

All students are responsible for **ALL** information given in class, whether or not it is presented in any other form (handout, course website, textbook, etc.). Thus, although lecture attendance is not mandatory, it is strongly encouraged, and it is essential that students who miss lecture consult classmates and find out about any information—academic, administrative, or other—that they missed. There may be severe, unintended consequences for students who do not keep up with all information from class. It is your responsibility to see that this does not happen to you. The easiest way to ensure it: Attend every lecture. ~~(If low lecture attendance becomes a problem, your professor reserves the right to make lecture attendance mandatory for the remainder of the course.)~~

There will be occasional “lab” meetings in class to work together with Matlab on course concepts. Attendance at labs is especially strongly advised. ~~and may be made mandatory.~~

There will be many opportunities for discussion and participation during class meetings; reviewing old material and reading new material can give these discussions more value for everyone in the class. An important part of the value of these discussions is *explanation*: It is *absolutely not expected* that every response in a class discussion will be correct; it is important, however, that students try to give reasons for their answers. (Note that participation is part of the course grade—students will not receive full credit for that part of the course grade without actively contributing to in-class discussions.)

~~As a courtesy to your classmates and your instructors, the use of computers, tablets, mobile phones, wearables, or other electronic devices during class meetings is discouraged. If for any reason it is important that you use such a device during class, please talk with me about how we can best accommodate you.~~

Homework Policies

Electronically submitted assignments such as programs and PDF write-ups are typically due by the end (11:59 PM) of the specified due date. There may also be some assignments turned in on paper (problem sets, writeups, code documentations, responses to papers, etc.), which may

instead be due by the beginning of class (e.g., 2:30 PM) on the specified due date. Assignments submitted in class should be turned in directly to me; such assignments received after the beginning of class may be considered late (in particular, assignments left in my office after I leave it for class, whenever that might be, will be considered late).

Policy for Before Break: It is important for your progress that each assignment / project be completed on time. The policy on lateness for problem sets and projects is: if an assignment is handed in 1-2 days late, a penalty of 10%; 3-4 days late, a penalty of 15%; 5-10 days late, 30% penalty; after 10 days, an automatic grade of 0 is given. The policy on lateness for small assignments—i.e., those graded on a $\checkmark +$ / $\checkmark$ / $\checkmark -$ / 0 scale—is: if an assignment is handed in 1-4 days late, a penalty of one “level” down; 5-10 days late, 2 levels down; after 10 days, an automatic grade of 0 is given. (In all of the above, “day” refers to a calendar day, whether or not class is meeting or Colby is in session on that day. Your professor reserves the right to make small changes to the details of this policy for administrative reasons. If there is to be a change to this policy, ample notice will be given.)

Policy for After Break: The above policy is unchanged except as applies to HW / project assignments: Because no HW / project assignment work has a deadline before the last day of classes, it becomes **extremely** important that work not be submitted very late. The policy for late HW / project assignments is: 0.5% penalty for every hour it is submitted beyond the deadline, up to 48 hours late. (I.e., up to one hour late is a very small deduction of 0.5%; between two and three hours late would be a 1.5% penalty; between 23 and 24 hours late would be a 12% penalty; etc.) Homework submitted more than 48 hours late will incur a penalty of 50%, and any assignment *must* be submitted at least 24 hours before its code demo—assignments not submitted at least 24 hours before their code demo will incur penalties greater than 50%, and assignments for which no code demo is done by deadline may not receive a grade at all. Please be sure to avoid severe penalties—**please turn in work on time!**

Before Break, a three-hour “freebie” was given to all CS346 students. That continues to apply: A student may submit *one* HW / project assignment up to 3 hours late without penalty. (To be clear: For assignments turned in after Break, any assignment turned in between three and four hours late will receive a 2% penalty, whether or not the student has used their “freebie.”) The exception to this: The “freebie” cannot excuse a penalty for not submitting work at least 24 hours before its code demo.

As with all CS346 policies, homework policies are intended to be fair to everyone involved in the course. They will be enforced fairly. Please feel free to ask me any questions about specific cases that may emerge over the semester!

The Colby Affirmation

Colby College is a community dedicated to learning and committed to the growth and well-being of all its members.

As a community devoted to intellectual growth, we value academic integrity. We agree to take ownership of our academic work, to submit only work that is our own, to fully acknowledge the research and ideas of others in our work, and to abide by the instructions and regulations governing academic work established by the faculty.

As a community built on respect for ourselves, each other, and our physical environment, we recognize the diversity of people who have gathered here and that genuine inclusivity requires active,

honest, and compassionate engagement with one another. We agree to respect each other, to honor community expectations, and to comply with College policies.

As a member of this community, I pledge to hold myself and others accountable to these values.

<https://www.colby.edu/catalogue/front-of-catalogue/colby-affirmation/>

Statement regarding Academic Accommodations *The following is the standard suggested language regarding Academic Accommodations at Colby. It applies to this course.*

I am available to discuss academic accommodations that any student with a documented disability may require. Please note that you'll need to provide a letter from the Dean of Studies Office documenting your approved accommodations. *Please meet with me within two weeks of the start of the semester to make a request for accommodations* so that we can work together with the College to make the appropriate arrangements for you. Kate McLaughlin, Associate Director of Access and Disability Services (kmclaugh@colby.edu), is the primary contact for accommodations and any questions related to educational testing and documentation.

Mental health: I care about our students' well-being and understand they may face mental health challenges. Students are encouraged to seek support from the College's available resources, including your advising dean and Counseling Services. (For immediate care, please call 207-859-4490 and press "0" to reach the on-call counselor.) I am willing to discuss reasonable accommodations during a crisis, but to fulfill our educational mission, students are expected to adhere to the attendance policy. Failure to do so because of mental health challenges may require consultation with the Dean of Studies Office.

Policy on Collaboration and Academic Integrity

Your CS346 homework will include both non-programming and programming exercises. (Programming will be in Matlab.) Collaboration on assignments is generally permitted, although there may be some parts of assignments for which work is expected to be individual, and collaboration will be explicitly prohibited. In addition, some exercises may be assigned to be done in teams of 2, and in such cases, teammates may share all ideas and written work with each other without restriction; other collaborations (between teams, between individuals that are not teammates) may be restricted. In all cases, every individual is responsible for understanding all the material in each assignment and doing their own work. Always strive to do your best, give generous credit to others where credit is due, start early, and seek help early.

As part of giving generous credit to others, on all assignments for CS346, please write down all sources of assistance, including everyone with whom you worked on the assignment and any other material consulted.

On most exercises, collaboration in the form of discussing **ideas and approaches on a general level** will be permitted, even encouraged! Your written work, however—including your coding work—must be entirely your own: you must write and submit your own code, and you may not share or copy code, solutions, or files; the originality or novelty of your work may be part of the basis for the grade of an exercise. **One implication of this—on a homework exercise, you may not look at a screen to see the code of a classmate.** (I understand there may be accidental

slips about this—please be sure to self-report to your prof. any time that seeing someone’s screen has influenced your work, to find a way to address it without any academic dishonesty!) Another way to think about it: You should be speaking in English with one another, not in Matlab or some other programming language.

In general, receiving and copying solutions (code, pseudocode, equations in a model, etc.) from any source (a classmate, a friend, a published text, an online source, etc.) is disallowed; note that using code or other material from sources (other than those explicitly given as course resources) as “inspiration” and submitting highly derivative solutions is viewed as copying. Furthermore, on each submitted assignment, you should always cite and acknowledge sources from which you receive assistance, including your textbook or your classmates.

Your professor reserves the right to ask students to verbally explain the reasoning behind any answer or code that they submit and to modify assignment grades based on the answers. It is vitally important that you turn in work that is your own! Reports of academic dishonesty are handled by an academic review board and a finding of academic dishonesty may result in significant sanctions. For more details on Colby’s Academic Integrity policies and procedures, see <https://www.colby.edu/academicintegrity/>.

In general, the highest level of academic integrity is expected of every student in this class. This policy is intended to be consistent with the particular subject matter and context of CS346, and it may be different from policies you’ve experienced in other courses.¹ If there are any questions about collaboration or related policies that come up over the semester, please come talk with me!

¹If there are to be changes to this policy over the semester, you will be given ample advance notice.