

Instructor: Robert R. Snapp, email: snapp@cs.uvm.edu, office: 353 Votey, phone: 802-656-0735.

Office Hours: Tue 1:30–2:30 PM, Fri 2:00–4:00 PM, and by appointment.

Lab Instructor: Mr. Sam Ogden, email: sogden@uvm.edu, office: 249 Votey; office hrs: *TBA*.

Lectures: MWF, 10:40 – 11:30 AM in 207 Votey Hall.

Discussion/Lab Sessions: In room **206 Votey**:

| Lab | Day | Scheduled Time | Room |
|-----|------|-------------------|-----------------|
| L01 | Tue. | 10:00 – 10:50 AM* | 229 Votey (new) |
| L02 | Thu | 10:00 – 10:50 AM | 206 Votey |
| L03 | Wed | 4:00 – 4:50 PM | 206 Votey |

* Rescheduled from Wed. 1:55–2:45 PM.

Web Page: www.cs.uvm.edu/~snapp/puzzles/

Description: An introduction to computer science that explores the history, rules, and strategies for puzzles and games, such as Rubik’s cube, chess, and go. We will introduce both mathematical and computational tools that allow computers to solve puzzles and play games. We will also introduce the scheme programming language with an emphasis on *computational thinking*.

This course satisfies the Mathematical Sciences distribution requirement for Bachelor of Arts students enrolled in the College of Arts and Sciences.

Three sections are being taught concurrently:

- Section A is a TAP (Teacher-Advisor Program) section reserved for first-year students in the College of Arts & Sciences.
- Sections B & Z are open to all UVM and continuing education students.

Prerequisites: None.

Assigned Reading: In addition to class notes (available in pdf format from the course web site), we will read the following:

1. Chapter One of Johan Huizinga, *Homo Ludens*, Beacon Press, Boston, 1955.
2. Chapters One and Two of Roger Callois, *Man, Play and Games*, University of Illinois Press, Urbana, IL, 1961,
3. Two short stories by Jorge Luis Borges: “The Garden of Forking Paths,” and “The Lottery in Babylon,” published in *Ficciones*, 1944, translated by Anthony Bonner in 1962.

Copies will be made available in class and in the Bailey-Howe Library,

For expository and creative writing assignments, *The Elements of Style* by William Strunk Jr. and E. B. White, is highly recommended.

Materials: The following materials are required:

- Two (or more) six-sided dice.
- Fifty to one-hundred counters (e.g., pennies, buttons, poker chips, dry beans, M&Ms).

- A standard $3 \times 3 \times 3$ Rubik’s cube, available at either Barnes & Noble, or Vermont Toy and Hobby.

Computer Software: Racket. You may download this for free from the web site <http://www.racket-lang.org>, for MS Windows, MacOS X, and Linux.

Grading Policy: The final letter grade you receive on your transcript will be an absolute measure of your achievement and understanding, as follows:

| Percentage | Grade | Percentage | Grade |
|------------|-------|------------|-------|
| 98 – 100 | A+ | 78 – 79 | C+ |
| 92 – 97 | A | 72 – 77 | C |
| 90 – 91 | A– | 70 – 71 | C– |
| 88 – 89 | B+ | 68 – 69 | D+ |
| 82 – 87 | B | 62 – 67 | D |
| 80 – 81 | B– | 60 – 61 | D– |
| | | 0 – 59 | F |

The course grade will be based on

- laboratory performance (20%),
- graded homework and field trip (20%),
- quizzes (20%, after dropping the lowest quiz),
- two midterm exams (20%), and the
- final exam (20%).

There will be many opportunities for extra credit: motivated students can complete an approved project, lead a discussion in a lab, or lecture session, etc.

Attendance and Participation: You are required to attend every lecture, one laboratory session per week, and the field trip (see below). You should come prepared for each session, and actively participate in discussions, and laboratory and classroom exercises.

Field Trip: On Saturday, *October 1* (rain date: October 8), we will visit and solve a corn maze situated in the Northeast Kingdom that has over two miles of twisty passages. Please bring a sack lunch and something to drink. The bus will leave UVM from the Royal Tyler Theater at 8:30 AM, and will return around 4:30 PM. (If you are not able to attend the field trip, you must notify the instructor by Monday, September 26, in order to receive an alternate assignment.)

Homework: Homework, which includes reading, writing, problem solving, programming, puzzle & game creation, and experimental play, will be assigned on a regular basis. Graded assignments will be identified in advance. Late homework will be penalized 20% credit per day.

Part of the homework will consist of expository writing, which will be graded on relevance, creativity, correctness (grammar, spelling, punctuation, etc.), and style. Please follow the *Essay Guidelines for CS 32* available at www.cs.uvm.edu/~snapp/puzzles/essayStyle.html. (*The Elements of Style*, by Strunk and White, is also highly recommended.)

Students are encouraged to consult the tutors at UVM Writing Center (www.uvm.edu/writingcenter) located in Room 105 of the Bailey-Howe Library, across from the Reference Desk.

Call 802-656-4075 for an appointment. The Writing Center is free to all UVM students and staff.

Some assignments will involve reading and writing simple programs in the scheme programming language using Racket, a pedagogical interactive software development environment. Individual help for programming is available during the laboratory sessions, and office hours. CSCrew, an organization of benevolent computer science students, offer free tutoring and assistance at various hours in room 322 Votey.

Quizzes: Approximately eight “pop” quizzes will be given during the term. Each quiz will consist of one or two short exercises that are usually similar to the homework, or to recent laboratory or class activities. The lowest quiz grade will be dropped. There will be no make-ups for missed quizzes, however, some quizzes have extra credit questions.

Midterm Exams: Two midterm exams will be given in class: the first, on Friday, **October 14**; and the second, on Friday, **November 18**. (N.B., the second midterm will be given on the last day of class before the Thanksgiving break. Please ensure that your travel plans will not interfere with this exam.) The material covered on each exam will be announced one week in advance.

Final Exam: The final exam for this course is scheduled for 7:30–10:15 AM, Monday, **December 12**.

Students entitled to special accommodation must notify the instructor by the second week of the semester.

Computer Accounts: Each student will receive an EMCF computer account, which will allow you to use the computers in room 206, as well as all other public computers in Votey Hall. Racket should be installed on the both the Windows and Unix platforms.

Collaboration: You are encouraged to share your knowledge, discoveries, and ideas with other students outside of class. However, all work (e.g., ideas, opinions, analyses, algorithms, data, and source code) generated by others should be properly cited, preferably with an archival source (e.g., a printed book or a peer-reviewed article). In general, sources that appear only on the internet (such as *Wikipedia*) are not sufficient. Every phrase that is not your own should appear between quotation marks, with a footnote or end-note that indicates the source.

Do not plagiarize. Do not cheat. Do not collude. Do not fabricate. Absolutely no collaboration or unauthorized material is allowed during any quiz or exam. All violations will be forwarded to the University Coordinator of Academic Honesty, following the new policy of Academic Integrity posted at

www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf

The first deliberate violation of academic integrity by an undergraduate normally results in a course grade of XF; the second, with a second XF and expulsion.

Online Discussions: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather

than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. You can login to piazza at: <http://piazza.com/login.html>, after you have enrolled by responding to the email that you received on Monday, Aug. 29, 2011. You should check the CS 32 piazza page regularly, as well as “What’s new?” at <http://www.cs.uvm.edu/~snapp/puzzles/news>.

Etiquette: If you own a laptop computer, you may find it useful on occasion to bring it to class. However, your computer activity must be relevant to the class or lab activity. The use of cell phones or other personal electronic devices (MP3s, iPods, radios, etc.) is not allowed. *Absolutely no calculators, laptops, phones, or other electronic devices are allowed during quizzes or exams.*

Religious Holidays: An official policy of the University of Vermont states:

Students have the right to practice the religion of their choice. Each semester students should submit in writing to their instructors by the end of the second full week of classes their documented religious holiday schedule for the semester. Faculty must permit students who miss work for the purpose of religious observance to make up this work.

Topics

The following topics are subject to change. We will try to discuss puzzles and games that pique our interests, so if you have a favorite, please let me know as soon as possible. We will try to describe the history, rules, and strategies for each puzzle and game we study. We will also describe how computers can solve puzzles and play games.

- Introduction to puzzles and games.
- *Homo ludens*: the importance of play, and what makes play fun?
- Word puzzles (crosswords, anagrams, etc.), card shuffles, & permutations
- Introduction to scheme programming: factorials, Pascal’s triangle, and Fibonacci numbers.
- The history of labyrinths and mazes.
- Graphs and trees.
- How to thread a real maze without getting lost!
- How computers can solve mazes and puzzles.
- Peg solitaire.
- Sliding block puzzles
- Rubik’s cube.
- The Tower of Hanoi and Chinese rings.
- Games of perfect information: Tic-tac-toe, mancala, checkers, chess, go, and hex.
- Nim, kayles, game trees & Sprague-Grundy numbers.
- Games of chance, including dice games, poker, blackjack, raffles, and lotteries.