## PHYS 220: Introduction to Computational Physics Syllabus Spring 2015

**Instructor:** Prof. Hui Zhang
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Reichardt 108 (during office hours)

**Time:** Lectures: Mondays, Wednesdays, and Fridays, 1pm-2pm;
Labs: Thursdays, 8am-11am

**Place:** Lectures: REIC 165; Labs: WRRB 004 (LL level, West Ridge Research Building)

**Office Hours:** Mondays, Wednesdays, and Fridays 12:00-1:00pm, or by appointment.

**Credits:** 4 credits, 3 hours/week of lecture and 3 hours/week of lab

**Text Books:** *Computational Physics*, Giordano and Nakanishi, 2nd Edition, 2005, Publisher: Addison-Wesley, ISBN-13: 978-0131469907

*Matlab: A Practical Introduction to Programming and Problem Solving*, Stormy Attaway, 3rd edition, 2013, Publisher: Butterworth-Heinemann, ISBN-13: 978-0124058767 (an order version is available for "free" loan as an e-book from the UAF Library Goldmine system)

### Course Description

Physics 220 will serve as an introduction to the use of a computer to solve physics problems that are difficult or impossible to solve analytically. 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. Students carry out their work primarily using the MATLAB computing language. The overarching goal of this course is to teach students how to think critically about using the computer as a tool for understanding the physical world.

### Grading

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| Attendance and In-class Exercise | 10% |
| Homework Assignments (one every week) | 25% |
| Project | 20% |
| Quizzes (closed book) | 10% |
| One Mid-term Exam (closed book) | 15% |
| Cumulative Final Exam (1-3pm on May 5, Tuesday) | 20% |
| Total | 100% |

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|---|---|
| > 93 % | A |
| 90 % -- 93 % | A- |
| 87 % -- 90 % | B+ |
| 83 % -- 87 % | B |
| 80 % -- 83 % | B- |
| 77 % -- 80 % | C+ |
| 73 % -- 77 % | C |
| 70 % -- 73 % | C- |
| 67 % -- 70 % | D+ |
| 63 % -- 67 % | D |
| 60 % -- 63 % | D- |
| < 60 % | F |

**Course Policies**

- NO MAKE-UP QUIZZES OR EXAMS WILL BE GIVEN.
  If the student must miss a quiz or an exam, under rare circumstances where the student has a legitimate reason, the student must notify the instructor that the exam will be missed and present written verifiable proof of the reason for missing the exam, e.g., a doctors note, police report, court notice, etc., clearly stating the date AND time of the mitigating problem. If these conditions are met, the score on the comprehensive final exam will be substituted for the quiz or exam the student missed. Otherwise, a zero score will be assigned for the missed quiz or exam. In the event the Final Exam is not taken, under rare circumstances where the student has a legitimate reason for missing the final exam, a makeup exam will be administered.

- Homework assignments will be given through blackboard and are due by 5pm on the due date stated in the problem sets. Please submit a single file (.docx or .pdf format) containing your solutions through the appropriate Blackboard assignment link. Assignments turned in up to 1 day late will earn a 10% deduction; 2 days late, 20% deduction; 3 days late, 30% deduction; 4 days late, 50% deduction. Assignments submitted on or after the 5th day will not be graded and will earn zero.

- 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, 22 January 2015. You are expected to start working on the home assignments prior the lab sessions and complete the programming parts of the homework assignments 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.** This process may require outside reading/research prior to the day's lab session.

- Project:
  You will choose a computational physics problem of your own, develop and execute a solution. A written project proposal will be submitted not later than 5pm on March 11. You will submit a complete, written solution of the problem, to include working codes through the appropriate Blackboard assignment link by 5pm on May 1. You will give a 10-minute presentation of your project to the class during the final lab session on April 30.

- High ethical standards are essential for maintaining credibility. Plagiarism is defined as appropriating passages or ideas from another person's work and using them as one's own. You may work with your classmates on homework assignments, however, you should submit your own work, not a copy from another source. Keep in mind that you will be required to do similar problems on your own during an exam. Plagiarism on homework or on an exam will result in a failing grade.

**Students with Disabilities Notice**

The University of Alaska Fairbanks is committed to equal opportunity for students with disabilities. Students with disabilities are encouraged to contact the coordinator of Disability Services (Mary Matthews) at the Center for health & Counseling (x7043). See section on "Disability Services" of the UAF Class Schedule (http://www.uaf.edu/schedule/).

**Tentative Weekly Schedule**

| Week | Date | Lecture Subject | Problem Sets |
|---|---|---|---|
| 0 | F Jan 16 | Introduction/Syllabus | |
| 1 | M Jan 19 | **Alaska Civil Rights Day (no classes)** | |
| | W Jan 21 | MATLAB I | |
| | F Jan 23 | | |
| 2 | M Jan 26 | MATLAB II | Homework 1 is Due |
| | W Jan 28 | | |
| | F Jan 30 | | |
| 3 | M Feb 2 | Radioactive Decay | Homework 2 is Due |
| | W Feb 4 | | |
| | F Feb 6 | | |
| 4 | M Feb 9 | Realistic Projectile Motion | Homework 3 is Due |
| | W Feb 11 | | |
| | F Feb 13 | | |
| 5 | M Feb 16 | Realistic Projectile Motion (continued) | Homework 4 is Due |
| | W Feb 18 | | |
| | F Feb 20 | | |
| 6 | M Feb 23 | Oscillatory Motion and Chaos | Homework 5 is Due |
| | W Feb 25 | | |
| | F Feb 27 | | |
| 7 | M Mar 2 | Oscillatory Motion and Chaos (continued) | Homework 6 is Due |
| | W Mar 4 | | |
| | F Mar 6 | | |
| 8 | M Mar 9 | The Solar System<br>Review | Homework 7 is Due |
| | W Mar 11 | | Project proposal is due |
| | F Mar 13 | | |
| X | M Mar 16 | **Spring Break** | |
| | W Mar 18 | | |
| | F Mar 20 | | |
| 9 | M Mar 23 | Mid-term Exam<br>The Solar System (continued) | |
| | W Mar 25 | | |
| | F Mar 27 | | |
| 10 | M Mar 30 | Potentials and Fields | Homework 8 is Due |
| | W Apr 1 | | |
| | F Apr 3 | | |
| 11 | M Apr 6 | Potentials and Fields (continued) | Homework 9 is Due |
| | W Apr 8 | | |
| | F Apr 10 | | |
| 12 | M Apr 13 | Waves | Homework 10 is Due |
| | W Apr 15 | | |
| | F Apr 17 | | |
| 13 | M Apr 20 | Waves (continued) | Homework 11 is Due |
| | W Apr 22 | | |
| | F Apr 24 | **UAF Spring Fest (no classes)** | |
| | M Apr 27 | | Homework 12 is Due |

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| 14 | M Apr 27 | Random Systems | Homework 12 is Due |
| | W Apr 29 | | |
| | F May 1 | | Project is Due |
| 15 | M May 4 | Review | |
| | T May 5 | 1-3pm, Final Exam | |