November 20th, 2015

The Atmospheric Physics Curriculum Committee within the Department of Physics & Astronomy is proposing the revision of a current senior-level course, Fluid Mechanics (PHYS 415). We intended to revise this course as part of a package of changes but forgot. For this course, we are proposing that PHYS 301 (Classical Mechanics) be deleted and PHYS 272 (Method of Applied Physics) be added to the list of possible prerequisite courses for fluid mechanics.

Several years ago, the Department created a new course PHYS272, Methods of Applied Physics. Many of our upper level courses previously required both linear algebra and differential equations, which was occasionally a scheduling problem and was also more math than some of our majors needed for their future careers. PHYS272 took pieces of those courses along with other math that we found useful and has proven to be a good substitute for these two math courses for many of our majors. It was our intention to offer this alternate math route into all of our upper level courses and for some reason PHYS415 was forgotten.

Currently, this course is offered (and will continue to be offered in the foreseeable future) every two years. Therefore, there is no anticipated overall cost to the department. The course will be required in the new Operational Meteorology and Atmospheric Physics Concentrations and serves as an elective in other programs (a full list is included in the enclosed paperwork). Hence, we are submitting this course change proposal in conjunction with the meteorology proposals.

Regards,

B. Lee Lindner

Chair, Atmospheric 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: B. Lee Lindner
Phone: 953-8288
Email: lindnerb@cofc.edu

Department or Program: Physics and Astronomy
School: SSM

Subject Acronym and Course Number: PHYS 415

Catalog Year in which changes will take effect: FALL 2016

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)
☒ Change Part of an Existing Course (complete parts C, D, E, F, G, I, J)
☐ Course Number (you must submit a course deactivation request for the old 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)
☐ Reactivate a Previously-Deactivated Course (complete parts C, D, E, G, I, J)

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

Fluid mechanics is an expected area of content mastery in operational meteorology and is a required content area in the minimal requirements listed by the American Meteorological Society for recommended programs in the Atmospheric Sciences. We have been tasked to design a curriculum that serves the needs of students and, as such, the course content must be available to our students. For this course, we are proposing that PHYS 301 (Classical Mechanics) be deleted and PHYS 272 (Method of Applied Physics) be added to the list of possible prerequisite courses for fluid mechanics.

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 be included in the following programs:

1. Atmospheric Physics Concentration (as an elective)
2. Meteorology B.A. Program (as an elective)
3. Operational Meteorology Concentration (as a required core course)
4. Meteorology Minor (as an elective)
5. Physics B.A. Program (as an elective)

This form was last updated on 12/13/13 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.

<table>
<thead>
<tr>
<th>Department: Physics and Astronomy</th>
<th>School: SSM</th>
<th>Subject Acronym: PHYS</th>
<th>Course Number: 415</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit hours: 3 lecture 0 lab 0 seminar 0 independent study</td>
<td>Contact hours: 3 lecture 0 lab 0 seminar 0 independent study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course title: Fluid Mechanics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Course description (maximum 50 words, exactly as it appears in the catalog):

An introduction to fluid mechanics that develops physical concepts and formulates basic conservation laws. Topics include fluid statics, kinematics, stresses in fluids, flow of real (viscous) fluids and compressible flow.

Prerequisites: MATH 323 and PHYS 301 or permission of the instructor.

Cross-listing, if any: None

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.

<table>
<thead>
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| Course description (maximum 50 words, exactly as it appears in the catalog):

An introduction to fluid mechanics that develops physical concepts and formulates basic conservation laws. Topics include fluid statics, kinematics, stresses in fluids, flow of real (viscous) fluids and compressible flow.

Prerequisites: 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? ☐ yes ☒ no
If so, which course? ________________

If equivalent, will the newly-created course replace the existing course? ☐ yes ☒ no
Note: If yes, 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.

This form was last updated on 12/13/13 and replaces all others.
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.**

<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. Successfully demonstrate a concrete understanding of the theoretical and mathematical principles underpinning fluid mechanics through quantitative problem solving.</td>
<td>Homework assignments and exams will assess achievement of student learning outcomes.</td>
</tr>
<tr>
<td>2. Successfully use physical principles and computational tools to solve problems within fluid mechanics.</td>
<td>80% is our target.</td>
</tr>
<tr>
<td>3.</td>
<td>Homework assignments and exams will assess achievement of student learning outcomes.</td>
</tr>
<tr>
<td>4.</td>
<td>80% is our target.</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 an elective in many different programs (as noted in section D), thus developing a formal alignment with each program is not plausible. However, this course is a required course within the Atmospheric Physics concentration and the Operational Meteorology concentration so our response here focuses on how the course aligns with the Student Learning Outcomes for these programs in particular.

The Atmospheric Physics concentration includes student learning outcomes of “understanding key principles central to meteorology” and “understanding how the law of physics applies to meteorology”. Both of these learning outcomes are clearly supported directly from the course content. These outcomes are introduced (in the first parts of the course), reinforced (throughout the semester), and demonstrated by students (in homework assignments and exam questions) throughout the course.

Fluid mechanics is considered one of the basic areas of meteorological study, and hence understanding of fluid mechanics clearly supports the outcome of “understanding key principles central to meteorology”. Since this
course aims to develop computational skills and critical thinking skills for students, the content also clearly relates directly to the outcome of “developing good problem solving skills and critical thinking skills.”

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
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.

The following curriculum proposals are attached:

1. Fluid Mechanics; course change

B. APPROVAL AND SIGNATURES.

1. Signature of Department Chair or Program Director:

   Name: Narayanan Jithin
   Date: 12/2/2015

2. Signature of Academic Dean:

   Name: [Signature]
   Date: 12/5/2015

3. Signature of Provost:

   Name: [Signature]
   Date: 1/7/15

4. Signature of Business Affairs (only for course fees):

   Name: [Signature]
   Date: [ ]
   [ ] fee approved on [Date]
   [ ] BOT approval pending

5. Signature of Curriculum Committee Chair:

   Name: [Signature]
   Date: [ ]

6. Signature of Budget Committee Chair (only for new programs):

   Name: [Signature]
   Date: [ ]

7. Signature of Academic Planning Committee Chair (only for new programs):

   Name: [Signature]
   Date: [ ]

8. Signature of Faculty Senate Secretary:

   Name: [Signature]
   Date: [ ]

Date Approved by Faculty Senate: [ ]