

Ledyard Public Schools  
Science Curriculum

# Earth Science

# 1400

Instructional Council Approval October 24, 2005

# Robotics and Remote Sensing

**Suggested Time:** Approximately 6 weeks

**Essential Question:**

What technologies are necessary to gather data from planetary surfaces?

**Focus Questions:**

1. What technologies are necessary to deliver data collecting equipment near or on planetary surfaces?

**Learning Objectives:** The Student will be able to:

- a. discuss how technologies are transported to planetary surfaces, orbits or flybys
- b. discuss the present technologies used to deliver data collecting equipment
- c. discuss possible future technologies that might transport data collecting technologies

2. How is transportation across planetary surfaces accomplished?

**Learning Objectives:** The Student will be able to:

- a. identify possible transportation modes to traverse a surface
- b. design a concept vehicle to traverse a surface
- c. build and/or operate a remote controlled vehicle.
- d. discuss how robotic devices are presently used in medicine and by law enforcement

3. How is visual data collected from planetary surfaces?

**Learning Objectives:** The Student will be able to:

- a. explain in writing how images are transmitted across space
- b. compare images of varying resolutions, color or 2D vs 3D
- c. use visual imaging to traverse a surface

4. How is physical data collected from planetary Surfaces?

**Learning Objectives:** The Student will be able to:

- a. demonstrate how robotic appendages are manipulated remotely
- b. build and/or operate a robotic appendage
- c. discuss the kinds of physical data collected from planetary surfaces

**Assessment:**

Science assessment includes: tests, which assess content knowledge and application, skill acquisition and application of knowledge at all levels of critical thinking; quizzes; formal laboratory assessments as full lab reports, parts of lab reports or quiz type lab assessments; a variety of written, oral and visual presentations; as well as a variety of other individual and group work assessments. All tests must include free response questions (or constructed response) as well as appropriate content and/or skill assessment and, except where inappropriate, must be balanced in terms of the critical thinking skills expected of students. Laboratory reports (or parts) will follow the Ledyard High School standard Laboratory format. Other Laboratory assessments should reflect CAPT Style multiple choice and / or open-ended questions.

**Required Activities:**

Robot building or operation  
 Remote sensing or manipulation equipment construction or operation  
 Visual imaging using remotely controlled devices  
 Fuel cells

**Resources:**

**Student & Teacher:** Appropriate manuals associated with robotics, remote sensing and imaging

**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concepts
1. Space Exploration	P1	P(1, 2, 3, 7, 8)
2. Planetary Transportation	P1, P3	P(7, 8, 9, 10, 11, 12, 13, 14)
3. Visual Data Collection	E1, P4	E(9), P(19, 21, 22)
4. Physical Data Collection	P1, P2, P4	P(2, 4, 11, 12, 17, 18)

# Planetary Surfaces and Atmospheres

**Suggested Time:** Approximately 6 weeks

**Essential Question:**

1. What does surface and atmospheric data tell us about conditions on a planet (or moon)
2. How are Earth analogies used to make assumptions or draw conclusions of planetary conditions

**Focus Questions:**

1. What data is obtained from planetary surfaces?  
**Learning Objectives:** The Student will be able to:
  - a. discuss the types and form of data obtained from planetary surfaces
  - b. identify earth analogies that may be necessary to draw conclusions about planetary surfaces
2. How is data from planetary surfaces analyzed?  
**Learning Objectives:** The Student will be able to:
  - a. discuss the information visual data gives concerning the surface of a planet
  - b. use visual data to describe a planetary surface
  - c. demonstrate how 2D images can yield 3D visualizations
  - d. use earth analogies from visual imaging to draw conclusions about planetary surfaces
  - e. apply earth analogies to the use of physical data from planetary surfaces
3. What are the issues concerning data obtained from planetary surfaces?  
**Learning Objectives:** The Student will be able to:
  - a. list the criteria for evidence of life on planetary surfaces
  - b. explain how data may yield differing conclusions

**Assessment:**

Science assessment includes: tests, which assess content knowledge and application, skill acquisition and application of knowledge at all levels of critical thinking; quizzes; formal laboratory assessments as full lab reports, parts of lab reports or quiz type lab assessments; a variety of written, oral and visual presentations; as well as a variety of other individual and group work assessments. All tests must include free response questions (or constructed response) as well as appropriate content and/or skill assessment and, except where inappropriate, must be balanced in terms of the critical thinking skills expected of students. Laboratory reports (or parts) will follow the Ledyard High School standard Laboratory format. Other Laboratory assessments should reflect CAPT Style multiple choice and / or open-ended questions.

**Required Activities:**

Comparison and analysis of images from Mars with similar images of earth  
Analysis of images collected by remote sensing devices  
Analysis earth images from space  
Weather investigations

**Resources:**

**Student & Teacher:**

**Explorations: An Introduction to Astronomy,**

Arny, Thomas, McGraw-Hill, 4th ed. 2006

**Physical Science: Concepts in Action,**

Wysession, Frank & Yancopoulos, Prentice Hall, 2004

**Curriculum Alignment with State of Connecticut Science Standards**

**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Questions	Content Standard	Supportive Concepts
1. Planetary Surfaces	E1, E5	1, 2, 3, 5, 9, 27, 58, 29, 30
2. Analyzing Planetary Information	E1	1, 2, 3, 5,
3. Issues with remote Data	E1	1, 2, 3, 5, 9

# Forces That Change Planetary Surfaces

**Suggested Time:** Approximately 6 weeks

**Essential Question:**

How are terrestrial surfaces changed over time.

**Focus Questions:**

1. What are the forces that change planetary surfaces  
**Learning Objectives:** The Student will be able to:
  - a. report on how the dynamic earth creates and changes landscapes
  - b. explore, in the laboratory, how water changes surfaces
  - c. explain the effect of wind on planetary surfaces
  - c. explore, in the laboratory, the effect of collisions with planetary surfaces
  
2. How are earth forces used as predictive models for planets and their moons  
**Learning Objectives:** The Student will be able to:
  - a. use earth processes to analyze planetary surface images
  - b. discuss the effect, over time, of forces that change planetary surfaces
  - c. discuss the evidence of earth analogous changes on planetary surfaces

**Assessment:**

Science assessment includes: tests, which assess content knowledge and application, skill acquisition and application of knowledge at all levels of critical thinking; quizzes; formal laboratory assessments as full lab reports, parts of lab reports or quiz type lab assessments; a variety of written, oral and visual presentations; as well as a variety of other individual and group work assessments. All tests must include free response questions (or constructed response) as well as appropriate content and/or skill assessment and, except where inappropriate, must be balanced in terms of the critical thinking skills expected of students. Laboratory reports (or parts) will follow the Ledyard High School standard Laboratory format. Other Laboratory assessments should reflect CAPT Style multiple choice and / or open-ended questions.

**Required Activities:**

- Rock formation activity
- Rock / mineral characteristics and properties Laboratory
- Plate tectonics activity
- 3-D geology (carolina biological) activity
- Erosion Laboratory studies
- Crater Laboratory activity (CAPT Craters)

**Resources:**

**Student & Teacher:**

**Explorations: An Introduction to Astronomy,**

Arny, Thomas, McGraw-Hill, 4th ed. 2006

**Physical Science: Concepts in Action,**

Wysession, Frank & Yancopoulos, Prentice Hall, 2004

**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Questions	Content Standards	Supportive Concepts
1. Forces That Change Surfaces	E2, E4, E5	11, 12, 13, 25, 26, 27, 28
2. Characteristics of Forces	E2, E4	11, 12, 13, 25, 26