Competitive Programming (CS 227)
Fall 2018

Location: CS Department Lab, 16 Wing Technology Center, UW-La Crosse

Time: Wednesday, 4:30pm–6:30pm

Instructor: Martin Allen

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Office hours: Monday/Wednesday/Friday, 12:00pm–1:00pm; Tuesday/Thursday, 1:30pm–3:00pm

Course Description: Programming competitions involve writing code to solve a set of problems, working under a time-limit. Learning to participate successfully in such competitions is an effective way to become a better programmer. This course introduces students to some of the techniques and problem types that are commonly encountered in many programming contests. Students will learn a set of common algorithms and data structures, along with general conceptual tools and rules of thumb, that will prepare them to be able to solve programming problems encountered in competition and job interview settings. The course will consist of code review, along with extensive coding practice. Even experienced programmers will have something to learn from the experience of solving new problems from scratch on a regular basis. (Repeatable for credit - maximum 3. Prereq.: CS 220. Concurrent enrollment or completion of CS 340 recommended. Offered Fall, Spring.)

Objectives for the Course: Students will learn a set of common algorithms, conceptual tools, and rules of thumb, intended to allow them to better solve programming problems of the sort found in programming competitions. Things you will learn how to do include, among other things:

• Applying various important algorithmic paradigms in practice, including (in some order):
  – Dynamic programming.
  – Divide-and-conquer.
  – Graph search and graph path.
  – Basic computational geometry.

• Identifying problem structure, including:
  – Combinatorial problems.
  – Graph problems (paths, matching, etc.).

• Programming using common tricks for efficiency, including:
  – When you might or might not want to use brute force.
  – Employing common handy data-structures.

• Understanding limits of language constructs, including working with values too large for basic data types.
Benefits of taking the course for students include:

• Practice in coding fundamentals.
• Practice in facing new problems and trying to find solutions in an open-ended manner.
• Increased knowledge of the common algorithms, mathematical approaches, and data-structures underlying many seemingly different problems.
• Learning why we need to have more than one tool in our tool-box for a certain type of computational problem.

Course Format and Expectations: The course will meet as a lab section for 2 hours, once a week. The instructor will provide some initial materials, problem examples, and discussion in the first half hour or so of a meeting. Students will then spend the remaining time trying to solve one or more practice problems. Difficulty of problems will vary, escalating over time as students become more experienced. Occasional meetings may take the form of team/individual “mini-contests,” and student teams will have the (optional) opportunity to compete for fame and fortune in the upcoming ACM programming contest, held at mid-semester.

Grading will be based solely on attendance, and on attempting problems. Some contest problems are very tricky, and part of the learning process is discovering through experience which sorts of problems are likely to be harder than others. It is not expected, nor required, that you will solve the majority of problems given, especially on your first try. A student who attends each week, and submits code attempts, will receive full credit for the course; grades will be adjusted downward for each day missed.

Please Note: Any student with a documented disability (e.g. ADHD, Autism Spectrum Disorder, Acquired Brain Injury, PTSD, Physical, Sensory, Psychological, or Learning Disability) who needs to arrange academic accommodations must contact The ACCESS Center (165 Murphy Library, 608-785-6900, ACCESSCenter@uwla.edu) and meet with an advisor to register and develop an accommodation plan. In addition to registering with The ACCESS Center, it is the student’s responsibility to discuss their academic needs with their instructors.

You can find out more about services available to students with disabilities at The ACCESS Center website: [http://www.uwlax.edu/access-center](http://www.uwlax.edu/access-center)

Other information about the legal obligations UW-La Crosse has to its students can be found at: [https://www.uwlax.edu/info/syllabus/](https://www.uwlax.edu/info/syllabus/)