Math 77D, Spring 2013
Topics in Mathematics and Computation in the Digital Age:
Game Simulation and Analysis
Lecture A: MWF 2:00-2:50 in RH 306
Lab 10: Th 2:00-3:20 RH 421
Lab 11: Th 3:30-4:50 RH 421

Instructor: Dr. Sarah Eichhorn
Office Hours: MW 10:30-11:30, F 8:00-9:00 and by appointment
Office Location: Rowland Hall 440J
Phone and E-mail: (949)824-5313, sfrey@math.uci.edu

Texts: None
Required Materials: spiral notebook for lecture and laboratory notes, mini stapler, pencil

Prerequisites: Math 2B and ICS 31 or pass equivalence

Course Overview: This is a lower division undergraduate introductory computational mathematics course on game simulation and analysis. This course is part of the UCI Interdisciplinary Computational Applied Mathematics Program (iCAMP) sponsored by the National Science Foundation. Students completing this course will be eligible to apply for the iCAMP funded student summer research program.

This course is designed not just to teach students particular mathematics and computer science material, but rather also give students an opportunity to participate in computational applied mathematics research and get a feel for the types of problems and techniques used in the modern workforce. It is expected that the students will be active in their learning in this course. Some lectures will be given to introduce new terminology and techniques, but a majority of the course will involve students actively engaged in projects and participating in finding relevant information for the problems being considered.

There are three main student learning objectives for this course:
- Students will be able to write adaptive learning programs to attempt to find optimal game strategies for a variety of combinatorial and random games.
- Students will be able to apply game theory tools and terminology to analyze a variety of combinatorial and random games.
- Students will participate in computational applied mathematics research and gain understanding of the research process including question formulation, tool development, mathematical and computational applications, results analysis and presentation of results.

Course Content: Combinatorial Game Theory: game classification, tree graphs, strategy analysis, Sprague Grundy functions, Bouton's Theorem; Zero-Sum and General-Sum Game Theory: payoff matrices, Minimax Theorem, Nash equilibrium; Machine learning: search algorithms, adaptive learning.

Grades: Final grade will be based on:

20% Participation, Engagement, Class Contributions
30% Labs, Classwork
20% Mini Projects (2 projects, 10% each)
30% Final Project
**Attendance and Participation:** Attendance and participation in class is a vital part of the learning process. Regular class attendance is mandatory. It is the student’s responsibility to keep informed of any announcements, syllabus adjustments, or policy changes made during scheduled classes. Due to the nature of this course, attendance and participation is absolutely essential.

**Laboratories:** There will be weekly laboratory activities. All students are expected to participate in the laboratory and contribute to the write-up. Occasionally, some work may need to be done outside of class to complete the laboratory.

**Written Assignments/Class Work:** There will be many open-ended, in-class assignments given. Students are expected to attempt all problems posed and keep a written record of their work on the problem. Students will frequently be asked to share results with class and question fellow student’s work.

**Mini Projects:** There will be two mini projects for the course. These projects will involve a mini research experience in which teams of students have to develop the mathematical and computational tools to answer specific questions about a particular game. Much of the work on these projects will be conducted in class, but some time may be required outside of class to finalize results.

**Final Project:** At the end of the course, students will have the opportunity to create their own research project. For the final project, students will pose their own game theory question and then utilize mathematical and computational tools from the course to answer their question. For this project, each team of students will select a game to analyze and then write an adaptive learning program suitable to study their particular game.

**Academic Integrity:** Students are responsible for informing themselves of UCI’s policies regarding academic dishonesty. Students found in violation of the code are subject to penalties ranging from loss of credit for work involved to a grade of F in the course, and possible risk of suspension or probation. The academic dishonesty policy will be enforced in all areas of the course, especially plagiarism for this course. For more information about the academic dishonesty policy and procedures, including information about your rights and responsibilities as a student, see [http://www.editor.uci.edu/catalogue/appx/appx.2.htm](http://www.editor.uci.edu/catalogue/appx/appx.2.htm)