SPACE SCIENCE AND ENGINEERING, MINOR

Space Science and Engineering Minor Requirements

- A Proposal and Course Plan, which must be approved by the student's advisor for the minor (hereafter referred to as the "Advisor"), before students register for the minor. The proposal must discuss a theme that unites the individual elements of the program (courses and internship(s)) into an intellectual whole.
- Five courses in Science and Engineering. One course is specified (AS.171.321 Introduction to Space, Science, and Technology) and the remaining four are chosen through the student's Proposal and Course Plan, which must be approved prior to taking the courses by the Advisor. All courses must be taken for a grade rather than satisfactory/unsatisfactory. A grade of C- or better is required. Courses that are named as requirements for the student's major may not be used. However, courses that are not named, but satisfy an elective requirement for the major, may be used.
- An internship or equivalent experience in the field of space science and engineering is required. This must have prior approval from the Advisor.
- A brief report on the internship or equivalent experience to the Advisor.

Course Requirements

Specified Course

The specified course is AS.171.321 Introduction to Space, Science, and Technology. The course carries 3 credits. The course is co-listed by the Departments of Earth and Planetary Sciences, Materials Science, and Engineering and Mechanical Engineering.

The recommended course background for AS.171.321 are the following courses: AS.171.101 General Physics: Physical Science Major I-AS.171.102 General Physics: Physical Science Major II and Calculus AS.110.108 Calculus I (Physical Sciences & Engineering)-AS.110.109 Calculus II (For Physical Sciences and Engineering). Students may also consider similar course pairings like AS.171.103 General Physics I for Biological Science Majors and AS.171.104 General Physics/Biology Majors II or AS.171.107 General Physics for Physical Sciences Majors (AL) and AS.171.108 General Physics for Physical Science Majors (AL).

Proposal and Course Plan for the Four Courses

To ensure that the program is a coherent intellectual activity, students are required to submit a Proposal and Course Plan to their Advisor early in their program, prior to taking the courses. The Proposal and Course Plan will identify a theme that describes the educational goal that the student will pursue through their course of study and a list of courses to achieve their goal. Examples of such themes could be "Remote observations of the earth and planets from space vehicles" or "Spacecraft design for astronomy missions." If consistent with the Proposal and Course Plan theme, students may use other courses with the permission of their Advisor.

The Proposal should also include ideas for completing the internship requirement discussed below.

Additional Requirements on the Four Courses

- One of the four courses may be at the 200-level, but at least three must be at the 300-level or higher.
- The total credits associated with the courses must be 12 or more.
- At least three of the courses must be in departments other than the department or program of the student's major.
- Courses cannot be "named" requirements of the major; however, elective courses for the major may be used.

Internship or Equivalent Experience

Practical experience in space science and space engineering can be obtained through an academic internship, non-academic internship or an equivalent experience. This practical experience can be acquired by at least six weeks of full-time effort or the equivalent effort spread over a longer period. This can take place during a summer or during the academic year.

Academic Internships

The Undergraduate Student Handbook describes the regulations governing academic internships. Students may find the following quoted material from the Handbook helpful:

- "Academic internships are practical work experiences which have an academic component as certified by a member of the faculty."
- "Academic credit for Customized Academic Learning must be sponsored by a full-time member of the Homewood faculty. This is the case whether the work is done on campus or not. The work supervisor and the faculty sponsor may be the same individual. If the faculty sponsor is not the work supervisor, the work supervisor must provide the faculty sponsor with a report on the student's achievements while doing the independent project."
- "Only one credit may be earned for an academic internship during one semester or summer."
- "The grading method is Satisfactory/Unsatisfactory only."
- "The use of credit for Customized Academic Learning to satisfy the requirements of a major or minor is subject to prior written approval by the appropriate department or program."

Non-academic Internships

These internships are offered by non-academic organizations such as the Space Telescope Science Institute, the Applied Physics Laboratory, and a number of NASA laboratories to provide undergraduate students practical work experience in space science and space engineering. These internships often carry a stipend and are not eligible for academic credit.

Opportunities within the university include the Applied Physics Laboratory, the Center for Astrophysical Sciences, the Space Telescope Science Institute, as well as individual professors and research staff. In addition, local laboratories and companies, such as NASA Goddard Space Flight Center, Lockheed Martin, Northrop Grumman, Orbital Sciences, and other private corporations offer excellent opportunities for internships and summer work experiences.

- Applied Physics Laboratory program for JHU students (https://www.jhuapl.edu/Education/JohnsHopkinsConnection/) – Students should indicate their interest in the Space Department of the JHU APL.
- Space Telescope Science Institute intern program (https://www.stsci.edu/institute/smo/students/)

- NASA (https://www.nasa.gov/centers/goddard/education/internships.html)

Equivalent Experiences

Other activities that meet the spirit of the requirement may be accepted. For example, employment opportunities, often in the summer, can provide practical experience in space science and space engineering.

Prior Approval Required

The student is responsible for identifying and arranging the internship or equivalent experience. However, in order to count toward the minor, it must be approved in advance by the Advisor. In general, the Advisor will require that the mentor or supervisor be either a space scientist or space engineer.

Required Report on the Internship or Work Experience

In order to have it count toward the minor, the student must provide a brief report (typically one page) describing the internship or equivalent experience to the Advisor at the beginning of the semester immediately following the activity. The report should give the name of the organization or laboratory (e.g., STScI, JHU-APL, NASA-GSFC), the start date and duration, and the name, position, and email address of the mentor/supervisor. It should include a brief summary describing the activity, a description of new knowledge and skills learned, and information about the overall experience.

For a detailed explanation of the minor and its requirements, including sample programs of study, please visit the Student Handbook for the Minor in Space Science and Engineering (http://spacestudies.jhu.edu/space-minor/).