

# Space and Planetary Sciences (SPAC)

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Space and Planetary Sciences Website (<http://spacecenter.uark.edu>)

## Degree Conferred:

M.S., Ph.D. in Space and Planetary Sciences (SPAC)

**Program Description:** The program provides advanced course work and research experience for persons seeking a career in the academic, government, private, or military sectors of space and planetary sciences or associated technologies.

**Primary Areas of Faculty Research:** Astronomical processes, geological processes on planetary surfaces, planetary atmospheres, mission instrumentation and design, astrobiology, applications to Mars, Venus, Pluto, and ice worlds.

## M.S. in Space and Planetary Sciences

**Admission to Degree Program:** Students wishing to apply for admission to the graduate degrees in space and planetary sciences should contact the Space and Planetary Science Center's graduate coordinator. Applicants should prepare to have transcripts, two letters of recommendation, and a statement of purpose sent to the center. Applicants are encouraged to submit scores from the Graduate Record Examination, including the writing score.

**Requirements for the Master's Degree:** At least 24 semester hours of courses plus at least six hours of SPAC 6000V are required for a total of at least 30 hours beyond the baccalaureate degree. Students are required to take the following courses:

### Non-Core Courses

SPAC 52101	SPAC Proseminar	1
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### Core Courses

Select three of the following (nine hours): 9

SPAC 50303	Astrophysics I: Stars and Planetary Systems	
SPAC 53103	Planetary Atmospheres	
SPAC 54103	Planetary Geology	
SPAC 55503	Astrobiology	
SPAC 56103	Astronautics	

### Space and Planetary Electives

(see list below) - Must take at least three courses (10 hours). 10  
Substitutions may be made with the approval of the committee.

ASTR 50403	Astrophysics II: Galaxies and the Large-Scale Universe	
ASTR 50803	Data Analysis and Computing in Astronomy	
BIOL 50071	Seminar in Biology	
BIOL 50173	Laboratory in Prokaryote Biology	
BIOL 52673	Cell Physiology	
BIOL 53583	Ecological Genetics/genomics	

BIOL 54673	Physiological Ecology	
CHEM 51001	Introduction to Research	
CHEM 5050V	Special Topics in Chemistry	
CHEM 58103	Biochemistry I	
CHEM 58403	Biochemistry II	
ELEG 5880V	Special Problems	
ELEG 52703	Electronic Packaging	
ELEG 55503	Switch Mode Power Conversion	
ELEG 59003	Engineering Technical Writing	
GEOS 5100V	Special Problems in Physical Geosciences	
GEOS 51103	Global Change	
GEOS 52503	Geomorphology	
GEOS 52703	Principles of Geochemistry	
GEOS 52903	Introduction to Global Positioning Systems and Global Navigation Satellite Systems	
GEOS 53603	Climatology	
GEOS 55603	Tectonics	
GEOS 56503	GIS Analysis and Modeling	
MEEG 5920V	Individual Study in Mechanical Engineering	
PHYS 5020V	Individual Study in Advanced Physics	
MEEG 54003	Advanced Thermodynamics	
MEEG 58303	Aerospace Propulsion	
PHYS 53603	Scientific Computation and Numerical Methods	
PHYS 56503	Subatomic Physics	
SPAC 50303	Astrophysics I: Stars and Planetary Systems	
SPAC 53103	Planetary Atmospheres	
SPAC 54103	Planetary Geology	
SPAC 55503	Astrobiology	
SPAC 56103	Astronautics	

### Other Electives

SPAC 51601	Seminar (must take every semester)	4
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### Thesis

SPAC 6000V	Master's Thesis	6
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**Total Hours** 30

NOTE: The student's committee consists of at least four faculty members; at least three of these must be from the space center faculty, drawn from three different departments, and these must include the graduate advisor and the chair of the committee. One member of the committee should be from outside of the space center.

Every student must register for a minimum of one credit hour of SPAC 6000V or 7000V in each term during which the student is away from campus and doing thesis or dissertation research.

Students should also be aware of Graduate School requirements with regard to master's degrees (<http://catalog.uark.edu/graduatecatalog/degreerequirements/#mastersdegreestext>).

## Ph.D. in Space and Planetary Sciences

**Admission to Degree Program:** Students wishing to apply for admission to the graduate degrees in space and planetary sciences should contact the Space and Planetary Science Center's graduate coordinator. Applicants should prepare to have transcripts, two letters of recommendation, and a statement of purpose sent to the center.

Applicants are encouraged to submit scores from the Graduate Record Examination, including the writing score.

**Requirements for the Doctor of Philosophy Degree:** Students are required to take a minimum of 72 hours beyond the baccalaureate degree or 42 hours beyond the master's degree to include a minimum 33 hours of required course work and 18 hours of SPAC 7000V. Course requirements are given below.

#### Non-Core Courses

SPAC 51601	Seminar	8
SPAC 52101	SPAC Proseminar	1
SPAC 51203	Internship	3

#### Core Courses

Select four of the following:		12
SPAC 50303	Astrophysics I: Stars and Planetary Systems	
SPAC 53103	Planetary Atmospheres	
SPAC 54103	Planetary Geology	
SPAC 55503	Astrobiology	
SPAC 56103	Astronautics	

#### Space and Planetary Electives

Choose at least three courses from the list below. Substitutions may be made with the approval of the committee. 9

ASTR 50403	Astrophysics II: Galaxies and the Large-Scale Universe	
ASTR 50703	Cosmology	
BIOL 50173	Laboratory in Prokaryote Biology	
BIOL 52673	Cell Physiology	
BIOL 53583	Ecological Genetics/genomics	
BIOL 54673	Physiological Ecology	
CHEM 58103	Biochemistry I	
CHEM 58403	Biochemistry II	
ELEG 52703	Electronic Packaging	
ELEG 55503	Switch Mode Power Conversion	
ELEG 59003	Engineering Technical Writing	
GEOS 51103	Global Change	
GEOS 52503	Geomorphology	
GEOS 52703	Principles of Geochemistry	
GEOS 52903	Introduction to Global Positioning Systems and Global Navigation Satellite Systems	
GEOS 53603	Climatology	
GEOS 55603	Tectonics	
GEOS 56503	GIS Analysis and Modeling	
MEEG 54003	Advanced Thermodynamics	
MEEG 58303	Aerospace Propulsion	
PHYS 53603	Scientific Computation and Numerical Methods	
PHYS 56503	Subatomic Physics	
SPAC 50303	Astrophysics I: Stars and Planetary Systems	
SPAC 53103	Planetary Atmospheres	
SPAC 54103	Planetary Geology	
SPAC 55503	Astrobiology	
SPAC 56103	Astronautics	

Other courses may count as electives with the approval of the student's research adviser and committee.

#### Dissertation

SPAC 7000V	Doctoral Dissertation	18
<b>Total Hours</b>		<b>51</b>

**Additional Requirements:** Students are required to complete a thesis or dissertation describing original research work in the space and planetary sciences that must be presented to and successfully defended before their committee. In addition, Ph.D. students must pass a candidacy examination.

The Ph.D. candidacy examination is administered by the student's committee and is designed to test the student's ability to assimilate, integrate and interpret material learned in the core required courses while at the same time having a depth of understanding in the area of the student's research. Thus, the candidacy examination will be in two parts:

1. A 2,500-word integrative essay on a theme chosen by the committee, and
2. An oral defense of the thesis before the committee.

Part 1 will be assigned six weeks before the candidacy defense and shall be presented to the committee two weeks before that defense. The defense will be held at a date determined by the committee but usually before the end of the student's second year in graduate school. The committee will judge the examination as pass/fail and in the case of failure — and at the discretion of the committee — a second attempt to pass the qualifying examination is permitted within a period of time determined by the committee.

Students should also be aware of Graduate School requirements with regard to doctoral degrees (<http://catalog.uark.edu/graduatecatalog/degreerequirements/#phdandedddgreestext>).

**Aly, Mohamed H.**, Ph.D. (Texas A&M), M.S., B.S. (Zagazig University), Associate Professor, Department of Geosciences, 2013, 2020.

**Boss, Steve K.**, Ph.D. (University of North Carolina at Chapel Hill), M.S. (Utah State University), B.S. (Bemidji State University), University Professor, Department of Geosciences, 1996, 2023.

**Ceballos, Ruben M.**, Ph.D. (University of Montana), M.A. (University of Alabama-Birmingham), B.S. (University of Alabama-Huntsville), Assistant Professor, Department of Biological Sciences, 2016.

**Chevrier, Vincent Francois**, Ph.D. (CEREGE, Aix-en-Provence, France), M.E.S. (University Paris VII), B.S. (Academy of Versailles, France), Research Associate Professor, Department of Chemistry and Biochemistry, 2005.

**Huang, Po-Hao Adam**, Ph.D., M.S., B.S. (University of California-Los Angeles), Associate Professor, Department of Mechanical Engineering, 2006, 2012.

**Ivey, Mack**, Ph.D., B.S. (University of Georgia), Associate Professor, Department of Biological Sciences, 1992, 1998.

**Kenefick, Daniel John**, Ph.D., M.A. (California Institute of Technology), B.S. (University College Cork, Ireland), Professor, Department of Physics, 2003, 2021.

**Kenefick, Julia Dusk**, Ph.D. (California Institute of Technology), B.S. (University of Arkansas), Professor, Department of Physics, 2003, 2024.

**Kral, Timothy Alan**, Ph.D. (University of Florida), B.S. (John Carroll University), Professor, Department of Biological Sciences, 1981, 2008.

**Kumar, Pradeep**, Ph.D. (Boston University), M.Sc. (Indian Institute of Technology, Mumbai, India), Associate Professor, Department of Physics, 2013, 2019.

**Lehmer, Bret Darby**, Ph.D. (Pennsylvania State University), B.S. (University of Iowa), Associate Professor, Department of Physics, 2015, 2021.

**Lessner, Daniel J.**, Ph.D. (University of Iowa), B.S. (University of Wisconsin-Stevens Point), Professor, Department of Biological Sciences, 2008, 2020.

**Mantooth, Alan**, Ph.D. (Georgia Institute of Technology), M.S., B.S. (University of Arkansas), Distinguished Professor, Department of Electrical Engineering and Computer Science, Twenty-First Century Chair in Mixed-Signal IC Design and CAD, 1998, 2011.

**Oliver, William F.**, Ph.D., M.S. (University of Colorado-Boulder), B.S. (University of Arizona), Associate Professor, Department of Physics, 1992, 1998.

**Roe, Larry**, Ph.D. (University of Florida), M.S., B.S.M.E. (University of Mississippi), Associate Professor, Department of Mechanical Engineering, 1994, 2000.

**Tullis, Jason A.**, Ph.D., M.S. (University of South Carolina), B.S. (Brigham Young University), Professor, Department of Geosciences, 2004, 2017.

## Courses

### **SPAC 50303. Astrophysics I: Stars and Planetary Systems. 3 Hours.**

Stellar structure and evolution, the properties of the solar system, and extrasolar planetary systems. (Typically offered: Fall Odd Years)  
This course is cross-listed with ASTR 50303.

### **SPAC 51203. Internship. 3 Hours.**

Internship for graduate students in the space and planetary sciences graduate degree programs and concentrations in the graduate programs in physics, biology, geosciences and mechanical engineering. Students conduct a phase of their research, normally for one month, at a national or industrial laboratory in North America or overseas. (Typically offered: Fall and Spring)

### **SPAC 51601. Seminar. 1 Hour.**

Seminars organized by the Center for Space and Planetary Sciences covering topics on the cutting edge of research in the field for graduate students conducting research with a faculty member in the space and planetary sciences as part of their graduate degree programs or concentrations in the graduate programs in physics, biology, geology, geography and mechanical engineering. (Typically offered: Fall and Spring) May be repeated for up to 8 hours of degree credit.

### **SPAC 52101. SPAC Proseminar. 1 Hour.**

Introductory course consisting of discourses and case studies in ethics, communications and public policy in the administration of space and planetary sciences. Prerequisite: Admission to program or instructor consent. (Typically offered: Spring)

### **SPAC 53103. Planetary Atmospheres. 3 Hours.**

Origins of planetary atmospheres, structures of atmospheres, climate evolution, dynamics of atmospheres, levels in the atmosphere, the upper atmosphere, escape of atmospheres, and comparative planetology of atmospheres. (Typically offered: Irregular)

### **SPAC 54103. Planetary Geology. 3 Hours.**

Exploration of the solar system, geology and stratigraphy, meteorite impacts, planetary surfaces, planetary crusts, basaltic volcanism, planetary interiors, chemical composition of the planets, origin and evolution of the Moon and planets. (Typically offered: Spring Even Years)

### **SPAC 55503. Astrobiology. 3 Hours.**

Discusses the scientific basis for the possible existence of extraterrestrial life. Includes origin and evolution of life on Earth, possibility of life elsewhere in the solar system (including Mars), and the possibility of life on planets around other stars. Prerequisite: Instructor consent. (Typically offered: Spring Even Years)  
This course is cross-listed with BIOL 55573.

### **SPAC 56103. Astronautics. 3 Hours.**

Study of spacecraft design and operations. Prerequisite: Admission to program or instructor consent. (Typically offered: Irregular)

### **SPAC 6000V. Master's Thesis. 1-10 Hour.**

Master's thesis. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

### **SPAC 7000V. Doctoral Dissertation. 1-18 Hour.**

Doctoral dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.