

COMPUTATIONAL PHYSICS -- PH322

SPRING TERM 2011

Instructor: Dr. Erik Bodegom
Phone/E-Mail: 725-4230 – Bodegom@pdx.edu, we will use D2L (<http://d2l.pdx.edu>) for submission of homework.
Office Hours: Tuesday 11-12:00 and by appointment, room 150 SB2
Text(s): N. Giordano and H. Nakanishi – “Computational Physics” 2nd edition
 Also see: <http://www.physics.purdue.edu/~hisao/book/> and 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 35%+final (in class) 25%+ project 15%+ class participation 10 % + quizzes 25%)
Grader: Will Porter (wporter@pdx.edu)
Homework: **Homework submitted on D2L.** Format: XYZ (*that is YOUR 3 initials*)_(*number of homework assignment*).7z, each exercise should start after input from the grader. Failure will net you a zero.
No late homework accepted. The worst homework grade will not be counted. Language: MATLAB
Plagiarism: Collaboration is encouraged; copying wholesale from anybody else will result at a minimum in a grade of zero for the assignment. That means no plagiarism! Further sanctions are possible.

Syllabus (subject to revision)

Week	Week	Monday/Wednesday – Reading	Assign#	Assignments (due Thursday, to D2L)	HW Pts out of:
3/28	1	Ch 1, Appendix A		Quiz 0: today and Quiz 1: Wednesday, Ch 1.	
4/4	2	Ch 2, Appendix D	1	1: 1, 4, 6, Quiz 2: Wednesday, MATLAB	3
4/11	3	Ap. B, Ch. 3	2	2: 2, 9, and wlsq, Quiz 3: Wednesday	3
4/18	4	Ch. 3 and Ap. C	3	2: 14, 18, and two problems below (3_3 and 3_4)	4
4/25	5	Ch. 4	4	See two problems below (4_1 and 4_2), and 3: 2, 12. Quiz 4.	4
5/2	6	Ch. 5 and 6	5	3: 22, 34, 37, and 4: 4, 8	5
5/9	7	Ch. 6 and Ap. E	6	4: 10, 17, 19, and 5: 4. Quiz 5.	4
5/16	8	Ap. F	7	5: 9, and 6: 1, 9. Presentation of project proposals	3
5/23	9	Ch7	8	E: 2, 5, 7 and two problems below: 8_3 and 8_4. Quiz 6.	4
5/30	10	Ch. 8 and 9	9	F: 1, 3, and 7: 2, 12	5
6/9		Final 6/9 (Thursday): 1230-1420		Project due: submit to D2L (zipped if more than 1 file: name it XYZ_project.7z with YOUR 3 initials replacing XYZ!)	

- 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 an extremum of $2x^4 - x^3 - x^2 + 17$ between: -10 and 10 . There might be multiple extrema, find at least one.
- 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.

Some other dates:

4/10 Last day to drop classes without a W. 5/15 Last day to change grading option.
 5/30 Memorial Day – Holiday!