FACULTY CURRICULUM COMMITTEE
SIGNATURE PAGE

- In section A, list ALL of the forms covered by this signature page. If you submit a form that is not listed in A, your proposal will be held back until we receive a new, updated signature page.
- You must obtain the signature of your department chair and dean before submitting your proposal.

A. FORMS COVERED BY THIS SIGNATURE PAGE. List each form you are submitting—for instance, PSYC 383, Course Form; PSYC, Change of Major Form; PSYC, Change of Minor Form.

1. PHYS 272 (New Course Form), 2. PHYS 301 (Change of Course Form), 3. PHYS 403 (Change of Course Form), 4. PHYS 405 (Change of Course Form), 5. PHYS 408 (Change of Course Form), 6. PHYS 409 (Change of Course Form).

B. APPROVAL AND SIGNATURES.

1. Signature of Department Chair or Program Director:
   [Signature] Date: 11/1/2013

2. Signature of Academic Dean:
   [Signature] Date: 11/6/2013

3. Signature of Provost:
   [Signature] Date: 1/5/2014

4. Signature of Business Affairs (only for course fees):
   [Signature] Date: _________________ [☐] fee approved on ____________
   [☐] BOT approval pending

5. Signature of Curriculum Committee Chair:
   [Signature] Date: _______________

6. Signature of [Department Name]
   [Signature] Are major change forms forthcoming for [Department Name]?

7. Signature of [Department Name]
   [Signature] PHYS 301 is required of both, and is being changed to include this new PHYS 272 as a pre-req.

8. Signature of Faculty
   [Signature] Also being made a pre-req for: JENNY 403, 405, 408, 409
   [Date Approved by Faculty: 11-13-18]
November 1, 2013

The physics curriculum committee within the Department of Physics & Astronomy is proposing the creation of a new junior-level course, Methods of Applied Physics (PHYS 272). This new course is an applied course designed to introduce a range of powerful mathematical techniques including Vector and Tensor Analysis, Complex Variables, Multiple Integrals, Lagrangians and Hamiltonians, Linear Algebra, and Differential Equations. However, the course is not meant to replace any of the required mathematics courses. Students, those especially planning to join graduate schools, are encouraged to take Linear Algebra and Differential Equations in addition to the proposed course. This new course is designed to bridge the gap between the theoretical mathematical tools students learn in mathematics courses and the applied upper level physics courses.

The new course will be offered every year and serve as an early mid-level elective that allows students to help meet the prerequisites for all upper level physics and Astronomy courses. It will directly help students better prepare for physics GRE exams and for success in graduate schools. It will also impact students’ learning indirectly because instructors teaching upper level courses will be able to spend less time reviewing mathematical concepts and more time on solving many of the problems arising in different branches of physics.

There is some overall cost to the department in the sense that, because PHYS 272 will be offered every year, the teaching load for the Physics and Astronomy degree programs will increase by 3 contact hours each year. However, it is anticipated that this extra load can be absorbed by offering fewer special topics courses.

Regards,

Dr. Alem Teklu
Chair, Physics Curriculum Committee
FACULTY CURRICULUM COMMITTEE
COURSE FORM

Instructions:
- Please fill out one of these forms for each course you are adding, changing, deactivating, or reactivating.
- Fill out the parts of the form specified in part B. You must do this before your request can move forward!
- Remember that your changes will not be implemented until the next catalog year at the earliest.
- If you have questions, start by checking the instructions on the website. Please feel free to contact the committee chairs with any remaining questions you might have.

A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu
Phone: 953-7187
Email: teklua@cofc.edu

Department or Program: Physics & Astronomy
School: SSM

Subject Acronym and Course Number: PHYS 272

Catalog Year in which changes will take effect: FALL 2014

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
☐ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J, K)
  ■ Course Number
  ■ Course Name
  ■ Course Description
  ■ Credit/Contact Hours
  ■ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
☐ Deactivate an Existing Course (complete parts C, D, E, G, I, J, K)
☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J, K)

C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

This new course provides a bridge for physics and astronomy majors between theoretical mathematics courses and applied upper level physics courses. Students will become competent with the tools that they need to be successful in upper level physics courses as well as graduate level courses. Instructors in the upper level courses will be able to spend less time reviewing mathematical techniques and more time exploring the related physics.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This course will help students to improve their skills in application of mathematical techniques used in our upper level physics and astronomy courses. This is an applied course that includes topics from Linear Algebra and Differential Equations. However, the course is not meant to replace those mathematics courses. Students are encouraged to take Linear Algebra and Differential Equations in addition to the proposed course.

This form was last updated on 06/03/13 and replaces all others.
However, it may allow students to progress in the Physics and Astronomy programs without delays as they work through the math sequence. This course bridges the gap between theory and practice.

E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.

Department: 
School: 
Subject Acronym: 
Course Number: 

Credit hours: __ lecture __ lab __ seminar __ independent study
Contact hours: __ lecture __ lab __ seminar __ independent study

Course title: 

Course description (maximum 50 words, exactly as it appears in the catalog):

Restrictions (pre-requisites, co-requisites, majors only, etc.):

Cross-listing, if any:

Is this course repeatable? ☐ yes ☐ no If yes, how many total credit hours may the student earn? 

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use **boldface** for the information that is changing.

Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 272

Credit hours: __3__ lecture __ lab __ seminar __ independent study
Contact hours: __3__ lecture __ lab __ seminar __ independent study

Course title: Methods of Applied Physics

Course description (maximum 50 words, exactly as it appears in the catalog):

This course is designed to develop skills in applying mathematical tools and concepts developed formally in the mathematics curriculum for use in the undergraduate physics curriculum. The focus will be on the practical problem solving process rather than the abstract or theoretical nature of techniques. MATH221 and PHYS112 or HONS 158 are prerequisites.

Restrictions (pre-requisites, co-requisites, majors only, etc.):

Pre-requisites: MATH221 and PHYS 112 or HONS 158

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it? ☐ yes ☒ no
If so, which course? ______________

Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

Is this course repeatable? □ yes ✗ no If yes, how many total credit hours may the student earn? ____

Is there an activity, lab, or other fee associated with this course? □ yes ✗ no What is the fee? $______

Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.

G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.

None.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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</tr>
<tr>
<td>1. Associate particular mathematical techniques (including integration, Lagrangian, Hamiltonian, etc.) to their area of utility in the undergraduate physics curriculum.</td>
<td>Test and final exam questions will assess achievement of student learning outcomes. 80% is our target</td>
</tr>
<tr>
<td>2. Interpret and analyze physics-related data using Fourier, statistical and probabilistic techniques.</td>
<td></td>
</tr>
<tr>
<td>3. Solve simple, physically motivated differential equations given appropriate boundary conditions.</td>
<td></td>
</tr>
<tr>
<td>4. Geometrically interpret and analytically calculate vector calculus expressions in applied physics problems.</td>
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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 will support upper level physics and astronomy courses. Instructors in the upper level classes will be able to spend more time on subject matter rather than reviewing mathematical concepts. The course will prepare students better for GRE exams and for success in graduate school.

I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? □ yes ✗ no
If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.

J. CHECKLIST.

☒ I have completed all relevant parts of the form.

☒ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☒ (For new courses only) I have attached a syllabus.

☐ (For courses used in any way by other departments, including cross-listing) I have attached an acknowledgement from the relevant department.

☐ (For courses intended to fulfill a Gen Ed requirement) I have submitted the proposal to the Gen Ed committee.

☒ I have submitted one Signature Form that lists all of the different forms I am submitting.

This form was last updated on 06/03/13 and replaces all others.
DEPARTMENT of PHYSICS and ASTRONOMY

PHYS 272: Methods of Applied Physics
Sample Syllabus

Contact information of Prof. (Mike Larsen or Alem Teklu)


Reference books (worth knowing/owning)
- J. Nearing, Mathematical Tools for Physics, University of Miami, 2003 (available for free online)

Lecture: MWF or TR

Website
This class has an OAKS page at http://my.cofc.edu. All students will be automatically enrolled. This gives you access to the latest homework assignment, posted solutions or corrections, grades, chat rooms with other students in the class for solving homework problems, finding a study partner, etc. Some simulations and other helpful materials may be added during the semester.

Course Description
PHYS 272 (Mathematical Methods for Physicists) is offered by the department of physics and astronomy to introduce a range of powerful mathematical techniques for solving physics problems. The topics covered include infinite series, complex variables, linear algebra, ordinary and partial differential equations, multiple integrals, vector and tensor analysis, calculus of variations, Fourier transform, and special functions with applications to various physics problems. You may have some prior exposure to some of the techniques through your calculus and differential equations courses. We will focus on the practical rather than the theoretical aspects of each technique, but there will naturally be some theory involved. With these mathematical tools, you will be able to solve many of the differential equations arising in different branches of physics. As a result, the main objective is to prepare you for upper division physics classes (and graduate schools) so it should preferably be taken before course like Classical Mechanics, Quantum Mechanics, Thermal Physics, Solid State Physics, Nuclear Physics, Fluid Mechanics, Electronics, Photonics, and Electricity and Magnetism.
Prerequisite or Co-requisite:
MATH 221 (Calc-III) and PHYS 112 (general Physics sequence) or HONS 158, or permission of the instructor.

Course Goal
This course is designed to develop student skill in applying mathematical tools/concepts developed formally in the Math Curriculum for use in the undergraduate Physics Curriculum.

Learning Objectives
This course endeavors to aid the motivated student in the following tasks:
- Develop a familiarity and working knowledge of the basic mathematical techniques and tools used by Physicists daily.
- Geometrically and/or physically interpret mathematical expressions given an applied context.
- Connect ideas from the Mathematics curriculum to applications in the Physics curriculum.
- Learn basic techniques to solve differential equations.

Learning Outcomes
At the end of this course, successful students will be able to:
- Graph functions of a single variable without resorting to use of a computer algebra system or hand-held calculators.
- Use basic principles from Linear Algebra to solve problems.
- Geometrically interpret and analytically calculate vector calculus expressions.
- Solve simple, physically motivated differential equations given appropriate boundary and/or initial conditions.
- Interpret and/or analyze data using Fourier, statistical, and/or probabilistic techniques.
- Associate particular mathematical techniques to their area of utility in the undergraduate Physics curriculum.

Attendance
Attendance is mandatory. In order to succeed in this course and understand the techniques used in mathematical methods, you must make an effort to learn. I think attending and participating in class is to your advantage, and I expect you to attend each class. I will. You are also expected to read the appropriate sections of your text. Please come to every class, participate, take good notes, read the book, and do the problems. Rather than repeat verbatim what is in the text, we will work problems, answer questions, talk about topics or applications that your book does not discuss, or which I want to handle differently.

You are responsible for what is discussed in class. If you miss class for an excusable reason the day assignments or new test dates are announced, it is your responsibility to find out about it. Failure to attend class on the day an assignment is assigned or is due does not mean that you may turn in a late assignment without penalty. Excusable absence requires documentation so please contact the Undergraduate Dean's Office to get it documented. After I get notified by the Dean's Office, I will decide whether you get an excused miss or a zero for the late or missed material. Three or more unexcused absences from class may result in a grade of WA (ref. Undergraduate Catalog).
Classroom Code of Conduct
Each student who attends class is expected to participate in a positive manner. The primary rule is to respect others in the class. This means being on time so as not to disturb the learning of others and making positive contributions to the learning environment. I don’t allow students entering the class if they are late by more than 5 minutes. I also expect you to remain in class for the duration of the entire lecture. Don’t bring food or drink, don’t pass notes, talk, or disturb others. No napping in class. 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 or text messaging in class is strictly prohibited. Please refer to the Student Handbook for additional information. Students who disturb others in any shape or form will be asked to leave the classroom.

Homework
There will be one or two homework sets per Chapter. Homework is due at the beginning of class on a designated date, and late homework will not be accepted. In case of extenuating circumstances (major religious holidays, illness, or other personal emergency) you can request a deadline extension. Any such requests must be made before the due date, or otherwise will not be considered. Homework problems generally will be done by hand, rather than solved with Mathematica, Matlab, or Maple. Be warned: an answer is not the same as a solution. Assignments that are too hard to understand are also too hard to grade, and will receive zeroes.

What if I have trouble with the homework?
Come see me during office hours (see times listed above) and I will try to point you in the right direction. You are encouraged to work in groups, but each person must turn in their own problem solutions. Don’t rely on your classmates so much that you cannot solve problems by yourself on tests or exams. I do not expect you to get perfect scores on new material, but I do expect you to try hard. Keep a detailed note of your work which would be useful in preparing for tests and exams. Doing the homework is so important to your learning that you are required to do all the homework – you will receive an Incomplete if more than four assignments are missing or very brief. The learning is in the doing. Nobody on this planet learns from copying someone else’s work, no matter how clear or correct it is. Every part of every problem that you let somebody else do for you is something that you are deciding that you just don’t want to learn. You will not have their help on exams!

Tests
There will be three midterm tests throughout the semester each approximately 50-75 minutes in length (see dates below). If you miss a test, an excuse from the Dean of Undergraduate Studies is required for a make-up test.

Tests are scheduled for the following dates:

<table>
<thead>
<tr>
<th>Test 1</th>
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<tr>
<td>Test 2</td>
<td></td>
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<tr>
<td>Test 3</td>
<td></td>
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</tbody>
</table>
Final Examination
The final exam will be comprehensive. It will be structured like the tests, except that it will be approximately twice as long.

Grading Policy

| Attendance | 5% | A: 93-100 4.0 | C: 74-76.9 2.0 |
| Homework: | 15% | A': 90-92.9 3.7 | C': 70-73.9 1.7 |
| Tests: | 40% | B': 87-89.9 3.3 | D': 67-69.9 1.3 |
| Final Exam: | 40% | B: 84-86.9 3.0 | D: 63-66.9 1.0 |
| | | B': 80-83.9 2.7 | D': 56-62.9 0.7 |
| | | C: 77-79.9 2.3 | F: below 55 0.0 |

Drop Grades
Your lowest homework grade will be dropped when computing your final grade at the end of the semester.

Study Skills
It is not possible to learn mathematical physics without asking lots of questions. The more active you are, the easier it will become. I have tried to offer as many ways as possible for you to ask questions: discussion sections, office hours, email, websites, wikis, blogs, labs, etc. Never be shy about asking a question! Chances are half the class has the same one. I strongly recommend studying with other students. Be sure you can solve all the examples and exercises in the main textbook.

Additional Comments
- Take careful notes in class and go over them before the next class to make sure all the steps and logical connections are understood.
- Do not wait until just before the tests to try to learn the course material.
- It is assumed that you have the necessary prerequisites.

SNAP Services
The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations should notify their professors as quickly as possible.

If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours.

Honor Code
The Honor Code of the College of Charleston specifically forbids cheating, attempted cheating, and plagiarism. A student found guilty of these offenses will receive a failing grade (XF) in the course. Additional penalties may include suspension or expulsion from the college at the discretion of 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 stored on a cell phone), 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. You can find the complete Honor Code and all related processes in the Student Handbook at http://www.cofc.edu/generaldocuments/handbook.pdf.

Feedback
I want Physics 272 to be the best learning experience you have at the College of Charleston. Please feel free to offer suggestions by email or office hours or even by anonymous note.

Wish you all a productive and enjoyable semester. Good luck!

Tentative Weekly Schedule

Course Content / Related Topics (Approximate)

Week 1
- Review of assorted concepts from precalculus and introductory calculus classes with an emphasis on skills regularly needed in upper-level Physics coursework. Includes basic graphing (to emphasize limiting cases in expressions as well as critical/inflection points, asymptotic behavior, etc.) Refresher on series expansions for $e^x$, $\ln(x)$, $\sin(x)$, $\cos(x)$, $(1+x)^n$ (especially $n = \pm \frac{1}{2}$), etc. Taylor/ Maclaurin series approximations. Leading term approximation. Large or small parameter substitution for numerical approximations to integrals, etc. Refresher on summing geometric series.
- Physics context - extremely broad. Examples from all-over, e.g. Maxwell Boltzmann Velocity Distribution Function, Gamma probability density function, Hydrogenic Radial Wavefunction solutions, Bose-Einstein Occupation Statistics, Planck Blackbody Equation, etc.) Relativistic corrections in the small v/c limit, period of slightly damped oscillators, quick numerical approximation of roots, Stirling's formula/Statistical mechanics, connection between geometric series and exponential behavior.

Week 2
Week 3


Week 4
- Continuation of Linear Algebra. Physical properties of matrices with physical relevance (transpose, conjugate, inverse, Hermitian, singularity, etc.) Identification of orthogonal, Hermitian, Anti-Hermitian, and Unitary matrices. Rotations in 2d and 3d.

- Physics Context - Measurability in QM. Euler Angles.

Week 5
- The Eigenvalue Problem. Calculation of eigenvalues and eigenvectors. Relationships between matrix properties and eigenvalue/eigenvector properties.


Week 6


Week 7-8

- Physics Context - Widely used in upper-level undergraduate and graduate texts. Standard notational treatment in solid state physics, GR, fluids, mechanics, E&M, etc. Writing vector identities. Matrix representation of curl. First Physical examples of tensors would likely include moment of inertia tensor, atomic polarizability tensor, permittivity
tensor, optical conductivity tensor, coherency tensor, field tensors in GR, stress-strain tensors, etc.

Week 9-10


- Physics Context - All over the place. This is not meant to replace a differential equations class in any sense of the word. Just enough to give students a flavor/Physics context. Emphasis is more on seeing how Heat Equation, Schrödinger Equation, and Diffusion equation are really all the same thing rather than how to solve them. Some introduction to Special Functions. Diff Eqs discussed to some degree: Beer-Lambert-Bouger Law/Radioactive Decay Law/Population Growth Models/Hydrostatic Balance equation; Hooke’s Law/Newton’s Second Law; Damped/Driven Harmonic Oscillator; Continuity Equation/Gauss Law, Faraday’s Law, Ampère-Maxwell Law, Vorticity Equation, Laplace Equation, Poisson’s Equation, Diffusion Equation, Schrödinger Equation for a Free Particle, Heat Equation, Wave Equation, Helmholtz Equation, Time-Dependent and Time-Independent Schrödinger Equation, Klein-Gordon Equation, Euler-Lagrange Equations, Hamilton’s Equations, Logistic Equation.

Week 11

- Dirac Delta Function/Heaviside Function, Integral Transforms / Fourier Series (sin/cos, Bessel, Legendre, etc.), Assorted Special Functions.

- Physics Context - Electricity and Magnetism; vector derivatives in Cylindrical and Spherical coordinates. Green’s function methods. Convolutions (later linked to autocorrelation functions, etc.) Laplace transforms revisited. Applications to solutions using separation of variables method via completeness and orthogonality.

Week 12

- Fourier Series Cont’d and the Fourier Transform


Week 13-14

- Probability and Statistics

- Physics Context - Bayesian analysis, Partition Functions / Bose-Einstein/Fermi-Dirac/Maxwell-Boltzmann statistics. Basic introduction to probability density and distribution functions. Mean, Variance, Skewness, Kurtosis – Physical interpretation, how to calculate for both discrete and continuous r.v. Chebyshev’s inequality and its use in

- Other Possible Topics (to replace other ideas or to add if time):
  - Variational Calculus: *Development of the Euler-Lagrange and Hamilton Equations*
  - Perturbation Theory: *Can show up nearly anywhere. Most commonly seen at undergraduate level in Quantum Mechanics*
  - Wavelets: *finite time-series analysis*
  - More extensive introduction to basic ODE/PDE solution methods (integrating factor, etc.): *useful throughout undergrad curriculum*
  - Elliptic Integrals: *e.g. the Brachistochrone problem*
  - Others?
Faculty Curriculum Committee
Course Form

Instructions:
- Please fill out one of these forms for each course you are adding, changing, deactivating, or reactivating.
- Fill out the parts of the form specified in part B. **You must do this before your request can move forward!**
- Remember that your changes will not be implemented until the next catalog year at the earliest.
- If you have questions, start by checking the instructions on the website. Please feel free to contact the committee chairs with any remaining questions you might have.

A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu  
Phone: 953-7187  
Email: teklua@cofc.edu

Department or Program: Physics & Astronomy  
School: SSM

Subject Acronym and Course Number: PHYS 301

Catalog Year in which changes will take effect: FALL 2014

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
☒ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J, K)
  ☐ Course Number
  ☐ Course Name
  ☐ Course Description
  ☐ Credit/Contact Hours
  ☒ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
  ☐ Deactivate an Existing Course (complete parts C, D, E, G, I, J, K)
  ☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J, K)

C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

In a separate proposal, we are introducing a new Methods of Applied Physics (PHYS 272) course as a mid-level bridge between our sophomore level physics courses and upper-level physics core and elective courses. Here we propose that this new course become the prerequisite for PHYS 301.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This change will have very little effect on existing programs and courses. It is simply changing the prerequisite for an existing course.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 301

Credit hours:  _3_ lecture  _ lab  _ seminar  _ independent study
Contact hours:  _3_ lecture  _ lab  _ seminar  _ independent study

Course title: Classical Mechanics

Course description (maximum 50 words, exactly as it appears in the catalog):
Newtonian dynamics of particles and rigid bodies, relativistic mechanics, Lagrangian and Hamiltonian mechanics, and waves.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 112 or HONS 158 and MATH 323, or permission of the instructor.

Cross-listing, if any:

Is this course repeatable?  [ ] yes  [x] no  If yes, how many total credit hours may the student earn?  ______

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use boldface for the information that is changing.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 301

Credit hours:  _3_ lecture  _ lab  _ seminar  _ independent study
Contact hours:  _3_ lecture  _ lab  _ seminar  _ independent study

Course title: Classical Mechanics

Course description (maximum 50 words, exactly as it appears in the catalog):
Newtonian dynamics of particles and rigid bodies, relativistic mechanics, Lagrangian and Hamiltonian mechanics, and waves.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 112 or HONS 158 and MATH 323 or PHYS 272, or permission of the instructor.

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it?  [ ] yes  [x] no
If so, which course?  ________________
Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

Is this course repeatable?  [ ] yes  [x] no  If yes, how many total credit hours may the student earn?  ______

Is there an activity, lab, or other fee associated with this course?  [ ] yes  [x] no  What is the fee?  $_______

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Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.

G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.
None.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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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?

I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? ☐ yes ☒ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.
J. CHECKLIST.

☒ I have completed all relevant parts of the form.

☒ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ (For new courses only) I have attached a syllabus.

☐ (For courses used in any way by other departments, including cross-listing) I have attached an acknowledgement from the relevant department.

☐ (For courses intended to fulfill a Gen Ed requirement) I have submitted the proposal to the Gen Ed committee.

☒ I have submitted one Signature Form that lists all of the different forms I am submitting.
FACULTY CURRICULUM COMMITTEE
COURSE FORM

Instructions:
- Please fill out one of these forms for each course you are adding, changing, deactivating, or reactivating.
- Fill out the parts of the form specified in part B. You must do this before your request can move forward!
- Remember that your changes will not be implemented until the next catalog year at the earliest.
- If you have questions, start by checking the instructions on the website. Please feel free to contact the committee chairs with any remaining questions you might have.

A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu                Phone: 953-7187                Email: teklua@cofc.edu

Department or Program: Physics & Astronomy         School: SSM

Subject Acronym and Course Number: PHYS 403

Catalog Year in which changes will take effect: FALL_2014_____

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
☒ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J, K)
   ☐ Course Number
   ☐ Course Name
   ☐ Course Description
   ☐ Credit/Contact Hours
   ☒ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
   ☐ Deactivate an Existing Course (complete parts C, D, E, G, I, J, K)
   ☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J, K)

C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

In a separate proposal, we are introducing a new Methods of Applied Physics (PHYS 272) course as a mid-level bridge between our sophomore level physics courses and upper-level physics core and elective courses. Here we propose that this new course become the prerequisite for PHYS 403.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This change will have very little effect on existing programs and courses. It is simply changing the prerequisite for an existing course.

This form was last updated on 06/03/13 and replaces all others.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.

Department: Physics & Astronomy   School: SSM   Subject Acronym: PHYS   Course Number: 403

Credit hours:  _3_ lecture ___ lab ___ seminar ___ independent study
Contact hours:  _3_ lecture ___ lab ___ seminar ___ independent study

Course title: Introductory Quantum Mechanics

Course description (maximum 50 words, exactly as it appears in the catalog):
Wave-particle duality; the wave function; general principles of quantum mechanics; systems in one, two and three dimensions; electron spin; perturbation theory; electro-magnetic radiation; systems containing identical particles; and applications.

Restrictions (pre-requisites, co-requisites, majors only, etc.):

PHYS 230 and MATH 323, or permission of the instructor.

Cross-listing, if any:

Is this course repeatable? □ yes  □ no  If yes, how many total credit hours may the student earn? ___

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use **boldface** for the information that is changing.

Department: Physics & Astronomy   School: SSM   Subject Acronym: PHYS   Course Number: 403

Credit hours:  _3_ lecture ___ lab ___ seminar ___ independent study
Contact hours:  _3_ lecture ___ lab ___ seminar ___ independent study

Course title: Introductory Quantum Mechanics

Course description (maximum 50 words, exactly as it appears in the catalog):
Wave-particle duality; the wave function; general principles of quantum mechanics; systems in one, two and three dimensions; electron spin; perturbation theory; electro-magnetic radiation; systems containing identical particles; and applications.

Restrictions (pre-requisites, co-requisites, majors only, etc.):

PHYS 230 and MATH 323 or PHYS 272, or permission of the instructor.

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it? □ yes  □ no  If so, which course? ___________

Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

Is this course repeatable? □ yes  □ no  If yes, how many total credit hours may the student earn? ___

This form was last updated on 06/03/13 and replaces all others.
Is there an activity, lab, or other fee associated with this course? □ yes  ❌ no What is the fee? $_____
Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.

G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.
None.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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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?

I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? □ yes  ❌ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.

This form was last updated on 06/03/13 and replaces all others.
J. CHECKLIST.

☒ I have completed all relevant parts of the form.

☒ I have attached a cover letter that describes my request and lists all the documents I am submitting.

☐ (For new courses only) I have attached a syllabus.

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FACULTY CURRICULUM COMMITTEE
COURSE FORM

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A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu                  Phone: 953-7187                  Email: teklua@cofc.edu

Department or Program: Physics & Astronomy       School: SSM

Subject Acronym and Course Number: PHYS 405

Catalog Year in which changes will take effect: FALL 2014

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
☒ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J, K)
  ☐ Course Number
  ☐ Course Name
  ☐ Course Description
  ☐ Credit/Contact Hours
  ☒ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
  ☐ Deactivate an Existing Course (complete parts C, D, E, G, I, J, K)
  ☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J, K)

C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

In a separate proposal, we are introducing a new Methods of Applied Physics (PHYS 272) course as a mid-level bridge between our sophomore level physics courses and upper-level physics core and elective courses. Here we propose that this new course become the prerequisite for PHYS 405.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This change will have very little effect on existing programs and courses. It is simply changing the prerequisite for an existing course.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 405

Credit hours: ___ lecture ___ lab ___ seminar ___ independent study
Contact hours: ___ lecture ___ lab ___ seminar ___ independent study

Course title: Thermal Physics

Course description (maximum 50 words, exactly as it appears in the catalog):
An introduction to quantum statistical mechanics, thermodynamic functions, and the laws of thermodynamics. There is an emphasis on the application of the fundamental concepts to astrophysics, electromagnetic radiation, low-temperature physics, and solid-state physics.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 230 and MATH 323, or permission of the instructor.

Cross-listing, if any:

Is this course repeatable? ☐ yes ☒ no  If yes, how many total credit hours may the student earn? ____

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use boldface for the information that is changing.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 405

Credit hours: ___ lecture ___ lab ___ seminar ___ independent study
Contact hours: ___ lecture ___ lab ___ seminar ___ independent study

Course title: Thermal Physics

Course description (maximum 50 words, exactly as it appears in the catalog):
An introduction to quantum statistical mechanics, thermodynamic functions, and the laws of thermodynamics. There is an emphasis on the application of the fundamental concepts to astrophysics, electromagnetic radiation, low-temperature physics, and solid-state physics.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 230 and MATH 323 or PHYS 272, or permission of the instructor.

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it? ☐ yes ☒ no
If so, which course? ____________
Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

Is this course repeatable? ☐ yes ☒ no  If yes, how many total credit hours may the student earn? ____

Is there an activity, lab, or other fee associated with this course? ☐ yes ☒ no  What is the fee? $______
Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.

G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.
None.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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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?

I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? □ yes ☒ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.
J. CHECKLIST.

☒ I have completed all relevant parts of the form.

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FACULTY CURRICULUM COMMITTEE
COURSE FORM

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A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu              Phone: 953-7187            Email: teklua@cofc.edu

Department or Program: Physics & Astronomy      School: SSM

Subject Acronym and Course Number: PHYS 408

Catalog Year in which changes will take effect: FALL 2014

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
☒ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J, K)
    ☐ Course Number
    ☐ Course Name
    ☐ Course Description
    ☐ Credit/Contact Hours
    ☒ Restrictions (prerequisites, co-requisites, junior/senior standing, etc.)
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C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

In a separate proposal, we are introducing a new Methods of Applied Physics (PHYS 272) course as a mid-level bridge between our sophomore level physics courses and upper-level physics core and elective courses. Here we propose that this new course become the prerequisite for PHYS 408.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

This change will have very little effect on existing programs and courses. It is simply changing the prerequisite for an existing course.

This form was last updated on 06/03/13 and replaces all others.
E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 408
Credit hours: ___ lecture ___ lab ___ seminar ___ independent study
Contact hours: ___ lecture ___ lab ___ seminar ___ independent study

Course title: Introduction to Solid State Physics

Course description (maximum 50 words, exactly as it appears in the catalog):
A survey of the fundamental principles determining the macroscopic properties of solids. The lattice system and the electron system are investigated as a basis for understanding dielectric, magnetic, optical, semiconductive and superconductive behavior in solids.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 230 and MATH 323, or permission of the instructor.

Cross-listing, if any:
Is this course repeatable?  ☐ yes  ☒ no  If yes, how many total credit hours may the student earn? _____

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use boldface for the information that is changing.
Department: Physics & Astronomy  School: SSM  Subject Acronym: PHYS  Course Number: 408
Credit hours: ___ lecture ___ lab ___ seminar ___ independent study
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Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 230 and MATH 323 or PHYS 272, or permission of the instructor.

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it?  ☐ yes  ☒ no  If so, which course?  ________________
Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

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Is there an activity, lab, or other fee associated with this course?  ☐ yes  ☒ no  What is the fee? $______

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G. COSTS. List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.
   None.

H. STUDENT LEARNING OUTCOMES AND ASSESSMENT.

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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?

I. PROGRAM CHANGES. Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration?  □ yes  ☒ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.
J. CHECKLIST.

☒ I have completed all relevant parts of the form.

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COURSE FORM

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A. CONTACT/COURSE INFORMATION.

Name: Alem Teklu               Phone: 953-7187               Email: teklua@cofc.edu
Department or Program: Physics & Astronomy       School: SSM
Subject Acronym and Course Number: PHYS 409
Catalog Year in which changes will take effect: FALL 2014

B. TYPE OF REQUEST. Please check all that apply, then fill out the specified parts of the form.

☐ Add a New Course (complete parts C, D, F, G, H, I, J, K)
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  □ Course Number
  □ Course Name
  □ Course Description
  □ Credit/Contact Hours
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C. RATIONALE AND EXPLANATION. Please describe your request and explain why you are making it.

In a separate proposal, we are introducing a new Methods of Applied Physics (PHYS 272) course as a mid-level bridge between our sophomore level physics courses and upper-level physics core and elective courses. Here we propose that this new course become the prerequisite for PHYS 409.

D. IMPACT ON EXISTING PROGRAMS AND COURSES. Please briefly describe the impact of your request on your own programs and courses as well other programs and courses. If another program requires the course, you must submit their written acknowledgement with this proposal. Also, the affected program must describe any change in the number of credit hours they require. Include a list of similar courses in other departments and explain any overlap.

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E. EXISTING COURSE INFORMATION. If you are proposing a new course, just leave this blank. Otherwise, please fill out all fields.

Department: Physics & Astronomy School: SSM Subject Acronym: PHYS Course Number: 409

Credit hours: _3_ lecture __ lab __ seminar __ independent study
Contact hours: _3_ lecture __ lab __ seminar __ independent study

Course title: Electricity and Magnetism

Course description (maximum 50 words, exactly as it appears in the catalog):
An intermediate course in electricity and magnetism. Subjects to be covered will include electric fields, magnetic fields, electric current, Maxwell’s equations, conductors, dielectrics and magnetic materials.

Restrictions (pre-requisites, co-requisites, majors only, etc.):
PHYS 112 or HONS 158 and MATH 323, or permission of the instructor.

Cross-listing, if any:

Is this course repeatable? □ yes ☒ no If yes, how many total credit hours may the student earn? ___

F. NEW COURSE INFORMATION. If you are deactivating a course, leave this blank. Otherwise, please fill out all fields. For changed courses, use boldface for the information that is changing.

Department: Physics & Astronomy School: SSM Subject Acronym: PHYS Course Number: 409

Credit hours: _3_ lecture __ lab __ seminar __ independent study
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Course title: Electricity and Magnetism

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PHYS 112 or HONS 158 and MATH 323 or PHYS 272, or permission of the instructor.

If this is a newly-created course, is it intended to be the equivalent of an existing course and replace it? □ yes ☒ no
If so, which course? ____________________
Note: You must deactivate that course by submitting an additional Course Form.

Cross-listing, if any (submit approval from relevant department):
Note: Cross-listed courses are equivalent.

Is this course repeatable? □ yes ☒ no If yes, how many total credit hours may the student earn? ___

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Note: The Senate cannot approve new fees; Business Affairs will submit any such request to the Board of Trustees. The course can still be created, but the fee will not be attached until the Board has approved it.
G. **COSTS.** List all of the new costs or cost savings (including new faculty/staff requests, library, equipment, etc.) associated with your request.
   None.

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**I. PROGRAM CHANGES.** Will this course be added to the existing degree requirements or list of approved electives of a major, minor, or concentration? □ yes ☒ no

If yes, please attach a Change Minor and/or Change Major/Program Form as appropriate.

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**J. CHECKLIST.**

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☒ I have submitted one Signature Form that lists all of the different forms I am submitting.
From: Mignone, Robert J
Sent: Wednesday, November 06, 2013 4:21 PM
To: Kuthirummal, Narayanan
Subject: Re: Proposal for Methods of Applied Physics

Dear Dr. Kuthirummal,

The Department of Mathematics supports the proposal from the Department of Physics for its new course PHYS 272: Methods of Applied Physics, and all of the associated prerequisite changes.

Sincerely yours,

Robert Mignone, Chair
Department of Mathematics