

USC Dornsife College of Letters, Arts and Sciences

The Space Shuttle & Popular Science

Units: 2 Credits

Term, Day, Time: Fall 2015, Monday, 2:00-3:50pm

Location: Waite Phillips Hall (WPH) 201

Instructor: Kenneth E. Phillips

Office: Ahmanson Center (ACB) 439H

Office Hours: Monday 12:30-1:30pm & 4:00-5:00pm

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Introduction: Thanks for joining this eleven-week course on the *Space Shuttle and Popular Science*! You'll discover it to be a broad survey with multiple objectives that require the full participation and enthusiasm of every student to maximize the opportunity for learning. You will be working in teams on the final classroom project that will make up the larger percentage of your grade.

Although designed to be rich in content, this course is about inspiration. If, by the end of our eleven weeks together, you are inspired (and that cannot be faked!) then you will have understood the real purpose of this course in addition to receiving two credits toward your USC degree. Hopefully, what you learn will make you aware of entire areas of inquiry that you may have overlooked or not formerly considered worthy of your attention. If so, then consider yourself fortunate because there are many follow-on opportunities available to you here at USC and, more broadly, throughout Southern California.

We will explore, through lecture, video, conversation, and field trips, the human effort to explore space as told mainly from the perspective of the United States space program as it evolved over the past 50 years. However, to be truly inspirational our quest must not focus exclusively on the efforts of any one country nor, in truth, can it be confined to the half-century of space exploration defined largely by the efforts of the National Aeronautics and Space Administration (NASA). Indeed, in order to fully appreciate the significance of our recent 50-year period of accomplishment, we must start our journey through the eyes of ancient peoples and before the dawn of specialized instrumentation that ushered in our "modern" understanding of the cosmos and our place in it.

Learning Objectives: The learning objectives of this Freshman Seminar include a qualitative understanding of selected scientific concepts that pertain to the exploration of space and the tradeoffs that inform a policy of space exploration for the United States. Students will:

- Explore historical and cultural factors that have shaped our concepts of the universe.
- Recognize the variety of instruments and craft used for the exploration of space.
- Learn to infer the destination and scientific purpose of a spacecraft based solely on its appearance.
- Distinguish spaceflight hazards that have design solutions from those that do not.
- Learn how a program of exploration unfolds through a series of well-defined missions.
- Craft a space exploration policy for the United States.

Attendance: Attendance and class participation are crucial! This will be a fast-moving course that covers a great deal of intellectual ground with lectures on both the USC and California Science Center campuses. Students will not be permitted to miss more than one class session.

Course Description: The course is summarized in table-1 below and shows the main message for each week along with the location of that class (USC campus or California Science Center).

Table-1: Course Schedule and Class Location

Monday	Session Title	Topic / Main Message	Location
Week 1 Aug 24 th	Course Introduction	Be Amazed!	USC – WPH 201
Week 2 Aug 31 st	A view from Earth	All is not what it seems!	USC – WPH 201
Sept 7th LABOR DAY – NO CLASS			
Week 3 ¹ Sept 14 th	Telescopes	Light is both messenger and message	USC – WPH 201
Week 4 Sept 21 st	Robotic Exploration	Getting closer/exploration in stages	Science Center: Sketch Gallery
Week 5 ² Sept 28 th	Humans in Space	Protect the crew!	USC – WPH 201
Week 6 ³ Oct 5 th	Race for the moon	Discrete programs/building capability	Science Center: Sketch Gallery
Week 7 Oct 12 th	Space Shuttle	New directions/working in space	Science Center: California Story
Week 8 Oct 19 th	International Space Station	Permanent presence in space	USC – WPH 201
Week 9 Oct 26 th	Commercial Space	Entrepreneurs and new markets	USC – WPH 201
Week 10 Nov 2 nd	Future Exploration	Distant destinations	USC – WPH 201
Week 11 Nov 9 th	America’s Space Policy	Student group presentations	USC – WPH 201

- **Week 1** will set the tone for our class through student introductions and a conversation about space exploration. Students will share their career aspirations along with their reasons for taking this course and what they hope to learn.
- **Week 2** will examine our place in the Cosmos through the eyes and traditions of indigenous peoples whose ways of life reflect an ancient view of the world. We will explore their creation mythologies with appropriate respect as we come to understand the development of the character of the people and their societies. *Assertion: A thing does not have to be factually accurate to harbor great truth and therefore merit our respectful consideration.*
- **Week 3** will focus on the centuries-long struggle to transform our thinking about the world from conjecture about the cause of events to reliance on the weight of evidence to explain the things that we observe. We will examine a few of the personalities responsible for this transformation in thinking and spend some time understanding the instruments they created; the data they collected; and the theories they developed. We will take particular notice of a few surprising discoveries that changed our thinking about the Universe.
- **Week 4** will focus on the discrete stages of robotic exploration that enable us to learn more about the objects within our own solar system. We will learn to recognize the components common to all

¹ Rosh Hashanah: Sept 14th & 15th

² Sukkot: Sept 28th & 29th

³ Sukkot: Oct 5th & 6th

planetary probes thereby enabling a reasonable inference about where in the solar system they went and what scientific measurements they most likely made.

- **Week 5** will address the dangers of spaceflight and the steps required to protect astronauts and cosmonauts during space missions. We will explore the lethal and chronic conditions that plague all space explorers and examine some design strategies and operating practices that address these problems.
- **Week 6** will focus on the race for the moon and the three projects that took America step by step from the first 15-minute spaceflight of Project Mercury to the multiple-day trip to the lunar surface and back in Project Apollo. In this week we will also address a special collaborative project between the United States and the former Soviet Union that established a precedent for cooperation that remains a characteristic of today's space exploration.
- **Week 7** will focus on the Space Transportation System (Space Shuttle) as a 30-year program that took America in a new direction for space exploration. We will dissect the flight profile of a typical mission to understand how the shuttle managed energy and to learn how the purpose of the shuttle program differed from previous programs of exploration.
- **Week 8** will focus on the International Space Station as a program to maintain permanent human occupancy in space. Our discussion will address the rationale for creating the ISS, its assembly sequence; some of the experiments conducted on board; and the diversity of nations and cultures that participate in this international program.
- **Week 9** will focus on the emerging role of private companies that are now competing for business from NASA and other governmental agencies as well as attempting to create a space tourism industry. Our discussion will focus on the risks and benefits of a key NASA decision to rely upon the private sector for selected missions based on a combination of NASA's emphasis on leading edge research combined with budget constraints on the agency.
- **Week 10** will focus on the future of human space exploration with a discussion of the risks and benefits of undertaking increasingly aggressive missions that will carry human crews deep into our solar system. In this week we will examine NASA's strategic policy for space exploration that includes goals for robotic planetary exploration, the construction of new telescopes and the design of spaceships for human exploration in preparation for the student presentations in week 11.
- **Week 11** Each group of students (groups TBD) will provide a 20-minute presentation describing their strategic plan for future space exploration. The plans must include a rationale for each area of activity, destinations of interest and some mention of the desired mix of robotic vs. human space exploration. The development of actual budgets is beyond the scope of this seminar; however, each presentation should include a pie-chart (or equivalent) that suggests the percentage of investment or level of emphasis for each area of activity.

Course Notes: Course notes will be provided either as handouts during class meetings or on USC's Blackboard as PDFs for download. Lectures will be supported with PowerPoint and video. Some audiovisual media may occasionally be posted on Blackboard for download and study prior to class meetings.

Technological Proficiency and Hardware/Software: No special computer skills are required for this course. Students are presumed to have fluency with web browsers and high-speed access to the Internet.

Readings: Required reading materials will be provided as downloadable PDF files available on USC's Blackboard or via tested links provided with each resource.

Table-2: Grading

Assessment	Content	Due Date	Proportion
Participation	Varies	Ongoing assessment	30%
Homework	Topics from prior class	Each Friday (via Blackboard)	30%
Team Presentation	National Space Policy Briefing	Week 11 (in class)	40%

This is a credit/no-credit course. Credit will be given to students who fulfill the assignments, participate in class discussions, and provide thoughtful, organized presentations.

Assignments: Homework assignments are due by 11:59pm on the Friday following class. Late assignments will be accepted through USC's Blackboard up until 1:59pm on the day of the next class meeting. An automatic 10% reduction in the graded assignment will be applied for each day beyond the official due date of the assignment. No credit will be given for homework received after the late assignment extension.

Teams: Students team members will need to coordinate their out-of-class time to craft their positions on a national space policy for space exploration. Students will be evaluated as a team for their class presentation. Students will be evaluated as individuals based on their participation in class and for their homework assignments.

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology. *The Office of Disability Services and Programs (DSP)* provides certification for students with disabilities and helps arrange the relevant accommodations. The new DSP campus address is 3602 Watt Way, Grace Ford Salvatori Hall, Room #120. Please refer to the following link: http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html.