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.

ASTR B.A. Change Program Form, ASTR B.A. checklist

B. APPROVAL AND SIGNATURES.

1. Signature of Department Chair or Program Director:

   Natarajan Kuthimad    Date: 9/16/2015

2. Signature of Academic Dean:

   Date: 9/16/2015

3. Signature of Provost:

   Date: ________________

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

   Date: ________________

   □ fee approved on __________
   □ BOT approval pending

5. Signature of Curriculum Committee Chair:

   Date: ________________

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

   Date: ________________

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

   Date: ________________

8. Signature of Faculty Senate Secretary:

   Date: ________________

Date Approved by Faculty Senate: ________________
April 19, 2015

Dr. George Chartas, Assistant Professor
Department of Physics & Astronomy
College of Charleston

Dear Faculty Curriculum Committee,

The Astronomy Curriculum Committee within the Department of Physics & Astronomy is requesting to make several changes to the requirements of the Astronomy B.A. degree to bring it closer in line with the Physics B.A. degree.

Specifically, we request to make Experimental Astronomy (ASTR 377) a required course for the Astronomy B.A. major and move Modern Physics (PHYS 230) from the required list of courses for the Astronomy B.A. major to the list of elective courses since we recently added the more relevant course titled Modern Astrophysics (ASTR 231) to the required course list.

To correct for a minor oversight in the Astronomy Major requirements we also request to include the courses Black Holes in The Universe (ASTR 210), Black Holes, Advanced Topics (ASTR 410), and NASA Space Mission Design Leadership (ASTR 460L) under the section of the Astronomy B.A. titled: “Complete and additional 12 credit hours. At least 6 of the credits must be selected from: ...”

The Physics and Astronomy faculty has unanimously agreed to all the requested changes.

The documents submitted with this request are:
1. The Faculty Curriculum Committee Signature Page
2. This cover letter describing the requested changes
3. The Faculty Curriculum Committee Change Program Form for the ASTR B.A.
4. The ASTR B.A. checklist
5. The program of study worksheet for the Astronomy B.A. degree.

Sincerely yours,

George Chartas
FACULTY CURRICULUM COMMITTEE
CHANGE/DELETE PROGRAM FORM

Instructions:
- Please fill out all of the portions of the form that are specified in section 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, please start by checking the detailed instructions on the website.
- Please feel free to contact the committee chair with any remaining questions you might have.

A. CONTACT INFORMATION.

Name: George Chartas  Phone: 814 441 4127  Email: chartasg@cofc.edu

School: College of Charleston  Department or Program: Physics and Astronomy

Name and Acronym of Major: Astronomy Bachelor of Arts (B.A.)

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

☒ Change Request (fill out all sections)
  ☐ Add an existing course to requirements or electives
  ☐ Add a new course to requirements or electives (attach completed course form for each)
  ☒ Delete courses from requirements or electives
  ☐ Add or modify concentration*
  ☐ Add or modify cognate*

*Note: Only concentrations and cognates requiring 18 or more credit hours will be tracked in Banner and Degree Works and noted on the transcript.

☐ Terminate Program (fill out E, G, H, and I)
  ☐ Terminate degree
  ☐ Terminate major
  ☐ Terminate concentration
  ☐ Terminate cognate

C. GENERAL INFORMATION

Number of Current Credit Hours (for existing program): __42__
Number of Proposed Credit Hours (for changed program): __42__
Catalog Year in which changes will take effect: FALL __2016__

D. CURRICULUM. Please list every change you are making below AND attach the current Program of Study Worksheet for this major (http://registrar.cofc.edu/program-of-study-resources/program-of-study-worksheets/index.php) with changes marked in RED. Additions should show where the course will be inserted, deletions should be noted by crossing out the course, and moves indicated with arrows. Distinguish between required and elective courses, and note any prerequisites, co-requisites, sequencing, or other restrictions. Provide the catalog description and course list exactly as they should appear in the catalog. For each new course, submit the Curriculum Committee’s Course Form and a sample syllabus.

This form was last updated on 6/6/2013 and replaces all others.

Page 1 of 5
E. RATIONALE AND EXPLANATION. Please provide a narrative addressing the request you are making and why you are making it.

Rationale and Explanation for requested changes to the Astronomy BA major:

The current Astronomy Major requirements for the Bachelors of Arts Degree contain the "hidden" required course Experimental Astronomy (ASTR 377). This requirement has led to quite some confusion amongst students seeking this degree. Specifically, the current list of required courses for the Astronomy BA degree does not explicitly contain the course ASTR 377, however, ASTR 377 is listed as a prerequisite or co-requisite or permission from the instructor and department chair for the course PHYS 419. PHYS 419 is a required course for the Astronomy BA major.

A student therefore seeking an Astronomy B.A. is indirectly required to take ASTR 377 since it is a PR or CO for the required course PHYS 419. A student can currently request permission from the instructor and department chair to take PHYS 419 without taking Experimental Astronomy ASTR 377.

ASTR 377 is currently listed in the section of the astronomy BA under: "Complete an additional 12 credit hours. At least 6 of the credits must be selected from:"

The Physics and Astronomy Department also offers a Physics Bachelor of Arts degree. Experimental Physics PHYS 370 is a required course for the Physics BA major.

One of our goals of this requested change is to bring the Physics and Astronomy BA programs in closer alignment. The Physics and Astronomy faculty unanimously agree that the experimental courses PHYS 370 and ASTR 377 should be required courses for the Physics BA and Astronomy BA majors, respectively.

To resolve the current confusion with ASTR 377 in the Astronomy B.A. major and to bring the Astronomy and Physics B.A. degrees in closer alignment we request (a) to make Experimental Astronomy (ASTR 377) a required course for the Astronomy B.A. major and (b) remove Modern Physics PHYS 230 from the required list of courses for the Astronomy BA major since we recently added the more relevant course titled Modern Astrophysics (ASTR 231) to the required course list.

As an oversight, the following 200+ level Astronomy courses:
(a) ASTR 210: Black Holes in The Universe (3) PR: None
(b) ASTR 410: Black Holes, Advanced Topics (1) PR: PHYS 112 or permission of instructor; CO: ASTR 210
(c) ASTR 460L: NASA Space Mission Design Leadership Lab (1) PR: Instructor permission; PR or CO: ASTR 260

are currently left out of the section of the astronomy BA titled: "Complete an additional 12 credit hours. At least 6 of the credits must be selected from:”, whereas, similar courses are included. For example ASTR 205 is currently in this section but ASTR 210 is not even though they are at a similar level.

To correct for this oversight we request to include the courses ASTR 210, ASTR 410, and ASTR 460L under the section of the astronomy BA titled: "Complete an additional 12 credit hours. At least 6 of the credits must be selected from:"

The Physics and Astronomy faculty unanimously agreed to all of these requested changes.
F. 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 major or program?</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. Students are able to answer general questions in the field of astronomy.</td>
<td>All students will be assessed in ASTR 231, the main required course in the Astronomy B.A. Questions on the final exam will be used to assess student performance.</td>
</tr>
<tr>
<td>2. Students use critical thinking and apply astronomy related knowledge to solve problems.</td>
<td>All students will be assessed in ASTR 377, the required experimental astronomy course. This is a research based experience, where students must apply knowledge to design and execute experiments. Students will be assessed using their project reports.</td>
</tr>
<tr>
<td>3. Students effectively communicate in scientific discussions and presentations.</td>
<td>All students will be assessed in PHYS 420 or 499, which are required capstone research courses. Final reports, gathered at the end of each semester, will be used to assess student performance.</td>
</tr>
</tbody>
</table>

G. IMPACT ON EXISTING PROGRAMS AND COURSES. Please describe the impact of this request on other programs and courses. If you are deleting a program, please describe the effect on all programs that will be impacted; if you are adding or changing a program, please explain any overlap with existing programs at the College.

We do not anticipate any impact of this request on other programs and courses. As a consequence of these requested changes it will be clearer now to students that ASTR 377 is a required course for the Astronomy B.A. program and that several additional Astronomy courses can be used as electives for the Astronomy B.A. degree.
H. COSTS ASSOCIATED WITH THE REQUESTED ACTION. List all of the new costs or cost savings (including new
faculty/staff requests, library, or equipment) associated with your request.

There are no expected costs associated with the requested actions.

I. 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.

☐ I have attached a Course Form for each newly-created or modified course.

☐ (For proposals that affect other departments in any way) I have attached an acknowledgement from the relevant
department.

☒ I have provided the complete curriculum for the program, concentration, emphasis, etc., including the description
and course list, exactly as it should appear in the catalog.

☒ I have submitted one Signature Form that lists all of the different forms I am submitting.
Astronomy Major Requirements
Catalog Year: 2015-16
Degree: Bachelor of Arts
Credit Hours: 43

"PR" indicates a pre-requisite. "CO" indicates a co-requisite.

Courses within this major may also satisfy general education requirements. Please consult http://registrar.cofc.edu/general-edu for more information.

**Required Courses**

☐ PHYS 111   General Physics I (3) **CO:** PHYS 111L; **PR or CO:** MATH 120 or equivalent or instructor permission
☐ PHYS 111L  General Physics I Lab (1) **CO:** PHYS 111 or instructor permission

☐ PHYS 112*  General Physics II (3) **PR:** PHYS 111 and 111L; **CO:** PHYS 112L; **CO or PR:** MATH 220 or equivalent or instructor permission
☐ PHYS 112L  General Physics II Lab (1) **CO:** PHYS 112 or instructor permission

☐ PHYS 230   Introduction to Modern Physics I (3) **PR:** PHYS 112 or HONS 158; **PR or CO:** MATH 221 or instructor permission
Replace with:
ASTR 377   Experimental Astronomy (4) **PR:** ASTR 231

☐ PHYS 419  Research Seminar (1) **PR or CO:** PHYS 370 or ASTR 377 or instructor permission

☐ PHYS 420** Senior Research (3) **PR:** PHYS 419; instructor and department chair permission
OR
☐ PHYS 499*** Bachelor's Essay (6) **PR:** PHYS 419 or department chair permission. Credit will not be awarded for both PHYS 420 and PHYS 499

☐ ASTR 231   Introduction to Astrophysics (3) **PR:** PHYS 112 or HONS 158

**Note:** * Upon completion of PHYS 101 with a grade of B or better and successful completion of MATH 120, a student may transfer to PHYS 112.
**Credit will not be awarded for both PHYS 420 and PHYS 499. ***With department approval, PHYS 499 may be substituted for PHYS 420.

**Complete an additional 12 credit hours. At least 6 of the credit hours must be selected from:**

☐ ASTR 205   Intelligent Life in the Universe (3) **PR:** None
Add the following course to this section:
ASTR 210   Black Holes in the Universe (3) **PR:** None

☐ ASTR 306   Planetary Astronomy (3) **PR:** ASTR 231

☐ ASTR 311   Stellar Astronomy and Astrophysics (3) **PR:** ASTR 231 and MATH 221

☐ ASTR 312   Galactic and Extragalactic Astronomy (3) **PR:** ASTR 231 and MATH 221

☐ ASTR 377   Experimental Astronomy (4) **PR:** ASTR 231 ASTR 377 was moved to **Required Courses**
Add the following course to this section:
ASTR 410   Black Holes: Advanced Topics (1) **PR:** PHYS 112 or permission of instructor; **CO:** ASTR 210

☐ ASTR 413   Astrophysics (3) **PR:** PHYS 301 and MATH 323 or instructor permission
Add the following course to this section:
ASTR 460L  NASA Space Mission Design Leadership Lab (1) **PR:** Instructor permission; **PR or CO:** ASTR 260
Select an additional 6 credit hours from the following:

☐ _______  ☐ _______

ASTR 205*  Intelligent Life in the Universe (3) PR: None

ASTR 210  Black Holes in the Universe (3) PR: None

ASTR 210*  Black Holes in the Universe (3) PR: None

ASTR 260  NASA Space Mission Design (2) PR: ASTR 130 or ASTR 306 or HONS 160 or GEOL 206 or PHYS 102 or PHYS 112 or HONS 158 or instructor permission; Co: ASTR 260L or GEOL 260L or PHYS 260L or ASTR 460L or GEOL 460L or PHYS 460L

ASTR 260L  NASA Space Mission Design Lab (1) Co: ASTR 260 OR

ASTR 460L  NASA Space Mission Design Leadership Lab (1) PR: Instructor permission; Co: ASTR 260

ASTR 460L*  NASA Space Mission Design Leadership Lab (1) PR: Instructor permission; Co: ASTR 260

ASTR 306*  Planetary Astronomy (3) PR: ASTR 231

ASTR 311*  Stellar Astronomy and Astrophysics (3) PR: ASTR 231 and MATH 221

ASTR 312*  Galactic and Extragalactic Astronomy (3) PR: ASTR 231 and MATH 221

ASTR 377*  Experimental Astronomy (4) PR: ASTR 231 ASTR 377 was moved to required courses of Astronomy BA

ASTR 410  Black Holes: Advanced Topics (1) PR: PHYS 112 or permission of instructor; Co: ASTR 210

ASTR 410*  Black Holes: Advanced Topics (1) PR: PHYS 112 or permission of instructor; Co: ASTR 210

ASTR 413*  Astrophysics (3) PR: PHYS 301 and MATH 323 or instructor permission

GEOL 206  Planetary Geology (3) PR: GEOL 103 and 103L or HONS 155 and 155L; or permission of the instructor

GEOL 412  Crustal Geophysics (3) PR: GEOL 103 and 103L and GEOL 105 and 105L or HONS 155 and 155L and HONS 156 and 156L and MATH 120 and GEOL 352 or instructor permission

PHYS 230  Introduction to Modern Physics 1 (3) PR: PHYS 112 or HONS 158; PR or Co: MATH 221 or instructor permission

PHYS 301  Classical Mechanics (3) PR: (PHYS 112 or HONS 158) and (MATH 323 or PHYS 272) or permission of instructor

PHYS 340  Photonics (4) PR: PHYS 112, PHYS 112L or HONS 158, HONS 158L

PHYS 390*  Research (ASTR topic required) (1-3, Repeatable up to 6) PR: Instructor and department chair permission

PHYS 394  Digital Signal and Image Processing with Biomedical Applications (3) PR: PHYS 112 and 112L or HONS 158 and 158L; Co: PHYS 394L

PHYS 394L  Digital Signal and Image Processing with Biomedical Applications Laboratory (1) PR: PHYS 112 and 112L or HONS 158 and 158L; Co: PHYS 394

PHYS 403  Introductory Quantum Mechanics (3) PR: PHYS 230 and (MATH 323 or PHYS 272) or instructor permission

PHYS 404  Introductory Quantum Mechanics (a continuation of PHYS 403) (3) PR: PHYS 403 or instructor permission

PHYS 405  Thermal Physics (3) PR PHYS 230 and (MATH 323 or PHYS 272) or instructor permission
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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<tbody>
<tr>
<td>PHYS 407</td>
<td>Introduction to Nuclear Physics (3) PR: PHYS 230 or instructor permission</td>
</tr>
<tr>
<td>PHYS 409</td>
<td>Electricity and Magnetism (3) PR: (PHYS 112 or HONS 158) and (MATH 323 or PHYS 272) or permission of instructor</td>
</tr>
<tr>
<td>PHYS 410</td>
<td>Electricity and Magnetism (3) PR: PHYS 409</td>
</tr>
<tr>
<td>PHYS 412*</td>
<td>Special Topics (ASTR topic required) (1-3) PR: Instructor permission</td>
</tr>
<tr>
<td>PHYS 415</td>
<td>Fluid Mechanics (3) PR: MATH 323 and PHYS 301 or instructor permission</td>
</tr>
</tbody>
</table>

**Note:** *When not used to fulfill the other above requirements.*

**Math Requirement**

- [ ] MATH 120  Introductory Calculus (4) PR: C- or better in MATH 111 or placement
- [ ] MATH 220  Calculus II (4) PR: MATH 120 or HONS 115
- [ ] MATH 221  Calculus III (4) PR: MATH 220

**Notes:**

- With department approval, completion with grades of at least "B" in PHYS 101/101L and PHYS 102/102L, together with MATH 120 and MATH 220 may be substituted for PHYS 111/111L and PHYS 112/112L.