Faculty Committee on Graduate and Continuing Education

Proposal to Change a Graduate Course

Department: Physics and Astronomy
Graduate Program: Science and Mathematics for Teachers
Course number and title: SMFT 548, Atomic Theory of Matter from Lucretius to Quarks

Will this course be cross-listed with an undergraduate or other graduate course? ☐ YES X NO
If yes, please complete an attach to this proposal a Permission to Cross-List a Graduate Course form.

Course change(s) will go into effect: Fall 2009
Change(s) desired: Change from 4 credit hours to 3 credit hours and from 6 contact hours to 3 contact hours.

Justification for change(s): The change should be made due to staffing constrains and due to low enrolment in the recent years.

Signature of Program Director: ___________________________ Date: ____________
Date approved by the Department: ____________
Signature of Department Chair: ___________________________ Date: ____________
Signature of Schools' Dean: ___________________________ Date: ____________

Return form to the Graduate School Office for Further Processing
Signature of Chair of the Faculty Committee on Graduate and Continuing Education: ____________ Date: ____________
Signature of Chair of Grad Council: ____________ Date: ____________
Signature of the Faculty Secretary: ____________ Date: ____________

If more space is needed for any section, please attach additional sheets to this form.

November 2007
I CONTACT INFORMATION

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Dr. Ana Oprisan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>Room 319, Bell South building</td>
</tr>
<tr>
<td>Phone</td>
<td>(843) 953-7582</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:oprisana@cofc.edu">oprisana@cofc.edu</a></td>
</tr>
<tr>
<td>WWW</td>
<td><a href="http://www.cofc.edu/~oprisana/">http://www.cofc.edu/~oprisana/</a></td>
</tr>
<tr>
<td>Lecture and labs</td>
<td>Th: (7-10)pm</td>
</tr>
<tr>
<td>Office Hours</td>
<td>Th: (4-6:30) pm or by appointment</td>
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II COURSE PHILOSOPHY

Physics SFMT 548, Atomic theory: From Lucretius to Quarks is the course for science teachers exploring the atomic theory of matter through lecture, demonstrations, hands-on activities and problems. Atomic theory course will be focused on the following topics:
- atomic structure of matter from antiquity to modern theory
- nature and behavior of these particles
- explanation of physical and chemical properties of particles and the connection between atomic theory and application in biology, physics, space science, material science and chemistry.

Completing this course will give a strong background of modern physics to science teachers and will deal with the conceptual understanding of matter. The goal of this course is to help prepare the science teachers to teach physics and physical science from elementary to high school settings.
Completing this course will introduce students to a better understanding of atomic structure of matter and their physical properties and the connection of physics to the real world.

If you miss a class session, you must take the initiative to find out from classmates what they learned during that class session. One lab make-up period may be offered for approved absences. In general, assignments and announcements will be posted on the WebCT course webpage. This includes, but is not limited to, homework assignments, homework solutions, syllabus changes, course rules and regulations changes and additions, dates and times of any review sessions, test solutions, and materials to be covered on class exams.

II.1 Goals

- To increase understanding of natural laws
- To develop physical curiosity
- To enhance problem solving and critical thinking skills
- To connect abstract laws with concrete objects and phenomena
- To enhance investigative and observational skills
PHYS 548 SMFT

Dr. Ana Oprisan

- To develop an appreciation for logical qualitative and quantitative reasoning
- To develop communication skills
- To put all of this in the context of the K-12 classroom

II.2 Objectives

After the successful completion of this class, the students will be able to:
1. Design experiments which examine the laws of physics.
2. Describe problems and their solutions to a variety of audiences.
3. Provide different representations for a problem (verbal, graphical, and through diagrams or equations).
4. Solve word problems.
5. Apply physical principles to novel situations.
6. Engage students in the study of the relationship of physics to other fields and relating physics to their real-life experiences.
7. Organize and manage physics activities effectively and safely in various settings.
8. Use various types of assessment strategies related to students’ needs and their level of learning and development.

II.3 Textbook and other resources

1. The textbook for this class is the “Physics Matters” by James Trefil and Robert Hazen (1st edition, 2004).
2. Substantial handouts of additional materials will be provided in a timely manner.
3. You should have a stand-alone, hand-held scientific calculator able to compute trigonometric and exponential functions.

III GRADING POLICY

| Final exam                                      | 30 points |
| Tests                                          | 20 points |
| Graded homework                                | 10 points |
| Hands on experiments                           | 20 points |
| Portfolio of materials appropriate for use in  | 5 points  |
| the pre-college classroom                      |          |
| WebCT discussion board activity, quizzes, and  | 5 points  |
| class participation                            |          |
| Final project                                  | 10 points |

The grading scale is as follows:
A  90-100, B+ 86-89.9, B 80-85.9, C+ 76-79.9, C 70-75, F Below 70.

III.1 Final exam

No textbooks, notes, or any other kind of help is allowed during tests and the final exam. During the semester you will compile a short formula sheet that can be used during the tests. The final exam is comprehensive. There will be no make-up for the tests or the final exam.

III.2 In-class tests
There will be one, 60-minute, in-class test during the semester. The test will consist of a mix of conceptual and quantitative problems, and some of them may be in multiple-choice format. The concept questions will be similar to the concept questions solved in class. The quantitative problems will be similar to the assigned homework problems and the examples given in your textbook and practice problems given in class.

### III.3 Homework

Homework assignments are based on the end of the chapter problems in your textbook, and from the additional handouts. Each assignment will consist mostly of quantitative evaluations with the purpose of developing your problem solving skills and sharpen your conceptual understanding of physical laws. Homework is absolutely essential in the physics learning process, perhaps more than in any other course. Extra help with homework is available during office hours or WebCT discussion board.

You can solve homework problems either individually or in study groups with your classmates, but don't rely on your classmates so much that you cannot solve problems by yourself on tests. Solutions will be available on the WebCT after the due date of each assignment.

Work problems neatly using only one side of the paper. Put your name on the top right corner on the back of the page.

In case of extenuating circumstances (major religious holidays, illness, or a valid personal emergency) you can request a deadline extension. Any such requests must be made before the due date, or will otherwise not be considered.

### III.4 Hands-on experiments

The hands-on experiments will be a combination of the topics covered in supplemental lab manuals by Robert Ehrlich and Ann Wyczalkowski and handouts of other lab activities. The core material in these experiments will be explored through a series of activities that consists of predictions, observations, measurements, analysis and reflection and are designed to guide students through the process of scientific inquiry. The hand-on experiments in this class will be done in cooperative groups of 2-3 students who will work together.

### III.5 Portfolio

It is your responsibility to keep an organized portfolio of materials ideas, laboratories, investigations, handouts and other resources that can be used in your classes or shared with other teachers for use in their classes.

### III.6 WebCT and discussion board postings

WebCT is an online management course management system adopted by the College of Charleston. We will use the WebCT website (https://webct.cofc.edu/webct/public/home.pl) to post solutions, grades, assignments, and make announcements. The WebCT page will include a calendar with test dates and other important information. To log into WebCT you need your Cougar rail ID # and your 6-digit Cougar Trail PIN.

The discussion board on WebCT allows everyone in this class to interact by posting or responding to messages related to homework assignments, or any other course-related questions. You can post on the discussion board either by composing a new message (create a new thread), or by replying to an existing message. By actively participating in the discussion board, you could get help from your colleagues and
instructor, and, at the same time, help me answer a question only once instead of sending multiple emails with the same answer.

III.8 Final Project

Your final project should be based on any topics covered in class and should address some portion of the South Carolina standards for grades K-12. Your project should include an experimental investigation using an existing kit in our lab, your school, Charleston Math and Science Hub, Charleston County School System Material resources Center, Berkley/Dorchester Math and Science Hub, Berkley County System, etc. Be prepared to give an oral presentation, and to hand in a summary of your project. Guidelines of the oral presentation, format and elements to be included in your final project will be available via the WebCT website.

IV SUPPORT RESOURCES

There are many ways to get assistance with the material in this course. Be sure to use these support resources as soon as you feel unsure about anything.

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<td>The nature of the atom; Rutherford, line spectra, Bohr model, quantum numbers.</td>
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<td>Energy</td>
<td>Week 11</td>
<td>Nuclear physics and radioactivity</td>
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<td>Week 3</td>
<td>Heat and temperature Changes of matter</td>
<td>Week 12</td>
<td>Nuclear reactors, fission and fusion.</td>
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<td>The physics of kinetic molecular theory.</td>
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<td>Week 5</td>
<td>Electrostatics</td>
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<td>Individual presentations</td>
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<td>Week 6</td>
<td>Electricity</td>
<td></td>
<td>Final test</td>
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<td>Week 7</td>
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| Week 3 | Heat and temperature  
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