Spring 2-1-2004

CS 495.01: Computer Simulation and Modeling

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Computer Science 495/595
Computer Simulation and Modeling
Spring 2004 Syllabus

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Professor

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Online Assistance

This semester I am using the University's Blackboard system to facilitate online learning. This is a system that I am new to. Some of the advantages appear to be:

- I will post all relevant course material there. This will include homeworks as well as solution keys.
- You will always be able to see your grade in the course.
- There is a mailing list facility that you are strongly encouraged to sign up for. It is here that I will post changes in assignments, exam dates, etc. I will also monitor the list and try to answer student questions about things that are not clear.

Course web site:

The text authors have also established some excellent online resources that can be explored at:

http://sip.clarku.edu/

Textbook

An Introduction to Computer Simulation Methods Second Edition
Applications to Physical Systems
Harvey Gould and Jan Tobochnik
1996 Addison Wesley Publishing Group ISBN 0-201-50604-1

Prerequisite

- Math 153, and 221
- CS 132
- And, consent of instructor.

Course Objectives

In this course, the instructor is trying to achieve the following:

- Develop the students ability to solve both ordinary and partial differential equations with computers.
- Develop the students ability to develop a computer simulation of a system based on the system's physical characteristics.
- Give students insight into the physical basis of differential equations.
- Improve students intuition for the behavior of physical systems.
- Improve the students ability to represent and understand datasets.
- Introduce students to new modeling concepts such as renormalization group, percolation, and cellular automata.
- Improve the students strength in using matrix based programming languages such as Matlab, Octave, and Scilab.
- Prepare students for graduate work involving scientific computing or employment in the engineering, scientific, or gaming sectors.

Meeting Times/Place

Times:	Monday, Wednesday, Friday 14:00–15:00+
Place:	Social Science 362

Final Exam Time and Place

15:20 May 13, 2004 Social Science 362

Grading Policy

Grades of A-F will be assigned based on the scale.

A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

Grades will be based upon the following forms of evaluation.

CS495

Exercise	Number	Percentage of final grade
Journal	6	40%
Projects	3	40%
Exams	1	20%

CS595

Exercise	Number	Percentage of final grade
Journal	6	30%
Projects	3	30%
Exams	1	10%
Final Project	1	30%

The categories for grading are explained in more detail here.

- **Journal** This is a running log of students simulations. Comparable to a scientific notebook or journal from a laboratory. It should include diagrams, source code, final graphs, observations, theories, etc. Additionally, journals should make clear statements about answers to the assigned questions. One journal grade will be assigned based on your performance as a "**student leader**".
- **Projects** These are larger, open ended programming/simulation assignments that will require a significant amount of time. Students will be expected to submit a final report on their findings. The final report will be drafted in a manner similar to a formal scientific publication.
- **Exam** This will consist of short programs, given overnight, that are similar to the simulations assigned in class.
- **Final Project (CS595 only)** This is to be a comprehensive project in modeling. Project progress will be measured across the following three milestones.
    1. **Planning**–Students must identify important theoretical material early in the course (in week 4). Before the course is one third over students must have

a clear project in mind and at least 3 papers from the relevant literature. Students are encouraged to use this project to complement their graduate research. Students that are at a loss for what to peruse can look at the text book author's web site:

`http://sip.clarku.edu/projects.html`

or talk to the instructor for ideas about good projects. I am interested in encouraging collaboration between science and computer science graduate students. Hence, group projects are a possibility.

2. **Implementation**–By the time the course is two thirds through the semester the students will have a working program that reproduces some essential behaviors suggested in the papers. Additionally, they will have to hand in a clear outline of the proposed project.
3. **Interpretation**–At the end of the semester the student will have completed the project in a satisfactory way. The results of the computer simulation will be reduced appropriately and interpreted.

The final report on the project will be a formal typed report, consistent in style with the projects. Students will also be required to deliver a 10–15 minute presentation on their project. There is no page requirement on the final project, but it should be a substantial piece of work.

When grading I will consider the following in approximate order of importance; correctness of implementation, intellectual rigor of approach, attention to detail, clarity of presentation, conciseness, writing style, and entertainment value.

I reserve the right to make changes to the grading policy that will be favorable to students grades.

Students taking the course pass/no pass are required to earn a grade of C or better in order to pass.

Attendance Policy

I am strongly encouraging attendance. I will have the "five will cost you ten" policy. Miss five classes, lose 10 points (one letter grade!).

Late Assignments

Other than in in exceptional circumstances, such as family emergencies, *late homework will not be accepted.*

Academic Integrity

As a student of the University of Montana, you are responsible for upholding all rules in the student conduct code. There are aspects of that code that are of particular importance in Computer Science courses. The electronic nature of the many assignments facilitates their dissemination. To be clear, from the student conduct code:

1. Plagiarism: Representing another person's words, ideas, data, or materials as one's own.

6. Submitting work previously presented in another course: Knowingly making such submission in violation of stated course requirements.

Of course, all other aspects of the student conduct code will be enforced as well. These are just the two that are commonly violated.

I will interpret these guidelines to the letter. Students found in violation will be penalized with the maximum punishment permitted in the student conduct code. That is to say, the matter will be handed over to the academic Dean and academic misconduct proceedings will take place.

In order to reconcile encouraged interaction between students and the academic misconduct policies, you must credit other students in your work. If, for example, you worked with others to develop some algorithm, or solve some homework problem, specifically mention those that you have worked with in the assignment that is handed in. Similarly, you must properly document and credit any online resources that you use.

Collaboration is encouraged. However, if you collaborate with others, the instructor reserves the right to question you about the material turned in. If it is evident that your understanding of what you turn in is weak, your grade will be lowered.

Students are to uphold a level of conduct becoming of adults. The use of profanity and abusive speech is not permitted under the student conduct code, and will not be tolerated in this course.

Schedule

The following is a tentative schedule for the course. I reserve the right to modify the schedule to reflect the way the course is going with respect to completion of assignments, performance on exams, etc.

Week	Dates	Topics	Chapter(s)	Notes
1	Jan 26–30	Coffee Cooling, Scilab	1	
2	Feb. 2–6	Coffee Cooling Falling Bodies	1 2	
3	Feb. 9–13	Falling Bodies	2	Feb 13, Last day to add/drop w/ refund
4	Feb. 16–20	Two body problems	3	
5	Feb. 23–27	Two body problems	3	
6	Mar. 1–5	Random processes	4	Project I Due
7	Mar. 8–12	Electrostatics	10	Mar. 9 Drop Add transcript clear.
8	Mar. 15–19	Electrostatics	10	I'm gone 3/15 and 3/19
9	Mar. 22–26	Electrostatics	10	I'm gone 3/22
10	Mar. 29–Apr. 2	Monte Carlo Methods	11	Project II Due
11	Apr. 5–9	Monte Carlo Methods	11	I'm gone 4/5
12	Apr. 12–16	Percolation	13	
13	Apr. 19–23	Percolation	13	
14	Apr. 26–30	Complexity	15	Apr 30 Last day to withdraw.
15	May 3–7	Complexity, Presentations	15	
16	May 10–14	Exam Week		Project II Due

Disabilities

Students with disabilities are encouraged to meet with me to discuss any accommodations they require.

Other Issues

- Turn off your cellphone, or set it to vibrate in class. Take the call outside the classroom.
- Do not talk in the classroom during lecture. Take it outside.