Syllabus Introduction to Computational Physics
PHYS F220 F01 – Spring 2018

Credits:	4.0
Laboratory:	Noyes Lab, REIC Thur 08:00 – 11:00
Lecture:	REIC 165 MWF 13:00 – 14:00
Prerequisites:	MATH F202X; PHYS F211X; PHYS F212X; PHYS F213X; or permission of instructor.
Instructor:	Martin Truffer
Office:	ELVE 401D (Geophysical Institute or GI)
Office Hours:	During all laboratory periods, 12-1:00 pm MWF at REIC or at the GI by appointment. My schedule at the GI is uncertain; please arrange an appointment via email or telephone prior to visiting.
Contact:	ELVE 401D 474-5359 (V,VM) Email mtruffer2@alaska.edu
Website:	I will post all course material, syllabus, homework assignments, labs, solutions, and sample code on Google Classroom.
Text:	The course curriculum is based on *Computational Physics, 2nd Ed.* by Giordano and Nakanishi. The book is not required, but does provide useful additional information. However, it is Fortran based, and we will program in Python in this class. I will distribute a manuscript with lecture notes that are based on this book for your use. A good Python based book is *Computational Physics* by M. Newman. Much of that material is available online at http://www-personal.umich.edu/~mejn/computational-physics/ Generally, there are many online resources for help with Python, and you're encouraged to spend some effort finding one that suits you well.
Grading:	

Mid-term Exam	20%
Final Exam	20%
Homework	15%
Project	20%
Laboratory	15%
Participation	10%

Grades will be based on the weights given here and ± modifiers will be used. Letter grade ranges will be assigned as follows: A+ [97-100%], A [93-96%], A- [90-92%], B+ [87-89%], B [83-86%], B- [80-82%], C+ [77-79%], C [73-76%], C- [70-72%], D+ [67-69%], D [63-66%], D- [60-62%] and F [<60%].

Course Description:	This course is intended as an introduction to the art and science of solving physics problems with a computer. The computer will be used as a tool to provide insight into physical systems and their behavior in all areas of physics. It is designed for undergraduate students who have completed their introductory coursework in physics and calculus. The course combines lectures and computer laboratory exercises.
Learning outcomes:	The overarching goal of this course is to teach you how to think critically about using the computer as a tool for understanding the physical world. Specific goals are: 1) Learn to develop numerical algorithms and turn them into workable code.

	2) Learn to solve ordinary differential equations using computational tools. 3) Introduce computational data handling tools, such as the Fast Fourier Transform and simple data fitting. 4) Introduce the numerical solution of partial differential equations 5) Understand the concept of using random walks to solve physical problems The course will have succeeded if you will know the necessary tools to address problems in physics that cannot be solved analytically, and if you feel comfortable using these tools.
Lab Sessions:	There is a weekly 3-hour lab session associated with this course. Please note that the first lab session will not take place until Thursday, 25 January 2018. Each week you will have a laboratory session involving problems in computational physics. You should be able to complete the bulk of your lab work and report during the laboratory session. **During the lab sessions you should not expect me to provide answers to your every question, as the laboratory is a place of self-discovery.**
Homework:	Weekly homework assignments are based on the lectures and labs. These assignments will be due one week after they are assigned.
Participation:	You are expected to fully attend both the laboratory and lecture sessions. Planned absences should be discussed with me in advance. Habitual tardiness or absenteeism affects not only your own performance, but also that of your classmates. Assessment will be based on your contributions to class discussions and laboratory investigations.
Project:	You will choose a computational physics problem of your own, develop and execute a solution. You are encouraged to develop your own idea, but extensions to lab problems (add more physics) are suitable topics. The textbook, other books, and the internet offer many suggestions for suitable projects. You are encouraged to discuss these with the instructor. A written project proposal will be submitted not later than the lecture session of 9 March. The project proposal should be no longer than 2 typewritten pages. It includes a fitting title, concise abstract, a description of the physics addressed in the project, a short description of the numerical methods used, and a list of expected results (figures, code, etc). The instructor will provide feedback on the content of this proposal, as well as the writing. The project proposal is part of the final project grade. You will submit a complete, written solution of the problem, to include working codes, prior to the beginning of the final scheduled lecture. The final report will be an expanded version of the Project Proposal with title, abstract, explanation of the physics investigated, description of the numerical method, presentation of results, a conclusion, and a bibliography. The expected length of the report is about 4 pages. You should also submit all working code as an appendix (in addition to these 4 pages). You will give a 10-minute presentation of your project to the class during the final lab session on 24 April. The presentation should be structured similarly to your written report. You will receive some additional guidance for making oral presentations during class, one or two weeks before the end of the semester.

Exams:	A one-hour mid-term examination will be given in lieu of lecture on 23 March. A two-hour final examination will be given 3 May, beginning at 13:00, per the UAF Exam Schedule. Both will be held in REIC 165.
Student Code of Conduct:	You are expected to submit work that is your own and properly acknowledge the work of others. You are responsible for understanding and adhering to the Student Code of Conduct that is printed in the UAF Course Catalog. **Abide By It.** Violations of the Code will be reported to the Dean of Students.
Disability Services:	If applicable, it is your responsibility to arrange for these services. The UAF Center for Health and Counseling provides services for UAF students with disabilities to ensure equal access to educational opportunities. The Center's Disability Services Program ensures compliance with §504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990. If you believe you are eligible for 504 and/or ADA accommodations, please contact them at 474-7043 (WHIT 203).