NS A196: SPECIAL TOPICS IN SCIENCE - EXPLORING MARS

Item	Value
Curriculum Committee Approval Date	10/06/2021
Top Code	191400 - Geology
Units	2 Total Units
Hours	72 Total Hours (Lecture Hours 18; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)

Course Description

Introduction to engineering design while building teamwork and communication skills and examining the engineering major offered and engineering careers. Completion of hands-on engineering design projects, preparation of short reports describing projects, and presentation of results. The specific project challenges students to explore the surface of Mars with an eye toward its potential for human habitation. The overall goal is to build a rover and develop programs that allow an unmanned autonomous rover to navigate the surface. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Identify, discuss and analyze current topics in the science of Mars.
2. Develop skills related to the current science of Mars.
3. Assess the limits of current engineering practices as they apply to Martian science and develop new strategies or directions for future practices.

Course Objectives

- 1. Demonstrate a new or enhanced professional skill and be able to graphically or verbally articulate a current topic in the sciences by producing a physical manifestation of newly acquired skills.

Lecture Content

Introduction Mars facts Mars across human history Mars in the Solar System Big Bang, Nucleosynthesis, Star Formation, and Death Molecular clouds, Formation of the Solar System, Condensation and Accretion Martian meteorites Missions to Mars Earlier orbiters and landers Past rovers - Spirit and Opportunity Recent missions - MSL and InSight, Mars 2020 sample return Major geological and morphological provinces on Mars Volcanoes, Canyons Crustal dichotomy, Impact basins, Highland Paterae Impact Processes, Cratering, and Telling time on Mars Martian climate and changes over martian history Aeolian Processes Water Ice on Mars Landing sites, defining goals Habitable zones, life in extreme environments Moons/Mars the next frontier

Lab Content

A. Introduction 1. The RedBoard Platform 2. Baseplate Assembly 3. RedBoard Anatomy 4. Breadboard Anatomy 5. The Arduino IDE 6. Inventory of Parts B. Light 1. Blinking an LED 2. Potentiometer 3. Photoresistor 4. RGB Night-Light C. Sound 1. Buzzer 2. Digital Trumpet 3. “Simon Says” Game D. Motion 1. Servo Motors 2. Distance Sensor 3. Motion Alarm E. Display 1. : LCD “Hello, World!” 2. Temperature Sensor 3. “DIY Who Am I.” Game F. Robot 1. Motor Basics 2. Remote-Controlled Robot 3. Autonomous Robot G. Going Further

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

Lectures, demonstrations, discussions, individual and small group exercises, instructor feedback, peer-to-peer.

Reading Assignments

Students will spend approximately 2 hours reading from the textbook and instructor material provided via LMS.

Writing Assignments

Students will spend approximately 1 hour per week on writing assignments, including: Keeping a journal of chronological notes taken during research, lecture, and laboratory experience. Author a technical report for each project written to industry standards for technical reports.

Out-of-class Assignments

Students will spend approximately 3 hours per week on out-of-class assignments, including: Researching topics as assigned. Preparing technical documents prior to laboratory projects. Completing technical reports after each project. Maintaining a portfolio of projects throughout the semester.

Demonstration of Critical Thinking

Students execute the design of a robot using the engineering design process. Students work individually and in groups to solve challenges presented in a project-based form. Quizzes are administered at the end of each topic to demonstrate mastery of the specific objective. Midterm and a final exam administered to test the ability to retain problem-solving skills.

Required Writing, Problem Solving, Skills Demonstration

Exercises Group and individual Projects Quizzes Midterm Exam Final Exam Keep a journal of chronological notes taken during: a) research b) lecture c) laboratory experience. Maintain a portfolio of technical reports, research and class notes. Submit technical reports for lab projects containing results and analysis.

Eligible Disciplines

Earth science: Masters degree in geology, geophysics, earth sciences, meteorology, oceanography, or paleontology OR bachelors degree in geology AND masters degree in geography, physics, or geochemistry OR the equivalent. Masters degree required. Robotics (computer integrated manufacturing): Any bachelors degree and two years of professional

experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Hartmann, W. K. . A Travelers Guide to MARS, 1st ed. Workman Publishing Company, 2003 Rationale: Details the processes and phenomena that make up the history, geology and climate of planet Mars 2. Required Forget, F.. Planet Mars- Story of another world, 2nd ed. Springer, 2021