

# USC Dornsife College of Letters, Arts and Sciences

## The Space Shuttle and Our Place in the Universe

**Units:** 2 Credits

**Term, Day, Time:** Fall 2017, Monday, 2:00-3:50pm

**Location:** Von KleinSmid Center (VKC) 160  
California Science Center (various locations)

**Instructor:** Kenneth E. Phillips

**Office:** Seaver Hall of Science (SHS) Room #361

**Office Hours:** Monday 12:00 pm - 1:30 pm

**Contact Info:** Phil156@usc.edu, 213-744-2216 (office)

**Introduction:** Welcome to this eleven-week, Freshman Seminar on the *Space Shuttle and Our Place in the Universe!* 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 understand our place in the Universe in a journey that begins through the eyes of ancient tribal peoples and ends with the United States' space program as it evolved over the past 60 years. Throughout this course we will reflect often on questions about truth and perception as these affect who we think we are!

**Learning Objectives:** The learning objectives of this Freshman Seminar include a qualitative understanding of selected scientific concepts that pertain to the exploration of space, the changing perception of our place in the Universe and the tradeoffs that inform a policy of exploration going forward. Students will:

- Explore historical and cultural factors that have shaped our concepts of the universe.
- Recognize the variety of scientific instruments and spacecraft 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 complex program of exploration unfolds through a series of well-defined missions.
- Craft a 50-year 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
<b>Week 1</b> Aug 21 <sup>st</sup>	Course Introduction	Be Amazed!	USC – VKC 160
<b>Week 2</b> Aug 28 <sup>th</sup>	A view from Earth	All is not what it seems!	USC – VKC 160
<b>September 4<sup>th</sup> Labor Day</b>			
<b>Week 3</b> Sep 11 <sup>th</sup>	The Astronomers	Light, both message and messenger	USC – VKC 160
<b>Week 4</b> Sep 18 <sup>th</sup>	Robotic Exploration	Put simply, get as close as we can	California Science Center
<b>Week 5</b> Sep 25 <sup>th</sup>	Humans in Space	Protect the crew!	USC – VKC 160
<b>Week 6</b> Oct 2 <sup>nd</sup>	1: Race for the moon 2: Politics of Cooperation	1: Take one step at a time 2: Bridge a cultural divide	California Science Center
<b>Week 7</b> Oct 9 <sup>th</sup>	Space Shuttle-1	Uphill: trade chemistry for speed	USC – VKC 160
<b>Week 8</b> Oct 16 <sup>th</sup>	Space Shuttle-2	Downhill: trade speed for heat	California Science Center
<b>Week 9</b> Oct 23 <sup>rd</sup>	Scale and Origins	Something from nothing?	USC – VKC 160
<b>Week 10</b> Oct 30 <sup>th</sup>	Course Review	A nation's investment in exploration	USC – VKC 160
<b>Week 11</b> Nov 6 <sup>th</sup>	America's Space Policy	Student group presentations	USC – VKC 160

- **Week 1 (Course Introduction)** will set the tone for our class beginning with student introductions and a conversation about space exploration and scientific discourse. We will discuss the role of evidence vs. conjecture in our efforts to understand the Universe and students will share their career aspirations along with their reasons for taking this course and what they hope to learn.
- **Week 2 (A view from Earth)** 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. *Recurring question: Must a thing be factually accurate to harbor great truth and merit our respectful consideration?*
- **Week 3 (The Astronomers)** 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 meet some of the characters 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 (Robotic Exploration)** 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 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 (*Humans in Space*)** will address the dangers of human 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 (*Part-1: Race for the Moon*)** 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.
- **Week 6 (*Part-2: Politics of Cooperation*)** will address a fascinating and then-controversial 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 (*Space Shuttle-1*)** will focus on the Space Shuttle as a 30-year program that took America in a new direction for space exploration. We will dissect the launch sequence and on-orbit operations of the mission profile 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 (*Space Shuttle-2*)** will focus on the Space Shuttle's re-entry into the atmosphere at the conclusion of each mission. As the third segment of the mission profile we will examine the thermal management strategy for Shuttle and compare it to the strategy of pre-shuttle re-entry.
- **Week 9 (*Origins*)** will return to our original reflection on our place in the Universe as the central concern of this course. We will view images that reveal what is known about the farthest reaches of the cosmos and do our best to wrestle with concepts of physical scale, distance, structure and the leading theory that discusses our origins (i.e. The BIG BANG!)
- **Week 10 (*Course Review*)** will align the previous nine-week conversation on the history of space exploration with a vision of the future involving increasingly aggressive missions in the areas of astronomy, robotic planetary exploration and human travel deep into the solar system. We will address 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. In this week we will examine NASA's strategic policy for space exploration as a model for the student presentations in week 11.
- **Week 11 (*Space Policy Presentations*)** Each group of students (groups TBD) will provide a 15-20 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 telescopic, robotic, and 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 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.

**Homework Assignment Content:** This course is designed to encourage the type of thinking that leads to informed opinions about a fairly wide range of topics including the matter of truth, the relative merits of one type of discovery over another, the notion of acceptable risk and the role that one might prefer on a mission team along with the rationale for the choice of that team's core scientific question. Therefore, homework assignments will usually challenge students to adopt a position on the topic most recently covered in class and produce a two-page critical review explaining their opinion/decision.

**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.

**Assignment Credit and Due Date:** 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 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 their homework.

### 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 Part B* in Section 11, *Behavior Violating University Standards and Appropriate Sanctions* <http://policy.usc.edu/scampus-part-b/>. 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/>.

### Safety

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://dps.usc.edu>. This is important for the safety of the whole USC community.

### 24-hour Emergency Phone Numbers are:

University Park Campus (UPC): 213-740-4321 and  
Health Sciences Campus (HSC): 323-442-1000

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 Relationship and Sexual Violence Prevention and Services (RSVP)* team <http://engemannshc.usc.edu/rsvp/> is located in the USC Engemann Student Health Center and is available 24/7 to provide confidential support.

## 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* <https://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/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html).

**NOTE ABOUT LINKS:** All links have been tested and proven operational at the time of this posting. The USC Emergency Information link does not launch from this document and must be copied into a browser. It is repeated here for convenience. <https://emergency.usc.edu>