ASTRONOMY 0087_SEC1070: Basics of Space Flight

2191 Syllabus (Fall 2018)

"Anyone who sits on top of the largest hydrogen-oxygen fueled system in the world, knowing they're going to light the bottom, and doesn't get a little worried, does not fully understand the situation."

NASA Astronaut John Young, after being asked if he was nervous about making the first Space Shuttle flight in 1981.

Lecture Class: Tu, Th, 2:30-3:45 pm, Alumni Hall, 7th Floor Auditorium
Recitation Class: We 1:00-1:50 pm OR 2:00-2:50 pm, 103 Allen Hall. See below.

Instructor:

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Teaching Assistant: TBD

Office Hours: The Instructor will hold office hours in 834 Alumni Hall on Thursdays from 3:45-4:45 pm (immediately after lecture), and by appointment as needed. Please schedule appointments in person, either before or after class, or by email. The course TA will schedule and post their office hours during the first week of class.

Text Book: There is **no required text to purchase for this course**. Instead, lectures are based, in part, on two OERs (Open Educational Resources – available FREE online):

First, **"*Basics of Spaceflight"* (2016**), a text designed specifically for this course, by Professor Emeritus Regina E. Schulte-Ladbeck. Dr. Schulte-Ladbeck taught this course at Pitt for many years. Her book is available online at https://reslscience.weebly.com/space-books.html.

Second, we will make use of the NASA-JPL Tutorial, ***"Basics of Space Flight"***, that is available online at http://www.jpl.nasa.gov/basics/.

Readings will be assigned, as appropriate, through CourseWeb.

Course Rationale and Description: This is a self-contained course for students not majoring in the physical sciences. The course focuses on identifying and understanding the general concepts associated with space flight. The course explores the history and technology of space flight, including both human and robotic missions. The course is conceptual and descriptive in nature but, since physics and astronomy are quantitative sciences, some of the lectures will make use of simple arithmetic and geometry.

Topics covered include: an introduction to the nature of scientific inquiry, a brief overview of the Universe and the solar system, the history of space flight, U.S. and foreign space policy, gravitation and mechanics, rocket propulsion, the Moon landings, interplanetary trajectories and planetary orbits, remote sensing, interstellar space travel, and life in the universe.

Specific examples of orbital and planetary space missions (both human and robotic) and their scientific instruments, goals and results will be discussed. Particular emphasis will be placed on current missions. At the end of the course the students will have a deeper understanding of space flight, its goals and purposes, its difficulties, and its inherent dangers and benefits.

This course fulfills the Physical Science course requirement for School of Arts and Sciences students. It forms an appropriate sequence with Astronomy 0089 (Stars, Galaxies and the Cosmos), Astronomy 0088 (Stonehenge to Hubble), Physics 0081 (Space and Time, Light and Matter) or Physics 0089 (Physics and Science Fiction).

Major Content Areas:

I. The Nature and Process of Science.
II. Our Place in the Cosmos – Size, Structure, and Motion of the Earth-Moon System, the Solar System, Milky Way Galaxy, and the Universe.
III. The History and Development of Rocket Science.
IV. Politics and Space Policy.
V. Astrodynamics – the Physics of Space Flight and Interplanetary Travel.

VI. Applications, Benefits, and Dangers – Communication, Surveillance, Research, and Exploration.
VII. Robotic and Human Space Flight, past and present.
VIII. The Future: Deep Space, Life in the Universe, and Interstellar Exploration.

Course Learning Objectives:

By the end of this course, students will be able to…

1. Identify and describe the key components, major steps, and unique processes of scientific inquiry.
2. Describe the basic features – such as size, shape, structure and motion – of space from the local to galactic scales, and explain our physical place in the Universe.
3. Relate the overall history of rocket science in broad outline, and identify the key stages in its development, including modern space policy.
4. Apply the basic laws of physics to understand and solve fundamental problems in astrodynamics.
5. Analyze the applications, benefits, and dangers of robotic and human spaceflight - past, present and future.

Course Notes and Other Materials: The course Syllabus**,** Power Point lecture files, external links, and any other relevant course materials will be found posted on CourseWeb. Students should also consult CourseWeb regularly for announcements or updates. Assigned reading material will be clearly identified and may appear on the Exams.

Recitation Class Sections: Each student should be signed up for one of the recitation class sections which are offered on **Wednesdays, 1:00-1:50 pm or 2:00-2:50 pm, in 103 Allen Hall.** The recitation classes provide time for: discussion of readings/homework assigned in the lecture class, discussion of questions on lecture class topics, more detailed consideration of any in-class demonstrations, and several exercises/quizzes throughout the semester dealing with class material in more depth. They will also be used for both pre- and post-Exam review sessions.

Attendance at recitation is for your benefit, and is **not** mandatory. However, attendance is strongly recommended, and material covered in recitations may appear on Exams. **Recitation sessions will begin on September 5th.**

Exams and Exam Policy: Students must bring their **ID cards** to all Exams, and must have their **PeopleSoft Number**. Four Exams of equal point value (50 points for each Exam) will be given and the lowest grade will be dropped (**leaving 150 total Exam points counted toward the Course Grade**).

The first three Exams will each cover one-third of the course material, but the final Exam will be **cumulative**. The Exam questions will be multiple-choice.

The FINAL EXAM is optional for those who are satisfied with their 3 previous exam scores. **Because of the policy of dropping the lowest Exam grade, make-up Exams will NOT be given in this course, except under extreme circumstances as determined by the instructor.**

The tentative Exam dates are:

_ Exam 1: **Thursday, September 27**, 2:30-3:45 pm (7th Floor Aud., Alumni Hall)
_ Exam 2: **Tuesday, October 30**, 2:30-3:45 pm (7th Floor Aud., Alumni Hall)
_ Exam 3: **Thursday, November 29**, 2:30-3:45 pm (7th Floor Aud., Alumni Hall)
_ Cumulative Final Exam: **Thursday, December 6**, 2:30-3:45 pm (7th Floor Aud., Alumni Hall)

N.B. - The Final Exam will *only* be administered on the last regularly scheduled class date as listed above.

Attendance Policy: Recitation attendance is not required, as stated above. Lecture attendance is required and will be taken intermittently. Students will be allowed two unexcused absences. Thereafter, each absence will result in a deduction of **5 points** from the grade point total. **Students are responsible for all material discussed in the lectures**. If you miss a class, ask a fellow student for the notes!

N.B. - There is no lecture class on Tuesday, October 16, due to Fall Break.

Course Grading Policy: The final course grade will be determined in accordance with the School of Arts & Sciences Policies, and the PHYAST departmental guidelines. The final grade will be based on total point scores at the end of the course. The distribution of total points for the purpose of grading is: Three Best Exams, **150 maximum points**. Letter Grades will be assigned by percentage average as follows:

A+	4.00	**Superior**	97-100%	145-150 points
A	4.00		93-96%	**139-144 points**
A-	3.75		90-92%	135-138 points
B+	3.25	**Meritous**	87-89%	130-134 points
B	3.00		83-86%	**124-129 points**
B-	2.75		80-82%	120-123 points
C+	2.25	**Adequate**	77-79%	115-119 points
C	2.00		73-76%	**109-114 points**
C-	1.75		70-72%	105-108 points
D+	1.25	**Minimal**	67-69%	100-104 points
D	1.00		63-66%	**94-99 points**
D-	0.75		60-62%	90-93 points
F	0.0	**Failure**	59% and Below	**89 points or less**

Academic Integrity Policy:
Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

Turnitin: Students agree that by taking this course all required papers and other assignments may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin reference database solely for the purpose of detecting plagiarism of such papers. Use of Turnitin page service is subject to the Usage Policy and Privacy Pledge posted on the Turnitin.com site.

Disability Resources:
If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the Disability Resources and Services no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call 648-7890 (Voice or TTD) to schedule an appointment. The Office is located in 216 William Pitt Union.

E-mail Communication Policy:
Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to http://accounts.pitt.edu , log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished. (For the full E-mail Communication Policy, go to www.bc.pitt.edu/policies/policy/09/09-10-01.html.)

Classroom Recording Policy:
This course will adhere to the University's Senate Educational Policy Committee recommendation on classroom recording of May 4, 2010:
To ensure the free and open discussion of ideas, students may not record classroom lectures, discussions, recitations, and/or other activities without the

advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Intellectual Property Policy:
Per the University's policies regarding copyright and intellectual property, http://www.library.pitt.edu/copyright-pitt, the instructor retains the rights to all original course materials – including, but not limited to, lectures, lecture notes, Power Point or other presentations, assignments, exams, papers, diagrams, etc.
– and none of this material may be used, shared, or reproduced in any way, for other than a student's own private educational use.

In addition, legal rights for all third-party materials, whether used by direct permission or under the Fair Use educational rules, is fully retained by the original authors. None of this material may be used, shared, or reproduced, in any way, for other than a student's own private educational use, unless permission is granted by the original authors or sources.

Sexual Misconduct, Required Reporting, and Title IX:
The University is committed to combatting sexual misconduct. As a result, you should know that University faculty and staff members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the University's Title IX office so that the victim may be provided appropriate resources and support options. What this means is that as your professor, I am required to report any incidents of sexual misconduct that are directly reported to me, or of which I am somehow made aware.

There are two important exceptions to this requirement about which you should be aware:

A list of the designated University employees who, as counselors and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: http://www.titleix.pitt.edu/report/confidentiality

An important exception to the reporting requirement exists for academic work. Disclosures about sexual misconduct that are shared as part of an academic project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX office.

If you are the victim of sexual misconduct, Pitt encourages you to reach out to these resources:

Title IX Office: 412-648-7860

SHARE @ the University Counseling Center: 412-648-7930 (8:30 A.M. TO 5 P.M. M-F) and 412-648-7856 (AFTER BUSINESS HOURS)

If you have a safety concern, please contact the University of Pittsburgh Police, 412-624-2121.

Other reporting information is available here: http://www.titleix.pitt.edu/report-0

Diversity and Inclusion:
I consider this classroom – i.e. both our shared physical and digital spaces - to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. Students in this class are encouraged to speak up, share their ideas, and participate during class meetings, and in online forums and assignments. All members of this class are also expected to conduct themselves in a professional manner that contributes to a respectful, welcoming, and inclusive environment for every other member of the class.

"Exploration is in our nature. We began as wanderers, and we are wanderers still. We have lingered long enough on the shores of the cosmic ocean. We are ready at last to set sail for the stars."

— *Carl Sagan*, Cosmos (1980)