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This document will be revised.

PHYS 540
Computational Physics
Lawrence University – Fall 2012

(LECTURE) **Youngchild 138, MWF 12:30p – 1:40p**

Instructor: **Rob Salgado** **Visiting Assistant Professor of Physics** Office: **Youngchild 111** Voice: **(920)-993-6083**	Email (the best way to contact me): **roberto.b.salgado@lawrence.edu** Instant-Messengers: AOL, WindowsLive, Yahoo, Google, Skype: ****to be announced**** (IM only… do *not* email here—I won't read it)	Office hours: ****to be announced****

Catalog Description:

PHYS 540 –Computational Physics
Treats computational approaches to problems in physics with particular emphasis on finite difference and finite element methods for solving partial differential equations as they arise in electromagnetic theory, fluid mechanics, heat transfer, and quantum mechanics and on techniques for graphical visualization of the solutions.

Units: 6.
Prerequisite: PHYS 225

Required Materials:

portions of Prof. David Cook's **"Computation and Problem Solving in Undergraduate Physics"**, which will be provided to you as we need them. By the end of the course, the portions will fill a 1.5"-three-ring-binder.

Electronic Materials:

I will maintain a Blackboard website (**http://moodle.lawrence.edu/course/view.php?id=5537**) that links to homework assignments, electronic-whiteboard notes, and handouts. (These materials are not a substitute for regular attendance, participation, and problem-solving.)

Course Goals:

A. To introduce computational methods than can be used to solve problems as they arise in various fields of physics.
B. To further develop physical intuition, mathematical reasoning, and problem solving skills (including scientific modeling and computational thinking).

Rough list of topics:

- Lagrangian Mechanics [from Prof. David Cook's "Notes for Computational Mechanics"], treated analytically. *[We may pursue some computational and/or symbolic -algebraic methods.]*
- Introduction to programming (with examples in FORTRAN, C, and IDL… and possibly Python)
- Introduction to the Numerical Recipes library
- Introduction to LSODE
- Solving Partial-Differential Equations with Finite-Difference and Finite-Element methods
- I may try to incorporate examples in VPython (the Visual library for Python)

Homework and Projects:

Given that your grade will mostly be based on your homework and project reports, your submissions should clearly represent your work. You are strongly encouraged to help each other with problems that you encounter, but all final programs and write-ups should be your work. Reports will be graded based on both the results and presentation. Include (and clearly present) derivations, results, figures and also your programs. Be creative!

There will be no final and no midterms. Your grade will be based on your homework and projects (to be specified later), as well as oral presentations of some of your work. Because of the class size, we have some flexibility in how the course will run. After consulting with the registered students, I will specify the structure of the course.

Programming is a time-consuming task. To compensate for this, not all of our regularly scheduled meeting times will be "class meeting" times. However, I will likely be around during those times to help, if requested.

You can always ask me for help after you have made an honest effort. You are always welcome to stop by my office hours, send an email, or an IM.