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## SFSU Physics 220: General Physics with Calculus I

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Prof. Joseph Barranco

e-mail: barranco@sfsu.edu

Office: Thornton 308, (415) 338-2450

website: [www.physics.sfsu.edu/~barranco](http://www.physics.sfsu.edu/~barranco)

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### Lectures & Office Hours

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Section 01	MWF 13:10 – 14:00	Thornton 429
Section 02	MWF 14:10 – 15:00	Thornton 429
Office Hours	W 16:10 – 18:00	Thornton 308

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### E-mail

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So that I can identify and respond to e-mails from you expeditiously, please put **[PHYS220]** at the beginning of the subject line. Your emails should have a salutation/greeting, a body written with correct spelling & grammar, and a closing/signature. I will respond to email within **48 hours**. Please use email for administrative matters or short clarifications of lecture or homework problems. More extensive help with homework and/or detailed clarifications of lectures are best done in person in office hours.

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### Important Websites

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- (1) [ilearn.sfsu.edu](http://ilearn.sfsu.edu) – course website with most up-to-date schedule
  - (2) [www.webassign.com](http://www.webassign.com) – access to e-book and online homework
- Class key: **sfsu 5458 5177**

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### Course Overview

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This course is an introduction to Newtonian mechanics, which is the study of motion of macroscopic objects at speeds much less than the speed of light. Topics include: vector algebra, kinematics (position, velocity, acceleration, linear motion, projectile motion, circular motion, relative motion), Newton's Three Laws of Motion (inertia/inertial frames,  $\vec{F} = m\vec{a}$ , action-reaction) & the concept of force (weight, gravity, normal forces, tension, spring forces, friction, etc.), impulse & linear momentum, work & kinetic energy, potential energy & conservation of energy, elastic & inelastic collisions, torque & angular momentum, planetary motion, rigid body statics & dynamics, and oscillatory motion (springs, pendulums).

The triad of Physics 220 (mechanics), 230 (electricity & magnetism), and 240 (fluid mechanics, wave motion, optics, thermodynamics) is an almost complete introductory survey of “classical” physics, and serves as the foundation for advanced study for students concentrating in any of the physical sciences and/or engineering. Note that Physics 230 and 240 do not depend on each other and can be taken in either order after completing Physics 220 with a grade of at least C. Students (such as those studying pre-med/health/life sciences) who prefer a two semester, algebra/trig-based sequence covering the same material at less depth (but faster pace) should consider Physics 111 & 121.

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### Course Objectives

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- (1) Qualitatively and quantitatively describe motion and explain its causes.
- (2) Interpret graphs of mechanics concepts (e.g., position, velocity, and acceleration versus time; potential energy as a function of position, etc.); translate graphs into written/verbal descriptions and vice versa.
- (3) Model a real physical system by a more simplified system using the appropriate approximations; be aware of the underlying assumptions and limitations of any model.
- (4) Translate physical principles into the language of mathematics (algebra, geometry, trigonometry and calculus).
- (5) Understand and apply the fundamental conservation theorems (linear momentum, angular momentum, mechanical energy).

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### Course Format

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It is cliché, yet very much true that you cannot learn physics (or much of anything, actually) via osmosis. You must *do* physics. To facilitate the active-learning of physics, this course will operate in a “flipped” mode:

- (1) Before class, you will read the textbook and watch online videos on a given topic.
- (2) In class, you will work in pairs or groups of 3 on applying physics concepts to qualitative and quantitative problems.
- (3) After class, you will work through homework problems to reinforce concepts and applications.

*It is imperative that you check into iLearn frequently so that you know exactly what topics will be covered and what activities must be completed before, during, and after each class!*

## Student Learning Outcomes for Lower Division Science GE Classes

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- (1) Explain the steps in the scientific method of inquiry, which involves gathering observable, empirical and measurable evidence subject to specific principles of reasoning, and recognizing that reproducible observation of a result is necessary for a theory to be accepted as valid by the scientific community.
- (2) Analyze specific examples of how the scientific method has been used in the past to collect data through observation and experimentation, and to formulate, test and reformulate hypotheses about the physical universe; evaluate scientific information from a variety of sources and use that information to articulate well-reasoned responses to scientific concerns.
- (3) Evaluate scientific information from a variety of sources and use that information to articulate well-reasoned responses to scientific concerns.
- (4) Recognize the utility of alternative scientific hypotheses in the development of scientific theories, research and applications and understand how scientific evidence is used to develop hypotheses and theories.
- (5) Describe ethical dilemmas arising out of contemporary scientific research and applications, which may include those related to social justice, and may have implications for local and/or global communities.
- (6) Use scientific theories to explain phenomena observed in laboratory or field settings.
- (7) Discuss the relevance of major scientific theories and research to their lives.

## Prerequisites & Corequisites

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Because this course uses calculus, students must have completed the following prerequisites:

- (1) Math 226 (Calculus I) or its equivalent, with a grade of C or better. If you did not complete this requirement at SFSU, be prepared to supply proof (e.g., unofficial transcript from another institution, A.P. Calculus exam with score of 4 or 5) in the first week.

In addition, students must have previously completed OR be co-enrolled in the following:

- (2) Physics 222 (General Physics I Laboratory).
- (3) Math 227 (Calculus II).

**Please see me in the first week if you have any concerns about your preparation.**

## Required Learning Resources

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- (1) Serway & Jewett, Physics for Scientists & Engineers, 9th ed. with WebAssign Access:
 

Bookstore	spiral-bound textbook, access code for WebAssign homework and e-book	\$141.50
Online	access code for WebAssign homework and e-book	\$125.00.

 This is a one-time purchase for textbook and homework for all 3 courses Physics 220, 230 and 240!
- (2) i>clicker2, \$56 new, \$42 used, \$28 rent at SFSU Bookstore. **Please register your i>clicker2 on the ilearn course website (look for “Remote Registration”).**
- (3) Scientific calculator (graphing capabilities NOT necessary).
- (4) Reliable internet access.

## Assignment of Grades

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WebAssign Homework Assignments	20.0%
Class participation (iClicker)	05.0%
3 In-class Exams	37.5% (12.5% each)
Final Exam	37.5% (3 parts, 12.5% each)

“Resurrection Final” – The final is comprehensive: there will be 3 parts; each part consists of content corresponding to the 3 in-class exams. If you do better on a part of the final exam than you did on the corresponding in-class exam, then I will replace that in-class exam with the final exam score for that part. I want to reward students who show improvement over the course of the semester.

**There will be NO make-ups for any of the 3 in-class exams. Instead, the grade for the corresponding part of the Final Exam will be used in place of the missing in-class exam.**

Letter grades will assigned according to the following scheme:

A: 90.0% – 100.0%	A-: 85.0% – 89.9%	
B+: 80.0% – 84.9%	B: 75.0% – 79.9%	B-: 70.0% – 74.9%
C+: 65.0% – 69.9%	C: 60.0% – 64.9%	C-: 55.0% – 59.9%
D+: 50.0% – 54.9%	D: 45.0% – 49.9%	D-: 40.0% – 44.9%
		F: 00.0% – 39.9%

**Note that a minimum grade of C is required to move on to Physics 230 or 240!** Students who earn a grade of C- or lower will need to repeat Physics 220.

## Homework

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Homework is an integral part of the learning process; how seriously you take the homework will ultimately determine how much you will understand physics and how well you will do in the course overall. There will be approximately one homework assignment due per week. Homework will be submitted via WebAssign ([www.webassign.com](http://www.webassign.com)). One of the advantages of a system like WA is that your homework is graded immediately, and you will have the opportunity to correct your answers for full credit (up to 10 free attempts per numerical or symbolic problem, increasing penalties after 10 attempts up to 15 attempts, multiple choice have only 1 attempt). I *strongly* suggest first writing-up your solutions on paper, complete with diagrams and explanations, before logging into the WA system to enter your answers. That way, if you get the answer wrong, you can look over what you did to identify the error. Also, you will have a record of what you have done to aid you in studying for exams. *Although you will not be graded on diagrams and explanations in WA, you must include them on exams in order to get full credit!!*

**Policy on homework extensions:** Every student has one free homework extension without penalty. Extensions must be requested within 2 weeks of the assignment due date. Requests must be made within the WebAssign system. After the one free extension, additional extensions will result in a 50% penalty, unless there is a serious and compelling reason (e.g., medical emergency, death in immediate family; documentation is required).

## Preliminary Schedule (Subject to Change!!)

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Week 01	01/23 – 01/27	Vector algebra
Week 02	01/30 – 02/03	Motion in 1D
Week 03	02/06 – 02/10	Motion in 1D, Motion in 2D
Week 04	02/13 – 02/17	Motion in 2D
Week 05	02/20 – 02/24	Newton's Laws
Week 06	02/27 – 03/03	Newton's Laws
Week 07	03/06 – 03/10	Newton's Laws
Week 08	03/13 – 03/17	Linear momentum
Week 09	03/20 – 03/24	Spring Break
Week 10	03/27 – 03/31	Work & kinetic energy
Week 11	04/03 – 04/07	Conservation of energy
Week 12	04/10 – 04/14	Torque & static equilibrium
Week 13	04/17 – 04/21	Angular momentum
Week 14	04/24 – 04/28	Rolling & Rotational dynamics
Week 15	05/01 – 05/05	Oscillatory motion
Week 16	05/08 – 05/12	Oscillatory motion, Gravitation
Week 17	05/15 – 05/16	Review

## Where to get help

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- (1) Office hours! Dr. Barranco, the instructors for the other sections (Dr. Jensen and Ms. Grigorescu) and the lab GTAs will have open office hours spread throughout the week. Note that you can go to the office hours of ANY instructor or GTA, not just the one who teaches your section or lab.
- (2) Enroll in Science 220: Science Concepts for Physics with Calculus I, 1 unit, Thursdays, 11:10-12:25 in Trailer TP-4 (behind Thornton Hall). This is a "supplementary instruction" course that reinforces conceptual ideas and covers problem solving strategies.
- (3) Elby, Portable TA: A Physics Problem Solving Guide; out of print, but can be found on [www.amazon.com](http://www.amazon.com)
- (4) Campus Academic Resource Program (CARP): <http://www.sfsu.edu/~carp1/>. You can make free appointments with peer tutors for individual or small group tutoring.
- (5) Learning Assistance Center (LAC): <http://www.sfsu.edu/~lac/tutoring.html>. You can make free appointments with peer tutors for individual or small group tutoring.
- (6) Khan Academy: <https://www.khanacademy.org/> – online lessons on many math and science topics
- (7) Online lectures by Prof. Matt Anderson (San Diego State U.): <https://www.youtube.com/user/yoprofmatt>
- (8) Online lectures by Prof. Mike DeWeese (U.C. Berkeley):  
[https://www.youtube.com/playlist?list=PL-XXv-cvA\\_iCJN9rZ631jAty0rQyGU1k\\_](https://www.youtube.com/playlist?list=PL-XXv-cvA_iCJN9rZ631jAty0rQyGU1k_)
- (9) Online lectures by Prof. Ramamurti Shankar (Yale U.):  
<https://www.youtube.com/playlist?list=PLFE3074A4CB751B2B>

## Drop, Withdrawal & Repeat Policy

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The “Drop” deadline is Monday, February 10. You can drop yourself from the class online without any penalty and without any record, for any reason. After February 10, students must petition for an official “withdrawal.” Because Physics 220 & 222 are “impacted” courses, withdrawal after the 3rd week will only be allowed for serious, extenuating circumstances (e.g., serious illness of student, serious illness or death of family member, loss of job and financial aid). Documents must be provided to support the petition to withdraw. If the petition is approved, the designation “W” will appear on the transcript. Students are only allowed to repeat a class once at SFSU. Note that designations of W, WU, NC count toward this limit.

## Academic Integrity

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You are encouraged to form study groups with your peers to discuss homework; however, you should write up your solutions on your own, and submit your own answers on WebAssign. Cheating via any method on exams will result in a grade of zero on that exam and being reported to the department chair and college dean for possible discipline. Using someone else’s i>clicker to help them earn participation points while they are absent, or having someone else use your i>clicker in order to get you class participation points when you are absent, is considered cheating. Both parties will receive scores of zero for class participation for the entire semester. Please see the official academic integrity policy for the Department of Physics & Astronomy at: [www.physics.sfsu.edu/policy/plagiarism.pdf](http://www.physics.sfsu.edu/policy/plagiarism.pdf).

## Expected Code of Conduct

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Classroom discussion and participation are strongly encouraged. However, please refrain from unrelated chatter. Also, please remember to place cell phones and other electronic communication devices on silent or vibration mode so as not to distract your fellow classmates. If you must arrive late or leave early, please sit toward the back of the room near the doors so as to minimize disruption.

## Disability Access

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Students with disabilities who need reasonable accommodations are encouraged to contact me early in the semester. The Disability Programs and Resource Center is available to facilitate the reasonable accommodations process. The DPRC, located in Student Services Building 110, can be reached by phone at 415-338-2472 (voice/TTY) or by e-mail at [dprc@sfsu.edu](mailto:dprc@sfsu.edu).

## Religious Holidays

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The faculty of San Francisco State University shall accommodate students wishing to observe religious holidays when such observances require students to be absent from class activities. It is the responsibility of the student to inform the instructor, in writing, about such holidays during the first two weeks of the class each semester. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.

## Student Disclosures of Sexual Violence

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SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:

The SAFE Place - (415) 338-2208; [http://www.sfsu.edu/~safe\\_plc/](http://www.sfsu.edu/~safe_plc/)

Counseling and Psychological Services Center - (415) 338-2208; <http://psyservs.sfsu.edu/>

For more information on your rights and available resources - <http://titleix.sfsu.edu>