

SYLLABUS**General Information**

Lectures	: Mon Wed Fri, 5:00 pm – 5:50 pm, NSC 222
Website	: https://ublearns.buffalo.edu/
Instructor	: Dr. Richard J. Gonsalves
Office hours	: Tu Th 11:00 am – 12:00 noon, 323 Fronczak, or by appointment
Phone	: (716) 645-2017 Ext. 191
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Course Description

This course integrates the elements of numerical analysis and computer programming in C||C++ to study a variety of problems in classical, quantum, and statistical physics. The course will cover basic numerical operations: root finding, interpolation, matrix inversion, numerical differentiation, and quadrature. Numerical techniques will include solution of linear and nonlinear differential equations of classical and quantum physics, boundary-value and eigenvalue problems, statistical analysis of data, the Fast Fourier Transform, and computer graphics. The course will be organized in the following biweekly topics: (1) Data Analysis, (2) Random Sampling, (3) Orbital Motion, (4) Chaotic Dynamics, (5) Quantum Eigenstates, (6) Phase Transitions, and (7) Electric Fields.

Required Background

This course assumes familiarity with undergraduate physics at the junior/senior level. You should have passed PHY 301, PHY 401, and PHY 403, or equivalent courses, or be taking them concurrently. If you are not a physics major, a strong background in undergraduate mathematics or computer science should suffice if you spend extra time to learn the physics background required for each topic. Familiarity with a programming language will be helpful, but is not required. Programming in C++ will be covered thoroughly but rapidly in lecture. If you are not familiar with C or C++ you should spend extra time very early in the course to bring yourself up to speed.

Required Materials

Access to an adequate personal computer is essential for this course. You can use any operating system which supports a C++ development environment: Windows (XP Professional or Vista Business), Macintosh (OS X 10.4 or later), or Linux (e.g. Ubuntu). All required software for this course can be downloaded for free. There is no required textbook for this course. Detailed lecture notes and online references will be provided.

Course Expectations

To succeed in this course you should read the lecture notes and posted materials before lecture, attend class and participate actively in discussion and quizzes, complete the weekly homework assignments on time, and take the final exam. Exceptions will be made only for documented medical reasons or major emergencies.

Homework Assignments

Homework will be assigned weekly. Each assignment will consist of three problems. PHY 410 students may choose to submit any two of the three problems. PHY 505 students must submit all three problems. Each

assignment report must be formatted as a single PDF file and uploaded to the Digital Dropbox on UBlerns before 11:59 pm on the due date (usually the following Sunday). Homework assignments will count for 60% of your course grade. Your two lowest assignment scores will be dropped in computing your final grade.

Class Participation

There will be brief quizzes in each lecture. The best way to prepare for quizzes is to read the lecture notes before class. Credit will be given for participation and for correct responses. Quiz grades will count for 20% of your course grade. Your lowest 20% of quiz scores will be dropped in computing your final grade.

Final Exam

A three-hour final exam will be scheduled during finals week. The exam will be paper based and consist of short questions on physics, numerical analysis, and computer programming. PHY 410 and PHY 505 will be given separate exams. The exam will be closed book/computer. You may bring with you two 8.5" × 11" sheets if you wish. The final exam will count for 20% of your course grade.

Letter Grades

An aggregate numerical grade of at least 50% will be required to pass this course. PHY 410 and 505 students will be assigned letter grades on separate curves. In past semesters the cutoff for an A grade has been approximately 85%. If you maintain a passing average on the quizzes and homework assignments but miss the final exam with a valid excuse, you may request an Incomplete (I) grade for the course. Incomplete work must be made up when the course is offered again, and before the default deadline.

Important Deadlines

The last day to drop this course without financial liability is Friday, September 4, 2009. The last day to drop this course without an "R" grade is Friday September 11, 2009. If you find that you are failing the course, or if you wish to withdraw from the course for any reason, you may resign with an "R" grade on or before Friday, November 13, 2009.

Academic Integrity

Academic integrity is a core value underlying all scholarly activity in the Department of Physics. Please review UB undergraduate policy at <http://undergrad-catalog.buffalo.edu/policies/course/integrity.shtml> or graduate policy in http://www.grad.buffalo.edu/policies/academic_integrity.pdf. You are encouraged to discuss class material and assignments with your colleagues. However, you should code and run your simulations yourself, and your homework writeup must be entirely your own effort. If you copy and/or modify code from any source for your assignments you should acknowledge this with an appropriate citation in your writeup.

Students with Disabilities

If you have a disability, (physical or psychological) and require reasonable accommodations to enable you to participate in this course, such as note takers, readers, or extended time on exams and assignments, please contact the Office of Disability Services, 25 Capen Hall, 645-2608, <http://www.student-affairs.buffalo.edu/ods/>, and also see me during the first two weeks of class. ODS will provide you with information and review appropriate arrangements for reasonable accommodations.