Space and Planetary Sciences (SPAC)

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479-575-5808  
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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, Mars: near-surface processes and biological investigations, and ice moons — particularly Titan — and surface processes.

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 at jcdixon@uark.edu. 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.

Basic Requirements for the Master’s Degree: At least 24 semester hours of courses plus at least six hours of SPAC 600V 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 5211</td>
<td>SPAC Proseminar</td>
<td>1</td>
</tr>
</tbody>
</table>

Core Courses

Select three of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 5033</td>
<td>Stars and Planetary Systems</td>
<td>3</td>
</tr>
<tr>
<td>SPAC 5313</td>
<td>Planetary Atmospheres</td>
<td></td>
</tr>
<tr>
<td>SPAC 5413</td>
<td>Planetary Geology</td>
<td></td>
</tr>
<tr>
<td>SPAC 5553</td>
<td>Astrobiology</td>
<td></td>
</tr>
<tr>
<td>SPAC 5613</td>
<td>Astronautics</td>
<td></td>
</tr>
</tbody>
</table>

Space and Planetary Electives

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

Other Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 5161</td>
<td>Seminar (must take every semester)</td>
<td>4</td>
</tr>
</tbody>
</table>

Thesis

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 600V</td>
<td>Master’s Thesis</td>
<td>6</td>
</tr>
</tbody>
</table>

Total Hours 24

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 at jcdixon@uark.edu. 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 to include a minimum 34 hours of required course work and 18 hours of SPAC 700V. Course requirements are given below.

Non-Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 5211</td>
<td>SPAC Proseminar</td>
<td>1</td>
</tr>
<tr>
<td>SPAC 5123</td>
<td>Internship</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Courses

Select four of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Stars and Planetary Systems</td>
<td>3</td>
</tr>
<tr>
<td>SPAC 5313</td>
<td>Planetary Atmospheres</td>
<td></td>
</tr>
<tr>
<td>SPAC 5413</td>
<td>Planetary Geology</td>
<td></td>
</tr>
<tr>
<td>SPAC 5553</td>
<td>Astrobiology</td>
<td></td>
</tr>
<tr>
<td>SPAC 5613</td>
<td>Astronautics</td>
<td></td>
</tr>
</tbody>
</table>

Space and Planetary Electives

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

Other Electives

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<tr>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 5161</td>
<td>Seminar (must take every semester)</td>
<td>4</td>
</tr>
</tbody>
</table>

Dissertation

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAC 700V</td>
<td>Doctoral Dissertation</td>
<td>18</td>
</tr>
</tbody>
</table>

Total Hours 47

Planetary Astronomy

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 5043</td>
<td>Astrophysics II: Galaxies and the Large-Scale Universe</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5263</td>
<td>Nuclear Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 5273</td>
<td>Cosmochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>
PHYS 5513 Atomic and Molecular Physics 3

**Planetary Geology**

GEOS 5123 Stratigraphic Principles and Practice 3
GEOS 5423 Remote Sensing of Natural Resources 3
GEOS 560V Graduate Special Problems 2-6

**Planetary Atmospheres**

GEOS 5353 Meteorology 3
GEOS 5363 Climatology 3
GEOS/ENDY Global Change 3

**Origin and Evolution of Life**

BIOL 4233 Genomics and Bioinformatics 3
BIOL 4263 Cell Physiology 3
BIOL 4353 Ecological Genetics/Genomics 3
BIOL 5463 Physiological Ecology 3
CHEM 5813 Biochemistry I 3
CHEM 5843 Biochemistry II 3

**Astronautics and Orbital Mechanics**

CSCE 5043 Advanced Artificial Intelligence 3
MEEG 4233 Microprocessors in Mechanical Engineering I: Electromechanical Systems 3
MEEG 5833 Aerospace Propulsion 3
MEEG 5273 Electronic Packaging 3

**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:

SPAC/ASTR Stars and Planetary Systems 3
SPAC/GEOS Planetary Atmospheres 3
SPAC/GEOS Planetary Geology 3
SPAC/CHEM/ CHEM 5613 Biochemical Evolution 3
SPAC 5613 Astronautics 3

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 2500-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/#phdandeedegreestext).

Chevrier, Vincent Francois, Ph.D. (CEREGE, Aix-en-Provence, France), M.E.S. (University Paris VII), B.S. (Academy of Versailles, France), Assistant Professor, Space and Planetary Sciences, 2005.
Kennefick, Julia Dusk, Ph.D. (California Institute of Technology), B.S. (University of Arkansas), Associate Professor, Department of Physics, 2003.
Kennefick, Daniel John, Ph.D., M.A. (California Institute of Technology), B.S. (University College Cork, Ireland), Associate Professor, Department of Physics, 2004.
Roe, Larry, Ph.D. (University of Florida), M.S., B.S.M.E. (University of Mississippi), Associate Professor, Department of Mechanical Engineering, 1994.

**Courses**

SPAC 5033. Stars and Planetary Systems. 3 Hours.
Stellar structure and evolution, the properties of the solar system, and extrasolar planetary systems.

SPAC 5111L. Space and Planetary Lab. 1 Hour.
Laboratory course in space and planetary sciences consisting of experiments in the five major areas of space and planetary sciences: planetary astronomy, planetary geology, planetary atmospheres, origin and evolution of life and orbital mechanics and astronautics. Intended for students enrolled in the graduate programs in space and planetary sciences.

SPAC 5123. 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.

SPAC 5161. Seminar. 1 Hour.
Seminars organized by the Arkansas-Oklahoma 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.

SPAC 5211. 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.

SPAC 5313. 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.

SPAC 5413. 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.

SPAC 5513. Biochemical Evolution. 3 Hours.
Abiotic synthesis of biomolecules on Earth, the origin of cells; genetic information, origin of life on Earth and elsewhere, evolution and diversity, ecological niches, bacteria, archaea, and eukaryotic, novel metabolic reshaping of the environment, life being reshaped by the environment, molecular data, and evolution. Prerequisite: CHEM 5813.
SPAC 5553. 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.
This course is cross-listed with BIOL 5553.

SPAC 5613. Astronautics. 3 Hours.
Study of spacecraft design and operations. Prerequisite: Admission to program or instructor consent.

SPAC 600V. Master's Thesis. 1-10 Hour.
Master's thesis. May be repeated for degree credit.

SPAC 700V. Doctoral Dissertation. 1-18 Hour.
Doctoral dissertation. May be repeated for degree credit.