

COMPUTATIONAL PHYSICS -- PH322 SPRING TERM 2008

Instructor: Dr. Erik Bodegom
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Office Hours: Monday 11-12:00 and by appointment, room 128 SB2
Text(s): N. Giordano and H. Nakanishi – “Computational Physics” 2nd edition
 Also see: <http://www.physics.purdue.edu/~hisao/book/> additional material: handed out as needed
Other books that might be useful (or later when you grow up ☺):
 Numerical Recipes–Press, Teukolsky, etc. Old version: <http://www.nr.com/oldverswitcher.html>
 Similar to Giordano: A first course in computational physics – DeVries
 Similar to Giordano: Computational Physics – Landau and Paez

Grading: Grade= (homework 30%+final (in class) 30%+ project 20%+ class participation + quizzes 20%)
Grader: Matt Gorby (mgorby@gmail.com)
Homework: Emailed: format: ESB (*that is YOUR 3 initials*)_(*number of homework*).7z, each exercise starts after input from the grader. Send your homework to the grader. Failure will net you a zero. **No late** homework accepted. The worst homework grade will not be counted. Language: Python

Syllabus (subject to revision: more quizzes to be announced)

Week	Week	Tuesday/Thursday - Reading	Assign#	Assignments (due Thursday, by email)	HW Pts out of:
3/31	1	Ch 1, Appendix A		Quiz 1: Thursday, Ch 1.	
4/7	2	Ch 2, Appendix D	1	1: 1, 4, 6, Quiz 2: Thursday, Python	3
4/14	3	Ap. B, Ch. 3	2	2: 2, 9, wlsq, Quiz 3: Thursday, torture of some sort	4
4/18		<i>Friday 5pm Hoffman Hall</i>		Lecture by Doug Osheroff + refreshments	
4/21	4	Ch. 3 and Ap. C	3	2: 14, 18, see 2 problems below	4
4/28	5	Ch. 4	4	See 2 problems below, 3: 2, 12	4
5/5	6	Ch. 5 and 6	5	3: 22, 34, 37, 4: 4, 8	5
5/12	7	Ch. 6 and Ap. E	6	4: 10, 17, 19, 5: 4	4
5/19	8	Ap. F	7	5: 9, 6: 1, 9. Presentation of project proposals	3
5/26	9	Ch7	8	F: 1, 3 and below	4
6/2	10	Ch. 8 and 9	9	E: 2, 5, 7, 7: 2, 12	5
6/9		Final 6/10: 1015-1205		Project due	

- 3_3: Find the root of $f(x)=\cos(x)-x=0$ by the method of bisection. How many iterations are necessary to determine the root to eight significant figures?
- 3_4: Repeat 3_3 by using Newton-Raphson and the secant method. Compare the effort to find the roots with 3_3.
- 4_1: Use N-R to solve $x^{2/3}-169=0$.
- 4_2: Find the extremum of $2x^4-x^3-x^2+17$ between: -10 and 10 .
- 8_3: Evaluate the integral $\int_0^\pi \sin^3 x dx$ using approximations to the integrand that are piecewise linear, quadratic and quartic. With N intervals, and hence $N+1$ points, evaluate the integral for $N=4, 8, 16, \dots, 1024$, and compare the accuracy of the methods.
- 8_4: Numerically integrate the Fresnel integrals: $C(v) = \int_0^v \cos(\pi w^2/2) dw$ and $S(v) = \int_0^v \sin(\pi w^2/2) dw$ and evaluate: $I/I_0=0.5 \{ |C(v)+0.5|^2 + |S(v)+0.5|^2 \}$ and plot the results. This is the pattern of diffraction at a knife edge.