



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE OUTLINE

1. **Course:** PHYS 481 Computational Physics II Fall 2017

Instructor: Dr. Brian Jackel | SB 627 | (403) 220-4271 | bjackel@ucalgary.ca | Office Hours: TR 14:30 – 15:30 or call for an appointment

Lecture Sections: LEC 1 | T 15:30 - 16:20 | ST 026

Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

2. **Prerequisites:** PHYS 381; and PHYS 325 or CHEM 373. (Please see University Calendar for more description.)

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 (8)	50%
Midterm Exam	20% (take home)
Final Exam	30% (take home)

Percentage to letter grade conversion scale:

> = 95 %	A +	> = 80 %	B +	> = 65 %	C +	> = 50 %	D +
> = 90 %	A	> = 75 %	B	> = 60 %	C	> = 45 %	D
> = 85 %	A -	> = 70 %	B -	> = 55 %	C -	< 45 %	F

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](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar.

5. **Scheduled out-of-class activities:** N/A

6. **Course Materials:** Notes and supplementary material to be provided on D2L.

Online Course Components: All course material to be provided on D2L

7. **Examination Policy:** N/A

8. **Approved Mandatory and Optional Course Supplemental Fees:** None

9. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

10. Human studies statement: Students in the course will not be expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar.

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Misconduct:** 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 [Section K](#). Student Misconduct 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 on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics and Astronomy, Dr. David Feder, by email (dfeder@ucalgary.ca) or by phone (403.220.3638).
- (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 is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). 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@ucalgary.ca.
SU Faculty Rep: Phone: 220-3913
Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca
Student Ombuds Office: 403 220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. 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.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

12. OTHER COURSE RELATED INFORMATION:

- (a) **Course Description**
Solution of problems associated with the analysis of physical systems, using digital computers, high level programming languages, and mathematical computation systems.
- (b) **Course Learning Outcomes**
At the end of this course, students should be able to:

- Design and implement working Python code.
- Display information and data for analysis in scientific problems.
- Undertake projects requiring higher computational analysis.

(c) **Course Learning Incomes**

Students taking PHYS 481 are expected to have prior knowledge of Python and experience with numerical integration and the solution of differential equations. Previous exposure to classical mechanics and modern physics would be advantageous.

(d) **Syllabus**

PHYS 481 deals with the basic mathematical, numerical, and conceptual elements needed for using a computer as a virtual physical science laboratory. Topics will include:

- *Efficient vectorized calculations with NumPy (Game of life)*
- *Random number generation, distributions, moments, and entropy*
- *1-D and 2-D Ising model*
- *1-D and 2-D Fourier transforms and filtering (audio and images)*
- *1-D and 2-D Laplace's equation (electrostatics)*
- *1-D Schrodinger's equation (quantum mechanics)*
- *Scientific data formats (FITS solar spectra, Balmer absorption)*

Department Approval _____ Date _____