



### COURSE OUTLINE

1. **Course:** PHYS 581, Computational Physics III - Winter 2020

Lecture 01: T 11:00 - 11:50 in ST 026

Instructor	Email	Phone	Office	Hours
Dr Rachid Ouyed	rouyed@ucalgary.ca	403 220-8418	SB 515	Tuesdays and Thursdays: 10:00-11:00 (Room: SB 515)

**Course Site:**

D2L: PHYS 581 L01-(Winter 2020)-Computational Physics III

**Note:** Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

**Prerequisite(s):**

Physics 481 and Mathematics 433 or Physics 435. Also known as: (formerly Physics 535)

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %
Assignments (3)	24%
Labs (3)	24%
Report+Presentations	20%
Final	32%

Labs consist of practise problems and exercises related to the topics covered in the course. The labs involve the development of codes and the use of software to solve the problems. The student is evaluated based on their understanding of the material, their skills at code development and on their lab write-ups.

The presentations are meant to be complementary to course material encouraging the students to “think outside the box” and add their input to the topics covered in class. The presentations will take place during class and will be marked based on the content, clarity and innovation.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student’s grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
<b>Minimum % Required</b>	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

This course has a registrar scheduled final exam.

4. **Missed Components Of Term Work:**

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section M.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hrs.

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 themselves with these regulations. See also

[Section E.3](#) of the University Calendar.

**5. Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

**6. Course Materials:**

4. "Computational Physics 1st ed", Ouyed & Dobler (2010)  
The textbook is accessible online at <http://www.quarknova.ca/courses/physics581.html>.

**7. Examination Policy:**

Students are allowed access to PJJ Lab posted material.

Students should also read the Calendar, [Section G](#), on Examinations.

**8. Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course

**9. Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also [Section E.2](#) of the University Calendar.

**10. Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

**11. Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

**12. Other Important Information For Students:**

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all

community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208).

- d. **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. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** 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 [procedure-for-accommodations-for-students-with-disabilities.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 & Astronomy, Dr. David Feder by email [phas.ahugrd@ucalgary.ca](mailto:phas.ahugrd@ucalgary.ca) or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). 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 [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca).
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- l. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

## The schedule:

Lab 1 (due Feb. 4) : Chapter 9&10 (MC Methods)  
Lab 2 (due Mar. 3) : Chapter 11 (Fourier Analysis)  
Lab 3 (due Apr. 2) : Chapter 12 (PDEs/Fluids)

Assgn 1 (due Feb. 11) : Chapter 9&10 (MC Methods)  
Assgn 2 (due Mar. 10) : Chapter 11 (Fourier Analysis)  
Assgn 3 (due Apr. 09) : Chapter 12 (PDEs/Fluids)

Present. 1 (due Feb. 13) : Chapter 9&10 (MC Methods)  
Present. 2 (due Mar. 12) : Chapter 11 (Fourier Analysis)  
Present. 3 (due Apr. 14) : Chapter 12 (PDEs/Fluids)

## Course Incomes:

- 1. Understanding of numerical techniques covered in Phys 381 and Phys 481
- (e.g. interpolation, extrapolation, least square fitting, cubic spline fitting, Runge-Kutta, Root Finding, Numerical Integration)
- 2. Knowledge of a modern programming language (e.g. F95, Python, Java, C++)
- 3. Design, compilation and development of a working code.
- 4. Knowledge of usage of modern numerical software (e.g. Mathematica, Matlab) and editing software (e.g. Latex, Emacs)
- 5. Previous exposure to classical mechanics and modern physics.

## Course Outcomes:

- Assess how problems in physics and astrophysics can be recast into computationally solvable problems
- Construct logic and flow approaches to physical solutions to more complex physical and astrophysical problems. Determine which aspects of a physical problem are best served by computational or numerical analysis
- To understand how their graduate research will be advanced by the use of modern scientific computing skills and tools
- The ability to analyse more complex physics and astrophysics problems using more advanced numerical techniques.
- Grasp the importance of the use of random numbers in physics and astrophysics
- Master the world of Monte-Carlo techniques and its ramification to various problems in academia and beyond academia.
- Develop a keen sense of analysis of differential equations with a much wider application in physics and astrophysics
- How to use Finite-difference, Finite-volume and Finite-elements methods to problems in hydrodynamics, plasma physics and other known physical and astrophysical problems.
- How to apply of Fast Fourier Transform to a wide variety of real problems in physics, signal analysis, engineering etc ...

Electronically Approved - Jan 07 2020 11:53

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## Department Approval