Course Syllabus: INFO 1201

Computational Reasoning 1: Expression & Media Transformation

Fall 2017, August 28–December 16

3 credit hours

Instructional Team

Instructor

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Class Meeting Times

Lecture: MWF 2:00pm–2:50pm, Hellems 252
Labs: Mondays, following lecture (varying times), Armory 201/211 computer labs

Course Information

Computing and information technologies permeate all aspects of our lives. They inspire how we connect with each other online through social networks and how we find information through search engines. Technologies also drive our physical world in how we navigate transportation systems and how we manage money on banking applications. Everyone should have the ability to not only use and interact with computing, but to also create and express themselves with computing.

This course is a hands-on introduction to create, invent, and build with computer programming. No programming experience is necessary and students of all backgrounds are welcome. Students will become exposed to high-level computational concepts and practices that include algorithms, data, parallelism, abstraction, and debugging. Assignments and projects will involve learning to program using the Python programming language. The creative and problem-solving strategies introduced in this course are applicable across many domains beyond information and computer sciences.

Per the official catalog, the statement of description and purpose for this course: *INFO 1201 introduces principles of computational thinking through the manipulation, transformation, and creation of media artifacts, such as images, sounds, and web pages. Students will be exposed to a high-level overview of algorithms, functions, data structures, recursion, and object-oriented computer programming through a series of assignments that emphasize the use of computation as a means of creative expression.*

This course has no pre- or co-requisite registration requirements.

Learning Goals

Upon completing this course, you will be able to:

- Develop Computational Thinking concepts, practices, and perspectives to create, explore, and understand the world in new ways. In this class, you will engage with computational thinking through creative expression with computer programming. These concepts, practices, and perspectives are applicable beyond this class into other domains and interests beyond computing.

- Create and share interactive media projects with Python
- Collect, examine, and interpret large datasets with Python
- Connect the ways that computing interacts with many part of our lives
- Learn about opportunities that exist to extend and expand on the practices and activities in this class within and beyond CU

Course Format

Class time each week consists of three lectures (MWF) and one lab (M). The 15-week class is divided up into 6 modules that encapsulate a set of topics: *telling a computer what to do*, *working with text, images, sounds, crunching data,* and *working with the Web*. For each topic, you will be assigned a weekly activity that develops practice and understanding of the topic, and a final "project" that you will be responsible for.

During Lab, you will have an opportunity to get some hands-on experience with each topic — seeing sample code, completing small "starter" exercises in small groups, and getting guidance about how to get started with the project. Labs will also serve as a place where you can ask questions in a small group (without having to take time out of your already-busy schedules to attend the instructor's or a TA's office hours!) and to show off your creations to an appreciative audience!

This format is meant to support a class structure where we can explore these ideas together, work on challenges together, learn from one another, and share our process of figuring things out (which will include lots of mistakes and detours) in addition to sharing our projects.

Textbooks and Course Materials

Guzdial, M. J., & Erickson, B. (2015). *Introduction to Computing and Programming in Python (4th Ed.)*. Boston, MA: Pearson. This textbook is available at the CU Boulder campus bookstore in both paperback and e-book formats. It is also available from many popular online retailers.

We will also be using JES (version 5.02), the *Jython Environment for Students* software, as the primary tool for developing and testing media-computation–enabled Python programs during the course. You are welcome to download and run this (free) software on your own computer or laptop; it can be found at the following website: http://coweb.cc.gatech.edu/mediaComp-teach#Python. JES will also be available for your use during lab meeting time and open lab sessions on the desktop computers in the CMCI computing labs (Armory 201 and Armory 211).

You may also choose to use *Pythy* (https://pythy.cs.vt.edu/), a web-based alternative to the *JES* software environment. However, please be aware that (1) Pythy runs a

slightly different dialect of the Python programming language than *JES* and (2) this research software is **not yet** hosted at the University of Colorado and may not include full support for all of the media computation functions required for the assignments in this course. (The course instructor is currently in the process of setting up a CU-based Pythy server, and we hope to transition to using this resource as the primary programming environment at a later date in the term.)

Expectations

Culture

Everyone who has ever learned to program knows how it can be both hard and fun. It's hard because it feels like learning a foreign language — it's confusing and frustrating not knowing so many things right away, but through practice and time you'll learn to express yourself fluently. It's fun because you'll get to do exciting things with computing that you may have never done before and this is just the beginning. To help people learn through this hard and fun process, we want to create a culture where people will feel welcome to take creative risks, to make mistakes, and to celebrate the progress we make. To this end, the course instructional team will do their best to ensure equitable and inclusive participation in this class. We ask that you also create and promote this environment with us.

Collaboration

We encourage you to support and learn from one another throughout the course. *When working on assignments and projects together, please list your collaborators and describe how you worked together (e.g., if you looked up information online or how you and your peers came up with the solution).* When submitting your work, each person must still program or write up their own code. Whether or not you collaborate, you are each responsible for learning and understanding the topics and ideas in this course.

Technology Use in Class

This is an interactive, participatory, and hands-on class. ***Please bring your laptops to lecture and lab.*** If you do not own a laptop, or if bringing a laptop to class is an issue, please speak with your instructor and we will come up with a solution.

No cell phones for non-class purposes: No talking on your phone. No checking your email on your phone. No texting on your phone. They are welcome as data and creative tools in our classroom.

Use laptops for class purposes only: all the same rules for your phone apply to your computer.

Communication

We encourage you to ask questions and share reflections and feedback about the course. There are multiple ways to reach your instructors for help and questions:

***D2L* discussion forums:** As you come up with questions or run into issues, other students might have already experienced it and asked it on the forums — or you have a question that your peers might be interested. We encourage you to answer each others' questions too, and we'll recognize your helpful interactions in your participation in this course. The instructors and TAs will also be checking the forums to help answer questions, assist in activities, and respond to comments.

Office Hours: Instructors will host office hours throughout the week. Days/times for office hours will be determined by a consensus of the class. We welcome you to attend them for extra help.

Email: The instructor and TAs are accessible by email, and we will do my best to respond, but we may not answer immediately, especially if you email after 9pm and/or over the weekend. The best way for asking questions about assignments or course processes is to email all of the instructors at info1201@lists.colorado.edu. Please direct all questions about *grading* to your lab TA first, and the instructor second. Grading questions are often best handled in person.

Late Work and Extensions

We can't emphasize enough the importance of keeping up with the pace of the class and completing activities and projects on time. This class moves very quickly and if you fall behind on the assignments and activities it will be very hard to catch up.

All assignments are due in the corresponding D2L dropbox by 11:59 p.m.

Assignments submitted after the D2L dropbox deadline will not be graded and will earn a zero.

No extensions will be granted without a compelling reason due to circumstances beyond your control and which must be documented by a healthcare provider letter, military activation order, obituary/memorial service notice, police/fire report, etc. Our intention is that if you miss an assignment for any *reason, the default course of action is to use one of your submission drops to cover the missed deadline. Only in* exceptional *cases will we grant a deviation from this policy.*

If there is a campus emergency (e.g., weather, closure, etc.), the instructor will send a message to the class with directions about assignments, deadlines, etc.

Participation and Attendance

Participation is an essential part of how you will learn in this class. By actively participating in the class, you can develop your skills and understanding of course concepts. All students are expected to come to class having made progress with course assignments and projects and fully participate fully in class activities and discussions.

Here are some examples of how you can participate:

- Practice active listening – be attentive and be engaged
- Ask questions – there are no dumb questions, but don't be afraid to challenge
- Comment, build on, or clarify others' contributions
- Submit a thoughtful response to the Weekly Note
- Post useful or interesting information to the *D2L* class discussion forums
- Visit the instructors or teaching assistant to chat, ask questions, or give feedback
- Engage in and contribute to small group activities
- Give feedback and ask questions when someone shares their project

We understand that emergencies and disruptions happen, so if you have to miss a class session, we ask that you consult the syllabus, D2L, and your peers to learn about what happened during class. It is still your responsibility to submit assignments and projects on time.

Assignments, Assessment, and Grading

Detailed rubrics will be distributed for each assignment. In this course, grading begins at zero and works up by accumulating points. Overall, the course grade will be determined by 4 main criteria:

1. ***Participation:*** Attendance and active participation in lab, including submission of in-lab exercises and presentation of your project deliverables to your peers (10% of your final grade; missed or below-average participation in **two** weeks of lab will be automatically dismissed/dropped, excluding the first week of classes, during which attendance will not be taken)
2. ***Practice:*** Completion of 8 small weekly exercises, including questions drawn from the textbook, that help you to explore coding concepts yourself (or in collaboration with your peers), practice putting parts and pieces of code together, and preparing for developing your own milestone project submission (30% of your final grade; missed or below-average participation in **two** weekly practice assignments will be automatically dismissed/dropped)
3. ***Mastery:*** As we move forward with the course, you will demonstrate your mastery of each topic by completing a final project **on your own** at several key

points during the course of the semester (3 milestone assignments). There will also be two mid-term exams and a comprehensive final exam, held during the scheduled course final examination time. (The projects and mid-term exams are collectively worth 40% of your final grade, and your lowest single project/mid-term grade will be **dropped** without penalty. The cumulative final exam will be worth an additional 10% of your final grade.)

4. ***Reflection*:** Computational thinking is a mindset, not just a series of programming practices. In conjunction with each milestone project submission, you will also be asked to write a short reflective essay (no more than 2 pages in length) responding to a series of prompts about your experiences and growth in incorporating computational thinking into your own lives and career development (10% of your final grade)

Extra credit *may* be possible for outstanding work that exceeds the rubric criteria, at the instructor's and TAs' discretion; however, you should not expect extra credit to be used as a lifeline for achieving any particular grade in the class.

This course uses a standard, 100-point grading scale:

90.0%–92.9%:	A-	93.0% and above:	A		
80.0%–82.9%:	B-	83.0%–86.9%:	B	87.0%–89.9%:	B+
70.0%–72.9%:	C-	73.0%–76.9%:	C	77.0%–79.9%:	C+
60.0%–62.9%:	D-	63.0%–66.9%:	D	67.0%–69.9%:	D+
				Below 60.0%:	F

Assignment and course grades *will not* be graded on using a curve; the grade(s) that you are awarded will be the grade(s) that you earn in the course, independent of the performance of your peers.

Your TA is your primary grader for this course. Disagreements with grades/scores must first be taken up with your lab TA. The instructor will not intervene in grading disagreements without written documentation of your original submission, your TA's response (e.g., by your forwarding an email conversation thread), and your reason for disagreeing with the TA's assessment. Re-grade requests may only be made for entire assignments, not single problems — note that this may result in a lower overall assignment score if other problems (above and beyond the primary point of disagreement) are found by the instructor. Any re-grading requests must be submitted within ***two weeks*** of your receiving a grade from your TA, and the instructor's decision regarding re-grades will be considered final.

Working Calendar

A working calendar for the course will be published (and kept up-to-date) via the course D2L *site.*

Week	Date	Topic	Reading	Assignments
1	8/28	Course overview/syllabus walkthrough		
	8/30	What is computer science/computational thinking?	*G&E*[1] 1	
	9/1	**Module 1: Telling a computer what to do** Data & Naming	*G&E* 2.1–2.4; NYT Article	Weekly Note
2	9/4	**LABOR DAY - NO CLASS**		
	9/6	Types, Variables, and Working with media	*G&E* 2.4	
	9/8	Making a program, Functions	*G&E* 2.5	Weekly Exercise 1, Weekly Note
3	9/11	**Module 2: Strings** Strings & text	*G&E* 3.1	
	9/13	Taking strings apart with *for* and testing the pieces with *if*	*G&E* 3.2	
	9/15	Putting strings back together (piles)	*G&E* 3.2	Weekly Exercise 2, Weekly Note
4	9/18	Taking strings apart with indices	*G&E* 3.2	
	9/20	Using indices to manipulate strings (reverse, cyphers)	*G&E* 3.2	
	9/22	Taking strings apart with words	*G&E* 3.3	Weekly Exercise 3, Weekly Note
5	9/25	Putting strings to work	*G&E* 3.4	
	9/27	*(flex day)*	-	
	9/29	Review of strings, exam prep	-	**Milestone Project 1**, Weekly Note
6	10/2	**MID-TERM EXAM 1**	-	
	10/4	**Module 3: Images** Picture & color representation	*G&E* 4.1–4.2	
	10/6	Pictures as arrays (for each)	*G&E* 4.3–4.4	Weekly Note
7	10/9	Whole-photo manipulation (negative, color balance, grayscale)	*G&E* 4.5–4.7	
	10/11	Pictures as arrays (indices)	*G&E* 4.8	

	10/13	Overwriting the image array: basic copying and mirroring	G&E 4.8	Weekly Exercise 4, Weekly Note
8	10/16	Pictures as arrays: comparing pixels	G&E *5.1–5.3*	
	10/18	Chromakey and canvas manipulation	*G&E* 5.4–5.6	
	10/20	Pictures as arrays: working with ranges; copying and mirroring	*G&E* 6.1–6.3	Weekly Exercise 5, Weekly Note
9	10/23	Rotating and scaling	*G&E* 6.3	
	10/25	*(flex day)*	-	
	10/27	Review of images	-	**Milestone Project 2**, Weekly Note
10	10/30	**Module 4**: **Sounds** Intro to sound, samples	*G&E* 7.1–7.2	
	11/1	Sounds as arrays, normalizing and clipping	*G&E* 7.3–7.4	
	11/3	Sounds, ranges, and indices: slicing, clipping, and copying	*G&E* 8	Weekly Exercise 6, Weekly Note
11	11/6	Review of sounds, exam prep	-	
	11/8	**MID-TERM EXAM 2**	-	
	11/10	**Module 5: Scaling Up Code and Data** Writing larger programs	*G&E* 10.1–10.3	Weekly Note
12	11/13	Debugging, algorithms, and modules	*G&E* 10.4–10.7	
	11/15	Structured text; text as lists	*G&E* 11.1–11.2	
	11/17	Files, CSV parsing	*G&E* 11.3	Weekly Exercise 7, Weekly Note
13	11/20	**FALL BREAK**		
	11/22			
	11/24			
14	11/27	Review: Structured data in files	*G&E* 11.3–12.1	
	11/29	*(flex day)*	-	
	12/1	**Module 6: Working with the Web** HTML and XML—A crash course	*G&E* 13.1–13.2	Weekly Exercise 8, Weekly Note
15	12/4	Reading and writing HTML	*G&E* 13.2	
	12/6	Using functions to simplify programming	*G&E* 16.1	
	12/8	*(flex day)*	-	**Milestone Project 3**, Weekly Note
16	12/11	Final exam review 1	-	
	12/13	Final exam review 2 and course wrap-up	-	
	12/15	**READING DAY - NO CLASS**		

	12/16	**CUMULATIVE FINAL EXAM (tentatively, 4:30-7:00p)**		

[1]*G&E* is used as shorthand for the Guzdial & Erickson textbook

Accommodation Statement

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website (www.colorado.edu/disabilityservices/students). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website and discuss your needs with your professor.

Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required assignments/attendance. Please contact me via email or office hours by the end of the second week of the course with specific dates that present conflicts so that I have an opportunity make systemic adjustments to the course requirements that will benefit all students. See the campus policy regarding religious observances for full details.

Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester so that we may make appropriate

changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

Discrimination and Harassment

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the Honor Code Office website.

The first instance of academic dishonesty will result in a grade of 0 on the assignment in question. Subsequent violations will result in a failing grade for the course.

Acknowledgements

The design of this course was influenced by many people and courses. This course builds on prior versions of INFO 1201 taught by CU Boulder Information Science Professors/Instructors Wendy Norris, Ricarose Roque, Danielle Szafir, and Stephen

Voida. We adopt facets of the *Computational Thinking* framework developed by MIT Professors Karen Brennan and Mitch Resnick (2012). We also took inspiration from ATLAS Professor Ben Shapiro's course ATLS 4519 *Code Sorcery for New Wizards*. Some of our course policies were developed from INFO 1111 *Representations* taught by Professors Jed Brubaker and Ricarose Roque and INFO 7000 *Introduction to Doctoral Studies in Information Science* taught by Amy Voida.