*Syllabus*

# ESS 100 -- Introduction to Space Science

**Space Camp® Advanced Space Academy**

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**Course Catalog Description:**

Credit Hours: 1

Introduction to a variety of space science subjects, including physiology in space, computer systems, materials in space, robotics, thermodynamics, astrophysics, and solar physics. Laboratory experiments and simulated missions. Offered in cooperation with U.S. Space and Rocket Center and Space Camp®. Open only to students enrolled in Advanced Space Academy®.

**Requisite:**

Open only to high-school students successfully completing the U.S. Space and Rocket Center Advanced Space Academy.

**Textbooks/ Course Materials:**

- Log Book (supplied at Space Camp®)
- Mission Checklist (supplied at Space Camp®)
- All other materials are supplied by Space Camp®

**Course Objectives:**

After completing this course you should:

- Have an understanding of the history and future of space flight.
- Have an understanding of the fundamental math and sciences required for space flight.
- Have experience in coordination and communication in a team environment.
- Have hands-on experience coping with the challenges faced by astronauts.

**Course Subject Matter:**

The course is divided into the following sections:

- History and Future of Space Flight
- Ropes Course
- Shuttle Anatomy
- Ablative Heat Shield
- Rocketry
- Special *Mission Specialist Track* or *Pilot Track* projects

**Course Grading:**

A grade of satisfactory/ unsatisfactory (S/U) will be assigned for the course based on meeting the following requirements specified by the U.S. Space and Rocket Center Advanced Space Academy guidelines for program completion:

- Attendance: 6 days 5 nights in full attendance
- Attitude: Must adhere to the Space Camp® Code of Conduct
- Participation: Completion of activities, missions and engineering challenges to a satisfactory standard

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**Students with Disabilities:**

Your U.S. Space and Rocket Center Instructor should be notified of any disabilities so that appropriate accommodations can be made.

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**Course Outline:**

Students must choose the *Mission Specialist Track* or the *Pilot Track.* Students will be accordingly divided into teams and rotate throughout the following lectures and projects during their time at Advanced Space Academy:

- **History and Future:** Each team will receive extensive education for space exploration. The history will begin with the Chinese invention of the rocket then travel through the work of Tsiolkovsky, Goddard, Oberth, and von Braun. The beginning of NASA and the Mercury, Gemini, Apollo and STS Programs will be covered in great detail before transitioning to the future of spaceflight with private companies.

- **Missions:** The authenticity, difficulty, and teamwork required in missions are made to challenge students and immerse them with the world of astronaut training. All areas of a mission will require communication and coordination for success. Teams will set their own pace as they complete Mission Control.

- **Ropes Course:** Each team will visit the ropes facility and participate in team building activities that prepare them for the stresses of the upcoming missions. They also will experience the high elements in which they will be stretched to their limits and given the opportunity to conquer their fears.

- **Scuba (Mission Specialist Track):** Students will get to experience a simulated microgravity environment. In fact, it is the closest possible to a true microgravity environment that humans can experience without being in space. This will be done via scuba diving in the Underwater Astronaut Trainer (UAT). Students must first complete different skill exercises to prepare for the dive. After completing these exercises, students will begin to descend

until reaching the bottom of UAT. At the bottom students must complete various projects and activities. Students will be constantly supervised by diving staff.

- **Shuttle Anatomy:** After an introduction and comparison of the equipment and hardware used on the Shuttle and ISS, students will be challenged with creating their own versions of the following two systems:

1) **Orbiter Systems-** Fuel Cell: Students must design and build a functioning fuel cell from provided materials and measure the voltage it creates over a period of time.
2) **Environmental Control & Life Support Systems-** Water Filtration System: Students must design and build a functioning water filtration system utilizing the knowledge from the presentation and provided materials.

- **Ablative Heat Shield:** This engineering challenge is focused on designing an ablative heat shield for reentry. Teams will be given a wide variety of materials to choose from in order to construct a heat shield. The heat shield must fit in the test housing. Teams will be given a budget that can count for or against them, depending on expenditure. The heat shield must withstand a blow torch for three minutes while protecting a precious egg. Scoring will be based on how well the egg was protected.

- **Aeronautic Design (Pilot Track):** This engineering challenge is focused on Aeronautics. Aeronautics is typically defined as the art or science of flight, or the science of operating an aircraft. Students must design a plane using common materials provided to each team. Then the plane will compete against other sub teams. A complete grasp of the initial aerodynamics briefing will be crucial for success in this challenge.

- **Rocketry:** This engineering challenge is focused on the design of a model rocket capable of launch and safely recovering an egg from a designated altitude. Students must design and build a *safe* rocket to complete this task. Scoring will be based on all work and performance of the rocket.

- **Space Suits (Mission Specialist Track):** Students will be taught about the many reasons for suits in space and the changing needs for different technology throughout the space flight programs, from a thin metallic suit to the lunar suits and the multiple iterations during the Shuttle program. Students must create a “suit” to protect an apple from various tests by using the provided materials while maintaining a budget.