Undergraduate Research in Applied and Computational Mathematics

MATH-4960

Spring 2009

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Tentative Schedule

Weeks 1-3	Numerical Differential Equations, MATLAB, and Introduction to Projects
Weeks 4-5	Kinetics, and Scientific Communication
Weeks 6+	Research Seminar
Last Week	Poster Presentation and Thesis Submitted

Course Web Page http://eaton.math.rpi.edu/faculty/Holmes/Courses/CSUMS/Spring09

General References (see CSUMS library for project related references)

Introduction to Numerical Solution in Differential Equations by M. H. Holmes
Introduction to Foundations to Applied Mathematics by M. H. Holmes (notes available)
Introduction to Perturbation Methods by M. H. Holmes
Mathematics Applied to Deterministic Problems in the Natural Sciences by Lin and Segel

Grading: Homework 1/4, Seminar Participation 1/8, Thesis and Presentation 5/8

Projects

Each student is required to undertake a research-oriented project. You can either propose a project, or select one from the CSUMS library. The latter contains papers that provide background for potential project areas, and these will be discussed in class. The exact schedule of events in the course is fluid, but it will be approximately as follows:

First of February: each student submits a report on three math research papers, each paper coming from a different area

Middle of February: research seminar begins

End of Semester: poster presentation and thesis due

Research Seminars

Your group will meet with your faculty mentor for two hours each week. During this time each student will be expected to provide an informal oral presentation on what they are working on (namely, you explain your results to-date, and discuss the problems you are now working on). This session is highly interactive, and you should expect numerous questions from the faculty mentor, and the other students in the meeting.

Report

You are to submit a report on three papers in the CSUMS library. The report should be at least six pages long, with approximately two pages per paper (12 pt font, 1.25 in margins, and 1.5 line spacing). Also, the three papers you report on must be selected from different topic areas in the library.

Thesis

You are to submit a thesis at the end of the semester that represents the culmination of what you did on your project. This includes the background and motivation for the problem, what you did, and your conclusions. It should contain references, and figures where appropriate. It should not contain computer code, although it can be included in an appendix. It should be a minimum of 15 pages (12 pt font, 1.25 in margins, and 1.5 line spacing). This document is to be written as the semester progresses, and so your advisor will require you to submit draft versions during the semester (approximately every three weeks).

Presentation

You will give a poster presentation at the end of the semester. In conjunction with this, you will give a short (10 to 15 minute) presentation to the class about what is on your poster.

Extra Events

The unique nature of this course provides opportunities for special events that will take place throughout the semester. One will be outside speakers. We will be inviting mathematicians to come to Rensselaer to talk to you about their research. They will also give regular research colloquia. When appropriate, we will ask the class to attend these lectures (and lectures of other visitors). Another event is the Hudson River Undergraduate Mathematics Conference, which takes place in April.

Miscellaneous

All computing will be done in MATLAB and this program will be introduced as the course progresses. RPI has a site license for MATLAB and you can contact the Help Desk in the VCC for more information about this. You will also need a word processor that is capable of formatting math expressions, as well as software capable of producing posters with math expressions. Examples are: MS Word and PowerPoint, and LaTeX/Keynote (the latter is what the instructor uses).

Academic Dishonesty

It is expected that you collaborate with the other members of your research group, but you are responsible for your component of the project. Also, you must provide attribution to any other work you use in your project. In regard to academic integrity, the Rensselaer Handbook should be consulted for more information about this.

Appealing a Grade

Course grades may be appealed through the office of the Chairman of the Department of Mathematical Sciences.