

Instructor: Robert R. Snapp [rsnapp@uvm.edu], 353 Votey.

Lectures: Session 2 (July 13–25, 2014): Monday–Thursday, 9:00am – 12:00 noon, and 1:30–3:30pm; Location: *TBA*.

Online coursework: July 26 – August 8, 2014, Internet postings.

Web Page: www.cems.uvm.edu/~rsnapp/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*.

Prerequisites: None.

Materials: The following materials are required:

- Two (or more) six-sided dice.
- Fifty counters (e.g., pennies, buttons, poker chips, dried beans, Skittles, M&Ms).
- A standard $3 \times 3 \times 3$ Rubik’s cube, available at many toy stores, Barnes & Noble, and amazon.com.

Students should bring a laptop computer (running either Windows, MacOS X, or Linux), so they can develop Racket programs in class, in the dorm, and during the online portion of the course. We will make an effort to accommodate students who do not own a laptop.

Computer Software: DrRacket. 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

- classroom attendance & participation (20%),
- graded homework (20%),
- quizzes (20%, after dropping the lowest quiz),
- midterm exam (20%)
- online-session coursework (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 and actively participate in every class session.

Homework: Homework, which includes reading, writing, problem solving, computer programming, puzzle & game creation,

and experimental play, will be assigned on a regular basis. Late homework will be penalized 20% credit per day.

Some assignments will involve reading and writing simple programs in the Racket programming language using DrRacket, a pedagogical interactive software development environment.

Quizzes: Approximately six “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: One midterm exam will be given in class, 1:30–3:30 pm, *Friday, July 24, 2014*.

Online Session: During the online session (July 26 – August 8, 2014), students will have some additional reading, and will complete and submit exercises. We will make frequent use of the piazza web site, so students should plan to have regular access to the internet during this period.

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

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

<http://www.uvm.edu/policies/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: We will be use Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from the instructor and your peers. Rather than emailing questions to the instructor, please 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:

<https://piazza.com/uvm/summer2014/cs32/home>,

after you have responded to the piazza invitation email. You should check the CS 32 piazza page regularly, as well as “What’s new?” at

<http://www.cems.uvm.edu/~rsnapp/puzzles/news>.

Etiquette: If you own a laptop computer, you should bring it to class. The 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. In this regard, we will introduce the programming language Racket early in the course, and will weave it into our discussions frequently throughout the course.

- Introduction to puzzles and games.
- The Doomsday Algorithm.
- *Homo ludens*: the importance of play, and what makes play fun?
- Word puzzles (crosswords, anagrams, etc.), card shuffles, & permutations
- Introduction to Racket and functional programming.
- 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.