Physics 305: Computational Physics

Spring 2012

Professor Gary S. Varner
Updated 3/25/2012

News:

- **There will be two in-class presentations as warm up for your Final Project presentation**
- **Final Project presentations: [link]**

- Detailed course schedule information **(updated: 25-MAR-2012)**
- **Assignments page [link]**

Important Course Information:

- Class meets (odd hours!) **Tuesday 12:30pm - 3:20pm**, **Wednesday 1:30pm - 3:20pm** in **Watanabe Hall room 415A**
- Instructor: Gary Varner   Office: WAT 333   Laboratory: WAT 214
- e-mail: varner#phys.hawaii.edu, varner#hawaii.edu
- Office Hours: Monday 4-5pm in   **WAT 214** (or other times by arrangement)
- Course WWW page: http://www.phys.hawaii.edu/~varner/PHYS305-Spr12/PHYS305_Spr2012.html
- **Student Learning Objectives** for this course are detailed here
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Prerequisites: Math 242. **Calculus is used in this course.**
Text: **A First Course in Computational Physics and Object-Oriented Programming with C++**

Grading: Assignments 40%, Final Presentation 20%, Final Report 30%, In-class 10%.
This is a **Writing Intensive** course, and posted assignments will be graded for correctness and written quality.

The course is project/assignment based: there are no exams (assignments test mastery).

C++, like any programming language, is a *language*, and practice is essential to mastery!

- **Final Project Presentations: to be confirmed -- possibly Tuesday May 8th @ 13:00 noon**

PHYS305 Course Syllabus			Spring 2012 - TW	GSV	25-Mar-12			
Week	Date	Programming Topic	CompPhys Topic	Chap # Reading	Lab # Assigned	Lab # Due	Project Deadlines	Study Notes	Notes
1	10-Jan-12	Intro to programming	Circle area and series calculation	1-3					
	11-Jan-12			4, 5	1				
2	17-Jan-12	Flow Control, Operators	Computational precision	5, 8, 11					
	18-Jan-12				2	1			
3	24-Jan-12	Input and Output Streams	Computational precision	5,8,11,12				keep reading/programming	
	25-Jan-12								GSV --> KAN
4	31-Jan-12	OOP Analysis	Numerical Error analysis/Deriv	5,8,11,12	3				
	1-Feb-12					2			
5	7-Feb-12	OOP Syntax	Integration	6, 13	4				
	8-Feb-12					3			GSV --> KAN
6	14-Feb-12	File I/O	Root finding	7					
	15-Feb-12					4			
7	21-Feb-12	Advanced Graphics I	Differential Equations (I)	8,9	TOPIC, 5				
	22-Feb-12								
8	28-Feb-12	Advanced Graphics II	Monte Carlo Methods	22	6				GSV --> KAN
	29-Feb-12					5	Topic		
9	6-Mar-12	Efficient Programming	Random Deviates		7				
	7-Mar-12					6			
10	13-Mar-12	A little cint	Isotope Decays		Proposal				
	14-Mar-12								
11	20-Mar-12	root I	Differential Equations (II)			7			
	21-Mar-12					Proposal	Proposal		
12	27-Mar-12		Spring Break						
	28-Mar-12								
13	3-Apr-12	root II	Signal fitting		8			keep reading/programming	
	4-Apr-12								
14	10-Apr-12	GEANT	Advanced Monte Carlo			A8		exercises 1-6 due (don't need to write up)	
	11-Apr-12								
15	17-Apr-12	benchmarking	Important Sampling		Kernel	8		Final Project Work	
	18-Apr-12								
16	24-Apr-12	cvs, svn code management	Kalman Filtering and error handling		Review	Kernel		Final Project Work	
	25-Apr-12								
17	1-May-12					Review		Final Project Work	
	2-May-12								
	8-May-12		Final Student Project presentations						

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Spring 2012 -- Assignments Page

Assignments:

- **Lab #1**:   Dev-C++ and C++ programming basics   **[completed]**
- **Lab #2:**   Fibonacci numbers and Recursion   **[completed]**
- **Lab #3:**   Derivatives and Numerical Error   **[completed]**
- **Lab #4:**   Integration   **[completed]**
- **Project Topic:**   Initial Thoughts for your project   **[completed]**
- **Lab #5:**   Random Walks   **[completed]**
- **Lab #6:**   Monte Carlo Integration   **[completed]**
- **Lab #7:**   Radioactive Isotope decay, radio Carbon dating   **[completed]**
- **Project Proposal:**   Detailed project concept   **[completed]**
- **Spring Break: March 26 - 30   [all above assignments must be completed]**
- **Lab #8:**   Numerical Solutions of Differential Equations: Euler's method, Runge-Kutta, and hitting a Home Run   **[Exercises 1-6 due April 10, write up Ex. 7-8 due April 17]**
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- **Project Kernel**:   **In class** presentation (April 24)   [**link**]
- **Project Review**:   **In class** presentation (May 1)   [**link**]
- **Final Project Presentation**:   **WAT415A @ time to be determined**
- **Final Project Write-up**:   **posted on your website, along with relevant code to run** [**Tuesday, May 10th (@5:00 pm)**]

Student Reports: **[link]**

Resources

- Sample paper, for examples of how to do scientific references
- Useful tools [link]

Projects

Project requirements summary and some suggestions

NEW **PROJECT RESOURCES**

Last modified: 3/25/2012

PHYS305 Student Learning Outcomes

Successful completion of this course will require students to master the following subject material.

1. The basics of the C/C++ programming language, as a tool for solving physics problems with a computer
2. Scientific Programming
3. Numerical Integration and Differentiation techniques
4. Monte Carlo estimates
5. Stochastic process modelling
6. Data manipulation, plotting, and fitting
7. Final student project that demonstrates mastery of these techniques
8. Effective communication of results obtained when applied to classical problems in physics
9. Well written, web-based documentation of procedures and code developed

Last updated: 11-JAN-2011 == GSV