PHY 474 Advanced Computational Physics Spring 2014

(lecture) Dr. Robert Ragan 2013 Cowley Hall 785-8449 **ragan.robe@uwlax.edu**	(lab) Dr. Rob Salgado 116 Cowley Hall **rsalgado@uwlax.edu**

Meeting Times: TuTh 11:00a-2:00p CH210.
Office Hours: TBA
Text: *An Introduction to Computer Simulation Methods* (3rd Edition) by Harvey Gould, Jan Tobochnik, and Wolfgang Christian.

Catalog Description: In-depth study of advanced computational techniques using the programming language *MATLAB*. Programming topics will include File I/O, graphics and animation. Projects *may* use PDEs, chaos theory, Metropolis Monte Carlo methods, and Fourier transforms on problems in classical, statistical, and quantum mechanics. Lect. 3h, Lab. 3h. Prerequisite: PHY 374; CS 120. Offered occasionally.

Programming Language: The programming assignments will be written in MATLAB. It is loaded on all the computers in the Experimental Physics Lab (CH 210) and Wing 15 GCA.

Assignments: Programming problems will be assigned on a 1-2 week basis and will usually require graphs and very short informal one or two page write-ups.

Grading: informal assignments (40%), formal reports (40%), term project (20%)

Term Project: A term project will be required on a mutually agreed upon topic, with a formal write-up (< 10 pages) with an introduction/theory section, methods, graphs, and results.

NOTE: Assignments will be graded on correctness, timeliness, *independence,* and *initiative*.

Accommodation
Any student with a documented disability who needs to arrange reasonable accommodations must contact the instructor and the Disability Resource Services Office (165 Murphy Library) at the beginning of the semester. A verification letter, written by a DRS adviser, of a student's eligibility for any requested accommodation is requested.

Tentative Course Outline (in approximate order)
1) PDEs: Wave Equation
2) Fractals, the Mandelbrot and Julia sets ; interactive GUIs
3) Quantum wave functions: 1-D potential-energy wells

(TBA, as the course progresses) additional course topics may include, for example:
- Chaos Theory – the Logistic Map, the n-body problem
- Genetic algorithm – the Traveling salesman problem
- Signal Processing – Spectral methods
- 3-D Refraction and Raytracing – crystal ball
- ?

Z) Term Project