Contact Name: Ana Oprisan  Email: oprisana@cofc.edu  Phone: 843 953 7582

Department Name: Physics and Astronomy  Graduate Program name: Master of Education in Science and Math for Teachers (SMFT)

Course Prefix, Number, and Title: SMFT 540 Fundamentals of physical science

I. CATEGORY OF REVIEW (Check all that apply)

NEW COURSE  CHANGE COURSE  DELETE COURSE

☐ New Course  ☐ Change Number (IV, VII, VIII, IX)  ☐ Delete Course (IV, VII, IX)
(attach syllabus*)  ☐ Change Title (IV, VII, VIII, IX)
☐ Change Credits/Contact hours (II, IV, VII, IX)  ☐ Prerequisite Change (IV, VII, VIII, IX)
☒ Edit Description (III, IV, VII, VIII, IX)

☐ Approve for Cross-listing (attach Graduate Permission to Cross-list Form)

Date (Semester/Year) the course will first be offered, course changes or deletion will go into effect: SumII 2015

NEW COURSE:

*ATTACH THE SYLLABUS FOR A NEW GRADUATE COURSE to include:

- Course description and objectives
- Method of teaching (e.g., lecture, seminar, on-line, hybrid)
- Required and optional texts and materials
- Graduate School Grading Scale
- Assignments, student learning outcomes and assessment components
- Policies to include attendance, Honor Code, American Disabilities Act statement
- Tentative course schedule with specific topics
List prerequisites and / or other restrictions below

Will this course be added to the Degree Requirements?

a) ☐ Yes  ☐ No
b) If yes, explain

II. NUMBER OF CREDITS and CONTACT HOURS per week

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Lab</th>
<th>Seminar</th>
<th>Ind. Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Contact Hours</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

B. Credit Hours 3

Is this course repeatable? yes ☒ no If so, how many credit hours may the student earn in this course?

III. CATALOG DESCRIPTION Limit to 50 words EXACTLY as you want it to appear in the catalog; include prerequisites, co-requisites, and other restrictions. If changing course description, please include both old and new course descriptions.

This course will provide the necessary strong physics background to science teachers through conceptual understanding and hands-on activities. The goals of this course are to prepare science teachers to teach physics from elementary to high school settings and solve problems with real world applications.

IV. RATIONALE / JUSTIFICATION: If course change – please indicate the course change details. If course change or deletion—please provide reasons for change(s) to or deletion of a course. If a new course—briefly address the goals/objectives for the course and the relationship to the strategic plan.

The contact hours have been changed from 6 contact hours - 4 credit hours to 3 contact hours-3 credit hours. Only the physics content will be covered in this course and hands-on activities will be integrated with the lecture.

This course was originally three hours of lecture and three hours of lab team taught by Dr. Fred Watts (physics-retired) and Betsy Martin (chemistry-retired) and covered physics and chemistry content. The course will no longer be taught with separate lecture and lab, but hands-on activities will be integrated with the lecture. The chemistry content in the older course will no longer be taught.

September 2011
## V. STUDENT LEARNING OUTCOMES and ASSESSMENT

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will students know and be able to do when they complete the course?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td>1. Apply physical/natural principles to analyze and solve problems.</td>
<td>Students will be assessed in weekly homework, final exam and midterm exam. Students are expected to achieve “meet or exceed expectations” in terms of examination.</td>
</tr>
<tr>
<td>2. Demonstrate an understanding of the impact that science has on society.</td>
<td>This learning outcome will be assessed in the essay “Present your view of the impact that physical science has on society”. Students are expected to achieve “meet or exceed expectations” in terms of examination.</td>
</tr>
<tr>
<td>3. Design experiments, which examine the laws of physics.</td>
<td>The third learning outcome will be assessed in hands on experiments, final teaching project. Students are expected to achieve “meet or exceed expectations” in terms of examination.</td>
</tr>
</tbody>
</table>

How does this course align with the student learning outcomes articulated for the major, program, or general education? What program-level outcome or outcomes does it support? Is the content or skill introduced, reinforced, or demonstrated in this course? This course is one of many courses that are on the Program of Study. Students may choose this course as one option in the B1 category; remaining where it was before the change. This course supports the program-level outcomes of gaining content and pedagogical content knowledge. Data from this course adds to other data from other courses in Compliance Assist. The content and skills are introduced, reinforced, and demonstrated in this course since the teaching and laboratory components are in the same course.

## VII. IMPACT ON EXISTING PROGRAMS and COURSES:

Please briefly document the impact and expected changes of this new/changed/deleted course on other departments, programs and courses; if deleting a course—list all departments and programs that include the course; if adding/changing a course—explain any overlap with existing courses in the same or different departments; if adding or deleting a course that will be part of a joint program identify the partner institution.

This course will provide a strong physics background to science teachers through conceptual understanding of physical science and will prepare science teachers to teach physics from elementary to high school settings. This course will be offered every odd summer. In the past six years SMFT 540 (4 credits, 6 contact hours) could not be offered due to staffing constraints. This course was offered in the past few years in the SMFT program as a special topics courses, SMFT 697 (3 contact hours, 3 credit hours), where only the physics content was covered. Course hours will make it easier for SMFT students to take it during the summer.

## VIII. COSTS ASSOCIATED WITH THE ACTION REQUESTED:

List all of the new costs or cost savings, (including new faculty/staff requests, library or equipment, etc.) associated with the action requested. New courses requiring additional resources will need special justification.

- **Staff**: It could be staffed by current members of the Department of Physics and Astronomy.
- **Budget**: none
c. Library none
IX. APPROVAL AND SIGNATURES

Signature of Program Director: ___________________________ Date: 9/9/14

Signature of Department Chair: ___________________________ Date: 9/15/2014

Signature of Additional Chair*: ___________________________ Date: 9/10/14

Signature of Schools' Dean: ___________________________ Date: 9/19/14

Signature of Additional Schools' Dean*: ___________________________ Date: 9/24/14

Signature of the Provost: ___________________________ Date: 10/20/14

Signature of Budget Director/Business Affairs Office: ___________________________ Date: ______________

*For interdisciplinary courses

Return form to the Graduate School Office for Further Processing

Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs: ___________________________ Date: 3/24/15

Signature of Chair of the Graduate Council: ___________________________ Date: 3/13/15

Signature of Faculty Senate Secretary: ___________________________ Date: ______________

Date Approved by Faculty Senate: ___________________________
SMFT 540 - Fundamentals of Physical science

I CONTACT INFORMATION
Instructor        Dr. Ana Oprisan
Office            TBA
Phone             (843) 953-7582
Email             oprisana@cofc.edu
WWW               http://oprisana.people.cofc.edu/
Lecture and labs  TBA
Office Hours      TBA

II COURSE PHILOSOPHY
SMFT 540 - Fundamentals of Physical science course is designed for science teachers exploring physics topics through lectures, demonstrations, hands-on activities, and quantitative problems. This 3 credit course covers: motion and forces, energy, work, waves, electricity, magnetism, and optics.

This course will provide the necessary strong physics background to science teachers through conceptual understanding and hands-on activities. The goal of this course is to prepare science teachers to teach physics from elementary school to high school settings. The focus will be on connecting physics to the real world. Each class period will be in the form of interactive discussions and the lecture will be periodically interrupted by short conceptual questions followed by hands-on activities, and problem solving sessions. The goals of the conceptual questions are to build intuition and confidence, to overcome any confusion, and to clarify conceptual difficulties. Students are expected to not only attend class, but also to actively participate in the concept discussions, problem solving and hands-on activities.

II.1 Goals
- To increase understanding of natural laws through conceptual questions.
- 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 through hands-on activities.
- To develop an appreciation for logical qualitative and quantitative reasoning.
- To enhance communication skills.
- To suggest practical approaches for teaching physics in K-12 classroom.

II.2 Learning outcomes
After the successful completion of this class, the students will be able to:
1. Apply physical/natural principles to analyze and solve problems.
2. Demonstrate an understanding of the impact that physical science has on society.
3. Design experiments, which examine the laws of physics.

Learning outcome 1 will be assessed in weekly homework, final exam and midterm exam. The second learning outcome will be assessed in the essay “Present your view of the impact that physical science has on society”. The third learning outcome will be assessed in hands on experiments and final teaching project.

II.3 Textbook and other resources
1. The recommended textbook for this class is the “Conceptual Physics” by Paul Hewitt, 11th edition. Substantial handouts of additional materials will be provided in a timely manner.
2. You should have a stand-alone, hand-held scientific calculator able to compute trigonometric and exponential functions.

III GRADING POLICY
If you miss a class session, it is your responsibility to find out from classmates what we covered during that class session. One lab make-up period may be offered for approved absences. Assignments and announcements will be posted through course management system (OAKS). This includes, but is not limited to, syllabus, course rules and regulations update, date and time of any review session, materials covered in class, homework assignments, and solutions to homework/tests.

| Final exam | 30 points |
| Midterm | 20 points |
| Graded homework | 13 points |
| Hands-on experiments | 15 points |
| Portfolio(3 points) and class participation(2 points) | 5 points |
| Paper: Present your view of the impact that science has on society | 7 points |
| Final project-lesson plans and presentation | 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 the midterm and the final exam. We 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 midterm or the final exam.

III.2 Midterm test
There would be one 60-minute midterm test for this class. The midterm test would consist of a mix of conceptual and quantitative problems, and some of them may be in multiple-choice format. The conceptual questions would be similar to those solved in class or from the textbook. The quantitative problems would be similar to the assigned homework problems, the examples, and practice problems covered in class.

III.3 Homework

Homework assignments would be based on the end-of-chapter problems from your textbook or the handouts. Each assignment consists mostly of quantitative evaluations with the purpose of enhancing your problem solving skills and sharpening your conceptual understanding of physical laws. Homework is absolutely essential for correct learning of physics concepts. Extra help with homework is available during office hours or through OAKS 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. 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 may 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 would be a combination of the topics covered in the supplemental lab textbook “Conceptual Physics Labs” by Paul Hewitt, Vernier Co. handouts, and handouts of other computer based lab activities that I will provide. The topics of these experiments would be explored through a series of activities consisting of predictions, observations, measurements, analysis and reflection. The lab handouts are designed to guide you through the process of scientific inquiry and cooperative learning.

III.5 Portfolio

It is your responsibility to keep a neat and well-organized portfolio of materials and ideas, laboratories, investigations, handouts and other resources that we covered in this class and could be used in your classes or shared with other teachers at your school.

III.6 OAKS and discussion board postings

OAKS is the official online course management system adopted by the College of Charleston. We will use OAKS website to post solutions, course notes, assignments, and grades. To access OAKS, visit http://lms.cofc.edu. Login through “MyCharleston” link with your username and password.

The discussion board on OAKS will count towards your class participation grade and allows everyone in this class to contribute and interact with others 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 thread. By actively participating on the discussion board, you could get help from your colleagues and instructor, and also help me answer a question only once instead of sending multiple emails with the same answer.

III.7 Final Project

Your final project should be based on any topics covered in this class and should address some 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. Prepare an oral presentation to be delivered in front of your classmates and a written summary of your project. Guidelines of the oral presentation, format and elements to be included in your final project will be available via OAKS website. The materials related to your final project (including the PowerPoint presentation, lesson plans, lab activities) should be posted online on OAKS in the drop box.

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.

1. Discussion board is an online resource available through our class page on OAKS. If you know the answer to any question already posted, I encourage you to write hints to your colleagues. The virtual office hours on the discussion board is a very convenient and fast helpline.

2. On-site office hours: I will always be available during the posted on-site office hours. If you cannot come to any of the posted times, call/email me to make an appointment.

3. E-mail: If you need help or advice, please consider posting your query on the discussion board on OAKS. This way we avoid duplication of commonly asked questions and your classmates also benefit from your question. Questions of a personal or private nature regarding this course should be e-mailed to me at: oprisana@cofc.edu.

4. Phone: (843) 953-7582 - Feel free to contact me with any class-related question.

V COURSE POLICIES

Students are expected to attend and participate in all classes, complete all assignments in a timely and professional manner, and inform the instructor well in advance of the circumstances which may result in an absence. Collaboration is not permitted during in-class midterm test and the final exam.

V.1 Class conduct

Cell phones, beepers, headsets and any other electronic devices that may disrupt the class must be turned off and put away prior to class unless you have a job requiring them to be on for safety (firefighter, EMT, etc.). Talking on cell phones in class or text messaging is strictly prohibited. Please refer to the student handbook for additional information.
Center for Student Learning (CSL) offers academic support services for assistance in study strategies, speaking & writing skills, and course content. The services are available to you at no additional cost. For more information regarding these services please visit the CSL website at http://csl.cofc.edu or call (843) 953-5635.

Rights of students with disabilities (http://policy.cofc.edu/documents/12.5.2.9.pdf)
“The College of Charleston and the Graduate School actively and affirmatively seek to accommodate any currently enrolled student with a certified disability according to the regulations established by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990. Services for students with disabilities (physical, psychological, learning disabilities, ADD/ADHD) are provided through the Center for Disability Services located in the Lightsey Center, first floor, Rm. 104. The web address is http://disabilityservices.cofc.edu/. Telephone number (843) 953-1431 (voice) and Fax: (843) 953-7731. SC Relay System 771 or i-800-735-2905.”

Accommodations for SNAP students (http://disabilityservices.cofc.edu/documents/student-guide.pdf)
“Accommodations will be determined on a case-by-case basis and are listed in the student’s Professor Notification Letter (PNL). It is the responsibility of the student to give the letter to their professors the first week of the semester. Students are not required to disclose their SNAP status to professors if they choose not to use accommodations in that professor’s class.” (http://disabilityservices.cofc.edu/accommodations/index.php) “Students are asked to sign up for their tests at The Center For Disability Services one week in advance. Professors are not required to accommodate students with extended time if they do not receive advance notice.” (http://disabilityservices.cofc.edu/accommodations/testing.php) See also http://disabilityservices.cofc.edu/documents/student-guide.pdf.

Honor Code and Academic Integrity (from http://academical Affairs.cofc.edu/documents/honor-code-language.pdf)
“Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file. Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board. Students should be aware that unauthorized collaboration -- working together without permission -- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is
permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others’ exams, fabricating data, and giving unauthorized assistance. Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor. See also Section 9 (page 10) of the Student Handbook and at http://studentaffairs.cofc.edu/honor-system/studenthandbook/documents-pdfs/handbook.pdf.

VI LECTURE SCHEDULE

The following is a tentative schedule for our lectures and both the topics and/or the test dates could change during the semester to accommodate unforeseen events. It is your responsibility to check OAKS website on a regular basis (at least once before each class meeting) to make sure you have the latest information. The date and time for the final exam is set by the Registrar’s Office.

<table>
<thead>
<tr>
<th>Activities</th>
<th>South Carolina Science Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction. Units and dimensional analysis, estimations and measurements, errors.</td>
<td>PS-1.1, PS-1.2, PS-1.3, PS-1.4, PS-1.9</td>
</tr>
<tr>
<td>Kinematics</td>
<td>PS-5.1, PS-5.2, PS-5.3, PS-5.4, PS-5.5, PS-5.6, PS-1</td>
</tr>
<tr>
<td>Newton’s laws of motion Forces (weight, normal, friction). Gravitational force.</td>
<td>PS-1, PS-5.7, PS-5.8, PS-5.9, PS-5.10</td>
</tr>
<tr>
<td>Energy (kinetic, potential elastic and gravitational). Conservation of energy. Conversion of energy</td>
<td>PS-1, PS-6.1, PS-6.2</td>
</tr>
<tr>
<td>Midterm test.</td>
<td></td>
</tr>
<tr>
<td>Electrostatics (electric charge, Coulomb law)</td>
<td>PS-1, PS 6-5</td>
</tr>
<tr>
<td>Electric current (Ohm’s law, series and parallel circuits)</td>
<td>PS-1, PS-6.6, PS-6.7, PS-6.8, PS 6.9</td>
</tr>
<tr>
<td>Magnetism (magnetic field, electromagnetic force, charged particles in magnetic field)</td>
<td>PS-1, PS-6.11</td>
</tr>
<tr>
<td>Interference of waves. Electromagnetic spectrum.</td>
<td>PS-7.5, PS-7.6, PS-7.1</td>
</tr>
<tr>
<td>Reflection and refraction of light</td>
<td>PS-7.6, PS-7.1</td>
</tr>
<tr>
<td>Topic</td>
<td>References</td>
</tr>
<tr>
<td>------------------------------</td>
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</tr>
<tr>
<td>Lenses and mirrors</td>
<td>PS-7.6, PS-1</td>
</tr>
<tr>
<td>Diffraction of light</td>
<td>PS-1, PS 7.6</td>
</tr>
<tr>
<td>Review for final exam</td>
<td>PS-1, PS 7.6</td>
</tr>
<tr>
<td>Final exam</td>
<td></td>
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</tbody>
</table>