

CREDIT HOURS: 4

CONTACT HOURS PER TERM: 60

June 5th-June 14<sup>th</sup>: 8:30 AM-4:30 PM, Room 126 Berthoud, Colorado School of Mines (except June 9th in field).

**CATALOG DESCRIPTION:** Geological content, including use of Adventure Engineering modules on Volcano Alert and Asteroid Impact. Field experience incorporated.

**PREREQUISITES:** no prerequisites

**INSTRUCTOR:** Michael Mooney & Michael P. Marlow

**Accreditation Standards:**

Competencies: Students will be able to:

1. Knowledgeable about mathematics and science instruction [State Standard 2]
  - ❖ Use the Colorado State Earth Science Content Standards to plan lessons
  - ❖ Determine if students' responses are scientifically correct
  - ❖ Interpret students' responses for their scientific reasoning
2. Knowledgeable of Standards and Assessment [State Standards 3]
  - ❖ Use a formative assessment to describe students' prior knowledge about a science idea
  - ❖ Plan instruction to further develop the idea
  - ❖ Make appropriate accommodations to ensure learning for all students
  - ❖ Lead a discussion to advance and assess the students' understanding of the science idea
3. Knowledge of Technology [State Standard 4]
  - ❖ Use technology to support instruction and enhance student learning

**COURSE OUTLINE:**

The purpose of this course is to acquaint participants with a variety of content, techniques and resources for teaching geological science. Though field experience teachers should better understand the processes of 'doing' earth science and provide them a basis for the development of student active lessons in their own classrooms.

- a. **Goals**
  - This course will provide opportunities for participation in activities demonstrating geological techniques commonly used in field studies.
  - Students will have opportunities to participate in grade-level group discussion related to earth science topics, teaching methodologies and integrated science.
  - Students will visit outdoor resource sites to encourage deeper understanding of earth studies.
  - Students will be able to review resources available for earth science program development.
- b. **Outcomes**
  - Course participant will develop an appreciation of an inquiry science approach to earth science education.
  - Course participant will understand methods and techniques used in elementary and secondary science education.
  - Course participants will be able to structure an earth science field lesson.
  - Course participants will begin understanding the value of extended classroom experiences.
  - Course participants will have developed materials for classroom use.

**III. Content**

Geology 5006 will provide a series of daylong experiences on appropriate earth science content. These classroom sessions will be used to provide earth science content understandings appropriate to the facilitation of earth science curriculum. Participants will be provided modular materials and units that may be used in their own classrooms e.g. kits of important rocks and minerals, computer data programs and e-

### III. Content

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#### a. Field Topics Activity

This course will involve a daylong field study:

##### • Colorado Mining Areas

The purpose of this day is to establish an understanding of sedimentary environments, mineral deposition, extraction, and mining impact on Colorado. Participants will make a geological map the Red Rock area. Major areas of investigation also include the I-70 corridor, the Idaho Springs and Central City Area. Participants will collect mineral and sediment samples for later use in classrooms.

#### b. Methodologies and Strategies

The course will utilize a variety of methods and strategies to accomplish participant understanding. The instructor will model field study planning and presentation using a problem solving approach. Some classroom sessions will involve an instructor lecture approach to provide basic information necessary to the topic. Other sessions will involve participants in cooperative small group activities in the development of materials and lessons. Student inquiry and authentic research within classrooms will be discussed and demonstrated through course activities. Video, slides and computer programs will enhance participant understanding of both the process and the content information.

### ASSIGNMENTS and GRADING

Students must achieve mastery on all items in order to earn a grade of B or better in this course.

| Assignment                                  | Mastery           |
|---|-------------------|
| 1. Class participation and attendance       | 20 pts            |
| 2. Field mapping participation              | 10 pts            |
| 3. Earth Science Activity Presentations (2) | 40 pts            |
| 4. Managing a field experience paper        | 30 pts            |
| <b>Total possible points</b>                | <b>100 points</b> |

|               |              |                  |
|---------------|--------------|------------------|
| A = 100 - 92  | B+ = 86 - 87 | C = 74 and below |
| A - = 88 - 91 | B = 78 - 85  |                  |
|               | B- = 75 - 76 |                  |

*Class attendance and participation* is expected and necessary to fully gain from this course. This is not a reading, discussion course but rather a series of activities and experiences that the student will use to construct understandings of the Colorado environment. Discussions will be embedded within the activity thus you must be here to benefit. Formal participation activities are required within each of the field trips.

*Field Mapping Participation:* This field trip will encompass 5 stops, each at a different rock/mineral sites. Course members in a team will be responsible for preparing field map and field log.

*The AI and VA module Activity* will be presented by group. The activity description sheet will be provided to each student in the class.

The *Managing a Field Experience paper* is a reflection on organizing and leading/facilitating an outside the classroom experience. It should include a clear statement of purposes for leaving the classroom and contain a short bibliography of appropriate readings. A two to three page length is sufficient.

## 2006 NSF Earth Processes Teacher Workshop

June 5-14

(Berthoud 126, Colorado School of Mines)

### 1. Monday June 5

|             | <u>Lead</u>                                      |               |
|-------------|--|---------------|
| 8:30-9:00   | Welcome and Introduction                         | Mooney/Marlow |
| 9:00-9:30   | Geology pre-test                                 | Marlow        |
| 9:30-10:15  | Mineral Groups                                   | Marlow        |
| 10:15-10:30 | Break  | Marlow        |
| 10:30-12:00 | Mineral Identification                           | Marlow        |
| 12:00-12:30 | Lunch with Asteroid Impact teams                 | Marlow/Mooney |
| 12:30-1:30  | Intro to engineering design                      | Mooney        |
| 1:30-2:30   | Asteroid Impact (AI) <i>What's the Problem?</i>  | Mooney        |
| 2:30-2:45   | Break  |               |
| 2:45-3:15   | AI <i>How Big?</i>                               | Mooney        |
| 3:15-4:30   | AI <i>Scaling the Map and Possible Locations</i> | Mooney        |

### 2. Tuesday June 6

|             |                               |                 |
|-------------|-------------------------------|-----------------|
| 8:30-9:30   | Identifying rocks             | Marlow          |
| 9:30-10:30  | Visit to Geology Museum       | Marlow          |
| 10:30-10:45 | Break                         |                 |
| 10:45-12:00 | Rock Activity                 | Marlow          |
| 12:00-1:00  | Lunch & Asteroid video        | Marlow/Rinehart |
| 1:00-2:30   | AI <i>Rocks, Rocks, Rocks</i> | Rinehart        |
| 2:30-2:45   | Break                         |                 |
| 2:45-4:30   | AI <i>Ranking the Rocks</i>   | Rinehart        |

### 3. Wednesday June 7

|             | <u>Lead</u>   |        |
|-------------|---|--------|
| 8:30-10:00  | Earthquakes   | Marlow |
| 10:00-10:15 | Break   |        |
| 10:15-12:00 | Plate Tectonics   | Marlow |
| 12:00-1:00  | Lunch & Team Discussion                                     | Mooney |
| 1:00-2:00   | AI <i>Drum Roll Please!</i>                                 | Mooney |
| 2:00-3:00   | AI <i>Team Presentations</i>                                | Mooney |
| 3:00-3:15   | Break   |        |
| 3:15-3:45   | AI assessment   | Mooney |
| 3:45-4:30   | Discussion about incorporating unit, i.e., extensions, etc. | Mooney |

### 4. Thursday June 8

|             |   |        |
|-------------|---|--------|
| 8:30-10:00  | Volcanism I                                   | Marlow |
| 10:00-10:15 | Break   |        |
| 10:30-12:00 | Volcanism II                                  | Marlow |
| 12:00-12:45 | Lunch with Volcano Alert team                 |        |
| 12:45-1:15  | Volcano Alert (VA) <i>What's the Problem?</i> | Mooney |
| 1:15-2:00   | VA <i>Video &amp; Questions</i>               | Mooney |
| 2:00-2:45   | VA <i>Ring of Fire</i>                        | Mooney |
| 2:45-3:00   | Break   |        |
| 3:00-4:30   | VA <i>What kind of Volcano?</i>               | Mooney |

### 5. Friday June 9 FIELD TRIP!!!!

|           |                        |        |
|-----------|------------------------|--------|
| 8:30-4:30 | Details to be provided | Marlow |
|-----------|------------------------|--------|

### 6. Monday June 12

|             |  | <u>Lead</u> |
|-------------|--|-------------|
| 8:30-10:00  | Earthquakes                                    | Marlow      |
| 10:00-10:15 | Break  |             |
| 10:15-11:00 | Physical weathering and landforms              | Marlow      |
| 11:00-12:00 | Landform activities                            | Marlow      |
| 12:00-1:00  | Lunch Presentation – landslides and rockslides | Paul Santi  |
| 1:00-2:00   | VA <i>Boom</i>                                 | Mooney      |
| 2:00-3:00   | VA <i>Viscosity and Velocity</i>               | Mooney      |
| 3:00-3:15   | Break  |             |
| 3:15-3:30   | VA <i>Build a Model Volcano</i>                | Mooney      |

### 7. Tuesday June 13

|             |                                       |        |
|-------------|---------------------------------------|--------|
| 8:30-9:30   | VA <i>Hazard Analysis</i>             | Mooney |
| 9:30-10:15  | VA <i>Save the Townspeople!</i>       | Mooney |
| 10:15-10:30 | Break                                 |        |
| 10:30-12:00 | VA <i>Early Warning System Design</i> | Mooney |
| 12:00-1:00  | Lunch and Volcano Video               |        |
| 1:00-2:30   | VA <i>Team Presentations</i>          | Mooney |
| 2:30-2:45   | Break                                 |        |
| 2:45-3:15   | VA Assessment                         | Mooney |
| 3:15-4:30   | Earth Mechanics Institute Tour        | Mooney |

### 8. Wednesday June 14

|             |                                      |        |
|-------------|--------------------------------------|--------|
| 8:30-10:00  | Rivers, glaciation                   | Marlow |
| 10:00-10:15 | Break                                | Marlow |
| 10:30-12:00 | Geology content                      |        |
| 12:00-12:30 | Lunch                                | Marlow |
| 12:30-4:30  | Geology Trail, Post-test and Wrap-up | Marlow |

### 9. Thursday June 15

|             |                             |         |
|-------------|-----------------------------|---------|
| 8:30-11:00  | Plate Boundary or Discovery | Mooney  |
| 11:00-12:00 | Volcanology                 | Mooney  |
| 12:00-1:00  | Lunch + Discovery Video     | Richard |
| 1-4:30      | add'l geology               | Marlow  |