PHY 374 **Computational Physics I** **Fall 2013**

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Meeting Times: MWF 2:15-3:10 CH201 and CH210 (Lecture), Tu 2:15-5:15 p.m. CH220 (Lab).

Office Hours: TBA

Text: *An Introduction to Computer Simulation Methods* (3nd Edition) by Harvey Gould, Jan Tobochnik, and Wolfgang Christian

Course Description: This course is an introduction to computational physics. Students will learn the fundamentals of applying numerical and graphical methods to a variety of physics topics ranging from mechanics, optics, electrodynamics, thermodynamics, and quantum mechanics. Prerequisites: PHY 104 or 204, and MTH 208, MTH 309 (concurrent).

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 Astronomy/Computational Physics Lab (CH220) It can also be accessed via the UW-L Virtual Desktop which can be downloaded at https://virtual.uwlax.edu to get started. Once the VMware View Client software is installed, you will use it to connect to the virtual desktop. **Use virtual.uwlax.edu for the connection server address.** You can also find online resources at http://www.uwlax.edu/its/virtual.

Assignments: Programming problems will be assigned on a 1 week basis and will usually require graphs and short informal write-ups. Two assignments will require formal write-ups (<10 pages) with an introduction/theory section, methods, graphs, and results. Guidelines will be distributed later.

Exams: There will be a one in-class closed-book exam and one take-home exam in which students will write MatLab programs without help from the instructor.

Grading: informal assignments(50%), exams(25%), formal assignments (25%) (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)
Introduction to MatLAB
Root Search and Minimization
Numerical Integration
Ordinary differential Equations
Partial differential equations
- Laplace Equation
- Heat equation
- Wave Equation
- Schrodinger Equation*

*Eigenvalue Equations
Random Walks
Ray Tracing*
Percolation

*Time Permitting