**Appendix to Senate Agenda, September 26, 2006**

# FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School: Physics & Astronomy Date: 8-24-06

Course No. or level: Physical Science 103 Title: Physical Science III: Earth Science

Semester hours: 4 Clock hours: Lecture: 3 Laboratory: 3

Prerequisites: PSCI 101 or PHYS 215 or permission of department

Enrollment expectation: 12 to 15

Indicate any course for which this course is a (an)

modification_____N/A_____
(proposed change in course title, course description, course content or method of instruction)

substitute_____N/A_____
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate_____N/A_____
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description: Joe H. Mehaffey

Department Chairperson's /Dean's Signature_____

Date of Implementation_____

Date of School/Department approval_____

Catalog description: 103 Physical Science III: Basic Concepts of Earth Science (4:3-3) (Prerequisites: PSCI 101 or PHYS 215 or permission of the department). S Study of the earth's structure and our environment with an emphasis on the processes that shape them. The fundamental principles of geology, meteorology, and oceanography will be covered. Topics include rocks and minerals, the earth's interior, earthquakes and tsunamis, weather and climate, the hydrosphere, natural resources, energy and environmental concerns.

Purpose: 1. For Whom (generally?)

Education majors seeking middle school science certification and any students with an interest in earth science.

2. What should the course do for the student?
The successful student will demonstrate a basic understanding of the earth's internal and external structures, the processes that shape those structures, and the techniques used to explore the earth.

Teaching method planned: Lecture, PowerPoint presentation, laboratory, homework, student literature research, and in-class presentation

Textbook and/or materials planned (including electronic/multimedia):

- Earth Science, 11th ed., Tarbuck and Lutgens
- Applications and Investigations in Earth Science, 5th ed., Tarbuck, Lutgens, Pinzke
(*Lab Manual*)

Course Content: (See attached course syllabus.)

Rationale: The original impetus for the proposed course was the department's interest in assisting future middle school science teachers by providing them with an improved content knowledge in the earth sciences. This course would be part of a larger effort to produce better-prepared middle school teachers in general.

The course would also serve as an addition to the university's general education science offerings, which have previously lacked any specific study of geology, meteorology, and oceanography.

Capital Needs: It is anticipated that this course would be offered once per academic year and that only one section would be needed. Therefore, existing department personnel and infrastructure will be adequate. The bulk of the expenditure for this course would involve the laboratory component and would include rock and mineral samples, topographic maps and some laboratory equipment. These items will be purchased from the Physics and Astronomy Department budget.

# PSCI 103 EARTH SCIENCE

Instructor: Mr. J.H. Mehaffey
Office: LSF L103
Email: jmehaffey@fmarion.edu
Phone: 661-1448

COURSE OBJECTIVES:
Upon completion of the course, students should be able to:

1. Demonstrate an understanding of the terms used in describing the earth's structural features (*igneous rock, mantle, subduction zone, S and P waves, oceanic ridge*).
2. Describe major processes that shape the earth and our environment (*volcanism, erosion, thermal and compositional convection, gulf stream, sedimentation, greenhouse effect, sea floor spreading, hydrologic cycle*).
3. Demonstrate a basic familiarity with the important models and theories that help scientists explain large-scale events and processes (*formation and evolution of the earth, plate tectonics, models of mantle convection, origin of earth's magnetic field*).
4. Demonstrate a familiarity with the techniques used to investigate the earth's exterior and interior (*seismic techniques, mineral streaking, drilling, radar and sonar, radiometric dating, analysis of lava flows*).
5. Develop an appreciation for the effects of increasing demands on the earth's finite natural resources and explore the efficacy of possible remedies (*global warming, alternative energy sources, soil and water conservation*).

REQUIRED MATERIALS:

- Earth Science, 11th ed., Tarbuck and Lutgens
- Applications and Investigations in Earth Science, 5th ed., Tarbuck, Lutgens, Pinzke

COURSE OUTLINE:

I. Introduction to Earth Science
   A. What is earth science?
   B. Resources, population growth, environmental problems
   C. Earth science and the scientific method
   D. Early evolution of earth
   E. Earth's spheres – hydrosphere, atmosphere, biosphere, geosphere
   F. A closer look at the geosphere

II. Minerals
   A. The "building blocks" of rocks
   B. Elements, atoms, isotopes, atomic bonding

C. Properties of minerals
D. Mineral groups
E. Mineral resources - metallic and non-metallic

III. Rocks
A. The rock cycle
B. Igneous rocks
C. Sedimentary rocks
D. Metamorphic rocks

IV. Weathering, Soil, and Mass Wasting
A. Mechanical weathering
B. Chemical weathering
C. Soil – properties and formation
D. Weathering and erosion

V. Earth's Internal Forces
A. Earthquakes
B. Seismology
C. Plate tectonics
D. Igneous activity

VI. Earth's History
A. Geologic time scale
B. Relative dating
C. Radiometric dating

VII. The Global Ocean
A. Mapping the ocean floor
B. Features of the ocean floor
C. Waves and Beaches
D. Wave erosion

VIII. Earth's Atmosphere
A. Heating the atmosphere
B. Moisture and cloud formation
C. Air pressure and wind
D. Basic weather patterns and severe storms
E. Climate

ASSIGNMENTS AND GRADING

Assignment of grades will be based on student performance on the following items. Relative weights of each item are given in parentheses.

Homework: Assigned in class, may consist of end-of-chapter questions and/or handouts.

"Google" assignments: Directed or open-ended web based assignments, equivalent in scope to homework. (Homework and Google assignments collectively, 15%)

In-class tests (3): Announced well in advance, typically consisting of multiple choice, short answer, calculation, and discussion questions.
(40%)

Laboratory: Weekly lab experiments/exercises/lab reports (15%)

Research paper and presentation: Each student will conduct "library" research on a current topic of concern in the earth (or environmental) sciences and submit a paper near the end of the semester. Each student will also give a brief (10 minute) presentation to the class on their findings. Guidelines and suggestions for appropriate topics will be provided. The instructor must approve topic selection in advance.
(15%)

Final Exam: Same format as other tests, will be cumulative. (15%)

Grading Scale:

A 90-100

B+ 87-89

B 80-86

C+ 77-79

C 70-77

D+ 67-69

D 60-67

F below 60

PROPOSED LABORATORY EXPERIMENTS

1. Earth Science Skills
   *- Students use concepts of latitude, longitude, grid system, great circles, etc. to specify location and measure distances on the globe.*
   *- Review of metric system, units conversion, devises/ techniques for measuring both small and large distances. Students determine densities of several samples and conduct a simple experiment illustrating the "scientific method".*

2. The Study of Minerals
   *- Recognize and describe the physical properties of minerals.*
   *- Use a mineral identification key to name minerals.*

3. Common Rocks
   *- Determine whether a rock is igneous, sedimentary, or metamorphic.*
   *- Use a classification key to identify a rock.*
   *- Recognize and name some common rocks by sight.*

4. Introduction to Aerial Photographs and Topographic Maps
   *- Use a stereoscope to view a stereogram. (A stereogram consists of two aerial photographs of a given area taken from slightly different angles; yields a three-dimensional view.)*
   *- Use map scales to determine distances.*
   *- Construct simple contour and topographic maps.*

5. Soil Analysis
   *- Students measure soil pH, salinity, and temperature.*
   *- Acid rain: causes, properties.*

6. Running Water and Groundwater
   *- Sketch and label the complete hydrologic cycle on an illustration.*
   *- Explain relation between infiltration and runoff during rainfall*
   *-Identify on a topographic map features associated with rivers and valleys, such as rapids, floodplains, backswamps.*
   *- Explain occurrence, fluctuation, use, and misuse of groundwater supplies.*

7. Ring of Fire
   *- From given data, plot earthquakes and volcanic eruptions on global map.*
   *- Explore correlation with plate tectonic theory.*

8. Atmospheric Heating
   *- Measure and explain the effects of absorption, reflection, and scattering on solar radiation.*
   *- Measure differences in heating and cooling of land and water.*
   *- Determine the effect that wind speed has on wind chill.*

9. Introduction to Oceanography
   - *Describe the distribution of land and water in each hemisphere.*
   - *Locate and describe general features of ocean basins on a topographic map.*
   - *Determine experimentally the relation between salinity and density of seawater.*
   - *Describe how seawater temperature varies with latitude and with depth.*

10. Waves, Currents, and Tides
   - *Explain general wave behavior in deep and shallow water .*
   - *Locate major surface ocean currents on global map.*
   - *Identify features of erosion and deposition on an appropriate illustration.*
   - *Explain causes and types of tides.*

11. Atmospheric Moisture, Pressure, and Wind
   - *Explain and measure humidity, relative humidity, dew point.*
   - *Describe relation between pressure and wind.*
   - *Explain adiabatic cooling, calculate temperature and relative humidity changes that result from adiabatic cooling.*

12. Air Masses, the Middle-Latitude Cyclone, and Weather Maps
   - *Explore characteristics, movements, and source regions of North American air masses.*
   - *Interpret data presented on surface weather maps.*
   - *Forecast a city's weather from weather map.*

## FRANCIS MARION UNIVERSITY: DESCRIPTION OF PROPOSED NEW COURSE or MODIFICATION OF AN EXISTING COURSE

Department/School Physics and Astronomy Date July 24, 2006

Course No. or level 397 Title Research in Physics

Semester hours 1,2, or 3 Clock hours: Lecture _____ Laboratory varied

Prerequisites Permission of Department

Enrollment expectation varied (1-2 per year)

Indicate any course for which this course is a (an)

modification _____
(proposed change in course title, course description, course content or method of instruction)

substitute _____
(The proposed new course replaces a deleted course as a General Education or program requirement.)

alternate _____
(The proposed new course can be taken as an alternate to an existing course.)

Name of person preparing course description Derek Jokisch

Department Chairperson's/Dean's Signature _____

Provost's Signature _____

Date of Implementation Spring 2007

Date of School/Department approval August 19, 2006

Catalog description:

**397 Research in Physics** (3), (2), or (1) (Prerequisite: Permission of Department) F, S, SU. In conjunction with a physics faculty advisor, each student will complete one or more research projects in physics, health physics or astronomy. The projects are developed as a result of consultation between the student and the advisor. Students will be expected to complete a written report and give an oral presentation. A maximum of 4 credit hours may be earned towards graduation.

Purpose: 1. For Whom (generally?)

The course is for undergraduates interested in receiving credit for working on a research project with a faculty member.

2. What should the course do for the student?

The course will introduce students to the methods used in scientific research such as: literature review, experimental design, experimentation, scientific conclusions and written and verbal reporting.

Teaching method planned:

The student will be actively engaged in all aspects of research with a faculty member.

Textbook and/or materials planned (including electronic/multimedia):

A textbook will not be utilized. Materials will vary by project and faculty member.

Course Content: ( Please explain the content of the course in enough detail so that the Academic Affairs Committee can make an informed judgement. Include a syllabus for the course.)

This course will serve as a vehicle for undergraduate students to receive credit for partaking in a research project with a faculty member. Existing courses are not specific to this purpose. PHYS 420 (Senior Research in Physics) is for senior physics majors and is required for students majoring in the computational physics track. PHYS 497 (Special Studies) is for juniors and seniors only. The new course will allow <u>any</u> undergraduate to receive credit for supervised research when approved by the department.

**When completed, forward to the Office of the Provost.** 9/03

# Research in Physics
# PHYS 397
# Spring 2007

Description and Objectives: In conjunction with a physics faculty advisor, each student will complete one or more research projects in physics, health physics or astronomy. The projects are developed as a result of consultation between the student and the advisor. Students will be expected to complete a written report and give an oral presentation.

Prerequisite: Permission of Department

Text: None. Materials determined by faculty member.

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|---|---|
| Instructor:<br>Faculty Research Advisor<br>Department of Physics and Astronomy<br>Francis Marion University<br>Office: Leatherman Science Facility 103<br>Office Hours:<br>Phone: 661-<br>Email: @fmarion.edu | ***Varied by individual faculty member***<br><br>Grades: Quality of Participation 25%<br>Written Report 50%<br>Oral Presentation 25%<br><br>A 90-100<br>B+ 87-90<br>B 80-87<br>C+ 77-80<br>C 70-77<br>D+ 67-70<br>D 60-67<br>F <60 |

Written Report: The format will be determined by the Faculty Research Advisor but will be similar to a formal laboratory report format that includes sections such as: Introduction, Theory, Methods, Results, Conclusions, References, etc. The due date and late policy will be determined by the Faculty Research Advisor.

Oral Presentation: At the end of the project, the student will give an oral presentation of at least 10 minutes summarizing the project. The student will work with the Faculty Research Advisor in determining a date and time for the presentation. Additional faculty and students will be invited to attend the talk.