21:460:240 Planetary Exploration and Astrobiology
Syllabus

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(1) Catalog Description: This course will explore the history and motivation or science objectives of planetary explorations. It will discuss fundamental questions: Are we alone in the universe? and Where did the life begin? These questions still remain unanswered by the modern-day science. The course will explore the space mission science development through the time, possible origins of life, its distribution in our solar system, and beyond.

(2)

(3) Learning Goals: In this course students will learn**:**

- Basic geological/chemical/physical processes relevant to origin and distribution of life in the Universe.
- Concepts about definition of life, the life's origins and the evolution.
- Students will analyze and interpret data from current space missions (such as Mars Science Laboratory, and the Kepler mission)
- Students will apply the knowledge from this course and explore an array of biosignatures that may be relevant to life detection on other planets.

(4) Course materials: "Astrobiology: Understanding Life in the Universe" by Charles S. Cockell, ISBN-13: 978-1118913338 and ISBN-10: 1118913337

(5) Readings and assignments: There will be 10 homework assignments based on the lecturers and assigned readings. All homework and reading assignments will be posted on the Blackboard. Homework will not be graded, but the topics and questions will be included in the quizzes and exams.

(6) Prerequisite: None

(7) Class Format: In-person lecture with discussion.

(8) Grading: Quizzes 60%, Midterm Exam 20%, Final Exam 20%

Quizzes will be used for in-class assessment "Concept Tests" (higher-order multiple-choice questions that focus on one key concept of a major learning goals for a lesson). Electronic Student Response Technology (e.g. clickers) will be used to administer the quizzes.

(9) Course Schedule (subject to change based on the class needs and performance)

Timeline	Lecture	Reading Assignments
Week 1	**Introduction to Planetary Exploration** (historic exploration of Earth's polar regions, Space race and the development of modern space programs)	NASA online material
Week 2	**Lunar Exploration** (Space race and resulting science, origin of the Moon and basic geology)	Miscellaneous reading
Week 3	**Mars** (Space missions to Mars, resulting science and overview of Martian geology)	Astrob. Ch 17
Week 4	**The rest of Solar System and Space missions** (Mercury, Venus, Icy moons, Jupiter, Saturn and Pluto)	Astrob. Ch 18
Week 5	**What is Life and The Origins of Life** (Definition of Life, Locations of Life's Origins, Panspermia, Life Chemistry)	Astrob. Ch 11.
Week 6	**Evolution** (Tree of life, rise of multicellular and complex life)	Astrob. Ch 6. 15
Week 7	**Planetary Habitability** (Fundamental parameters of habitability of a planet, such as Mars, and other planetary systems)	Astrob. Ch 13, 14, 16
Week 8	**Midterm Exam**	Review Material
Week 9	**Life in Extreme Environments** (Limits of life and why it matters)	Astrob. Ch 7.
Week 10	**Biosignatures** (definition, examples and relevance to life detection on other planets)	Astrob. Ch 12, 19
Week 11	**Terrestrial Analogs** (how to advance planetary exploration with confidence)	Miscellaneous reading
Week 12	**Mars2020 Space Mission** (Science goals, rover, landing site, and Sample Return Mission)	NASA website
Week 13	**Planetary Protection** (How to properly explore other planets and safely bring extraterrestrial samples to Earth)	COSPAR and NASA documents
Week 14	**Human Missions to Mars and the Moon** (Current ISS mission and Future missions to the Moon and Mars, Space Tourism)	Astrob. Ch 21, and Miscellaneous reading
Week 15	**Final Exam - Review**	Review Material

***Policy Concerning Disability*:** Rutgers abides by the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments (ADAA) of 2008, and Sections 504 and 508, which mandate reasonable accommodations to be provided for qualified students with documented disabilities. For more information please contact the Disabled Student Services Office on 973-353-5300.

Academic Honesty Policy: Cheating in any form will not be tolerated. The first occurrence of any of this behavior will result in a grade of "F".