

COMPUTATIONAL PHYSICS -- PH322

SPRING TERM 2007

Instructor: Dr. Erik Bodegom
Phone/E-Mail: 725-3891 - Bodegom@pdx.edu
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
<http://physics.pdx.edu/~d4eb/ph322>

Other books that might be useful (or later when you grow up ☺):

The big resource: “Numerical Recipes in Fortran” – Press, Teukolsky, et al.
 “A first course in computational physics” – DeVries
 “Computational Physics” – Landau and Paez

Grading: Grade= (homework 40%+final (in class) 30%+ project 20%+ class participation 10%)*{1,0}

Grader: Jason Vielma: vielmaj@pdx.edu

Homework: Emailed: format: ESB (*that is YOUR 3 initials*)_(*number of homework*).zip, each exercise starts after input from the grader. Send your homework to Jason. Failure will net you a zero. **No late** homework accepted. The worst homework grade will not be counted. Language: Python

Syllabus (subject to revision)

Week	Week	Tuesday/Thursday - Reading	Assign#	Assignments (due Sunday, by email)	Pts out of:
4/2	1	Ch 1, Appendix A, D	1	1: 1, 4, 6	3
4/9	2	Ch 2, Appendix D	2	2: 2, 9, wlsq	4
4/16	3	Ap. B, C Ch. 3	3	2: 14, 18, see 2 problems below	4
4/23	4	Ch. 3 and Ap. C	4	See 2 problems below, 3: 2, 12	3
4/30	5	Ch. 4	5	3: 22, 34, 37, 4: 4, 8	4
5/7	6	Ch. 5 and 6	6	4: 10, 17, 19, 5: 4	4
5/14	7	Ch. 6 and Ap. E	7	5: 9, 6: 1, 9	3
5/21	8	Ap. E, F, and Ch. 7	8	F: 1, 3 and below	4
5/28	9	Ch7, Ap. F	9	E: 2, 5, 7	3
6/4	10	Ch. 8 and 9	10	7: 2, 12	3
6/11		Final 6/12: 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_1 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 x^2-2x-2 between 0 and 10.

8_3: Evaluate the integral $\int_0^\pi \sin x dx$ 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.