UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS and ASTRONOMY
COURSE OUTLINE

1. Phys581, Computational Physics

Lecture(s)/Time: TR 11:00-13:30, ST 026

Instructor: Dr. R. Ouyed, Office: Science B 515, **Phone:** 210-8418, **email:** rouyed@ucalgary.ca, **Office Hours:** Tu 10:00 – 11:00, TR 10:00 – 11:00 or ***call 210-8418 for an appointment***

Course Website: http://www.pjl.ucalgary.ca/courses/physics581.html

D2L IS NOT USED FOR THIS COURSE

2. PREREQUISITES: Physics 481, 455; **Prerequisite:** Physics 443, or Chemistry 373

3. GRADING: The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments (2)/labs (3)	60%	(30% Labs. & 30% Assgns.)
Midterm Test (1)	10%	(2 hours: Feb. 24th, in-class)
Final (Laboratory) Examination	30%	(TBD: Apr. 14th, in-class)

Students who fail the Final Examination should not expect to receive a course grade higher than "D+".

The conversion between course percentage and letter grade is given in the syllabus below.

NOTE – No individual component of the course will have its grade scaled or "curved". However, the ***final*** grade for the course may be scaled or "curved" upwards at the discretion of the instructor. Final grades will never be scaled lower.

4. Missed Components of Term Work. The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: **http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html**. It is the student's responsibility to familiarize himself/herself with these regulations. See also **http://www.ucalgary.ca/pubs/calendar/current/e-3.html**.

5. REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. TEXTBOOK: ***"Computational Physics 1st ed"***, Ouyed & Dobler (2010)
The textbook is accessible online at http://www.pjl.ucalgary.ca/course/physics581.html.
Students should bear in mind that many chapters in the full edition will not be used (see attached Syllabus).

7. EXAMINATION POLICY: [Statement regarding aids allowed on tests and examinations (e.g., calculator, open book, etc.).]
Students are encouraged to read the Calendar, Section G, on Examinations:
http://www.ucalgary.ca/pubs/calendar/current/g.html.

Department Approval_____ **Date**_____

Associate Dean's Approval for Alternate final examination arrangements:

_____**Date:**_____

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) ACADEMIC MISCONDUCT (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (**http://www.ucalgary.ca/pubs/calendar/current/k.html**) to inform yourself of definitions, processes and penalties

(b) ASSEMBLY POINTS in case of emergency during class time. Be sure to FAMILIARIZE YOURSELF with the information at http://www.ucalgary.ca/emergencyplan/assemblypoints.

(c) ACADEMIC ACCOMMODATION POLICY. Students with documentable disabilities are referred to the following links:
Calendar entry on students with disabilities: **http://www.ucalgary.ca/pubs/calendar/current/b-1.html**
Disability Resource Centre: **http://www.ucalgary.ca/drc/**

(d) SAFEWALK: Campus Security will escort individuals day or night (**http://www.ucalgary.ca/security/safewalk/**). Call **220-5333** for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) FREEDOM OF INFORMATION AND PRIVACY: This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence**, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page**. For more information see also **http://www.ucalgary.ca/secretariat/privacy.**

(f) STUDENT UNION INFORMATION: VP Academic **Phone**: 220-3911 **Email**: suvpaca@ucagary.ca.
SU Faculty Rep. **Phone:** 220-3913 **Email:** sciencerep@su.ucalgary.ca Website **http://www.su.ucalgary.ca/home/contact.html**.
Student Ombudsman: **http://www.su.ucalgary.ca/services/student-services/student-rights.html**

(i) INTERNET and ELECTRONIC COMMUNICATION DEVICE Information. You can assume that in all classes that you attend, **your cell phone should be turned off**. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

COURSE SYLLABUS

Phys 581 starts by exposing the students the notion of Random Numbers in Physics and Computation followed by advanced Monte Carlo Methods including Metropolis-Hasting and Simulated annealing (optimization techniques). The second part deals with advanced Fourier techniques (Fourier series, Fourier Transforms, DFT, FFT) with applications to signal analysis and image analysis with applications in academia and practitioner's world. The last part deals with coupled non-linear Partial Differential Equations with introduction to finite-difference techniques. The student MUST be very comfortable with tools used in Phys 381 and Phsy481 (see list below).

The following syllabus is based on Ouyed&Dobler textbook notes (http://www.pjl.ucalgary.ca/courses/physics581.html):

The following topics are covered in depth:

- Random Numbers and Monte Carlo Techniques *[Chapter 9 in Ouyed&Dobler]*
- Optimization and Simulated Annealing *[Chapter 10 in Ouyed&Dobler]*
- Fourier Analysis (Series, Transforms, DFT, FFT) *[Chapter 11 in Ouyed&Dobler]*
- PDEs, Finite-difference, Fluid dynamics simulations *[Chapter 12 in Ouyed&Dobler]*

TOOLS/LANGUAGE/SYSTEM: ***MAKEFILES, EMACS, GNUPLOT, LATEX, FORTRAN-95, LINUX, Mathematica***

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Conversion between course percentage and letter grades:

95 - 100%	A+
90 - 94.9%	A
85 - 89.9%	A-
80 - 84.9%	B+
75 - 79.9%	B
70 - 74.9%	B-
65 - 69.9%	C+
60 - 64.9%	C
55 - 59.9%	C-
50 - 54.9%	D+
45 - 49.9%	D
0 - 44.9%	F

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