MEMORANDUM

Date: August 21\textsuperscript{th}, 2014

To: Dr. Mark Archambault, Chair UGCC.

CC’d:

From: Dr. D. Batcheldor, Interim Head Physics & Space Sciences.

Re: Items for August 2014 UGCC Meeting.

Dear Dr Archambault,

There are three UGCC matters for the August 29\textsuperscript{th} meeting from PSS.

1) ANM Astrobiology.
2) ANM Astronomy & Astrophysics.
3) CRC PHY 1050 Physics & Space Science Seminar.

Included are the signed required forms, and further justification documents where deemed necessary. These will be delivered to you by hardcopy shortly.
Teach Out Plan for 7137 & 7136

The proposed changes to Space Sciences: Astrobiology (7137) and Space Sciences: Astronomy & Astrophysics (7136) are very minor; just one class different. Therefore, the PSS Teach Out Plan for these degrees is simple.

First, for current seniors (graduating Fall 2014 or Spring 2015) there will be no changes. They will graduate under with diplomas of Space Sciences: Astrobiology (7137) and Space Sciences: Astronomy & Astrophysics (7136). Second, during the coming academic year (2014-15) we will transition all remaining students – beginning with the juniors – into the new programs using change of major forms. We will properly process the necessary core substitution forms, program plans, and petitions to graduate to reflect the new course sequences.

Respectfully submitted,

D. Batcheldor
Interim Head, Physics & Space Sciences. 6/8/14.

[Signature]

Approved.

Hamil K. Real
8/6/2014
Florida Institute of Technology

ADDITIONAL MAJOR OR MINOR TO THE CURRICULUM

Please provide the following information when requesting a new major or minor (program or option) to be added to the curriculum. Only new majors, minors, and options are assigned a new code and print on the diploma. The code will be assigned by the Office of the Registrar and information emailed to all appropriate personnel.

COLLEGE Science DELIVERY MODEL(S) Classroom

DEPARTMENT Physics & Space Sciences CAMPUS/SITE(S) Main

PROGRAM TO BE ADDED ☑ Major ☐ Minor ☐ Option for ____________________________ (existing degree program)

NOTE: Only Majors, Minors, and Options receive new codes and print on the diploma; use Option for new program name to appear with existing degree name.

☐ Associate of Arts (A.A.) ☐ Master of Arts in Teaching (M.A.T.) ☐ Master of Science in Aviation (M.S.A.)
☐ Associate of Science (A.S.) ☐ Master of Business Administration (M.B.A.) ☐ Educational Specialist (E.S.S.)
☐ Bachelor of Arts (B.A.) ☐ Master of Education (M.Ed.) ☐ Doctor of Philosophy (Ph.D.)
☒ Bachelor of Science (B.S.) ☐ Master of Public Administration (M.P.A.) ☐ Doctor of Psychology (Psy.D.)
☐ Master of Arts (M.A.) ☐ Master of Science (M.S.) ☐ Graduate Certificate

OTHER ADDITION TO THE CURRICULUM (NOTE: Only Majors, Minors, and Options receive new codes and print on the diploma; use Concentration or Specialization if the new program represents less than a full degree curriculum.)

☐ Concentration or ☐ Specialization for ____________________________ (existing degree program)

PROGRAM TITLE Restricted to 30 characters, including spaces

Astrobiology

TERM TO BE INITIATED Fall 2015 ADVISOR FOR NEW PROGRAM Dr. Sam Durrance

(Date program to be initiated must be no sooner than the next term for which registration has not begun)

ROUTING APPROVALS: 1) Department head/program chair and college dean approve and sign form. 2) The associate vice president for Institutional compliance reviews and signs form. 3) The executive vice president or his designee approves business plan of the program in terms of financial viability and impact on the university mission and signs form. 4) Undergraduate Curriculum Committee or Graduate Council approves academics and signs form. 5) The executive vice president or his designee gives final approval of program, signs form and forwards to Office of the Registrar.

1) Matthew J. Drumm, Program Chair 8/14/14
2) Nancy H. Gallogly 8/14/14
3) Monica L. Falzone 8/14/14
4) Chair, Graduate Council Date
5) Executive Vice President Date

REGISTRAR’S USE ONLY

FSA ATLAS ☐ SOARREF ☐ SMAPRLE
SVVMAIR ☐ SOACUR ☐ Major Code Assigned
GWYSDAX ☐ CIPACODE ☐ Operator Initials/Date

DISTRIBUTION Original – Registrar Copy – Academic Unit

Florida Institute of Technology • Office of the Registrar
150 West University Boulevard, Melbourne, FL 32901-6975 • (321) 674-7877 • Fax (321) 674-7827
General Information – ext. 8115, Graduation – ext. 8116, Records and Transcripts – ext. 8117, Registration – ext. 8118

* This is not a "new" major, but just a rebranding/marketing effort. There will be a new major code, however. DPB.
Astrobiology, B.S.

**Major Code:** 7191  
**Degree Awarded:** Bachelor of Science  
**Age Restriction:** N  
**Admission Status:** undergraduate  
**Delivery Mode/s:** Classroom only  
**Location/s:** main campus.

The undergraduate space sciences program for the astrobiology major is designed for students interested in pursuing a broad range of space-related careers, either upon completion of the bachelor's degree program or after completing graduate studies. Emphasis in the curriculum is on achieving a broad yet rigorous education in the basic physical, mathematical and engineering sciences as a foundation for successful entry into any of the many subfields of modern space science activity. Because basic physics and introductory space sciences courses form a critically important foundation for all advanced coursework in the space sciences program, the minimum grade for satisfying the prerequisite requirements for a space sciences major is a grade of C for each of the following courses: PHY 1001, PHY 2002, PHY 2003, PHY 2091, PHY 2092, SPS 1020.

This program is interdisciplinary and designed to meet the needs of students intending to pursue graduate education in astrobiology, astrophysics, planetary sciences or biology.

### Freshman Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASC 1000</td>
<td>University Experience</td>
</tr>
<tr>
<td>CHM 1101</td>
<td>Chemistry 1</td>
</tr>
<tr>
<td>COM 1101</td>
<td>Composition and Rhetoric</td>
</tr>
<tr>
<td>MTH 1001</td>
<td>Calculus 1*</td>
</tr>
<tr>
<td>PHY 1050</td>
<td>Physics and Space Science Seminar</td>
</tr>
<tr>
<td>SPS 1020</td>
<td>Introduction to Space Sciences*</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 1102</td>
<td>Chemistry 2</td>
</tr>
<tr>
<td>COM 1102</td>
<td>Writing about Literature</td>
</tr>
<tr>
<td>MTH 1002</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>PHY 1001</td>
<td>Physics 1</td>
</tr>
<tr>
<td>PHY 2091</td>
<td>Physics Lab 1</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1010</td>
<td>Biological Discovery 1</td>
</tr>
<tr>
<td>HUM 2051</td>
<td>Civilization 1</td>
</tr>
<tr>
<td>MTH 2001</td>
<td>Calculus 3</td>
</tr>
<tr>
<td>PHY 2002</td>
<td>Physics 2</td>
</tr>
<tr>
<td>PHY 2092</td>
<td>Physics Lab 2</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1020</td>
<td>Biological Discovery 2</td>
</tr>
<tr>
<td>COM 2223</td>
<td>Scientific and Technical Communications</td>
</tr>
<tr>
<td>MTH 2201</td>
<td>Differential Equations/Linear Algebra</td>
</tr>
<tr>
<td>Year</td>
<td>Fall</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td><strong>PHY 2003</strong> Modern Physics</td>
</tr>
<tr>
<td><strong>Junior Year</strong></td>
<td><strong>PHY 3011</strong> Physical Mechanics</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>PHY 3060</strong> Thermodynamics, Kinetic Theory and Statistical Mechanics**</td>
</tr>
<tr>
<td></td>
<td><strong>Humanities Core Course</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Humanities Elective</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td></td>
<td><strong>BIO 2010</strong> Microbiology</td>
</tr>
<tr>
<td></td>
<td><strong>CHM 2002</strong> Organic Chemistry 2</td>
</tr>
<tr>
<td></td>
<td><strong>PHY 3035</strong> Quantum Mechanics**</td>
</tr>
<tr>
<td></td>
<td><strong>PHY 3440</strong> Electromagnetic Theory</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4039</strong> Astrobiology</td>
</tr>
<tr>
<td></td>
<td><strong>Senior Year</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td></td>
<td><strong>BIO 2110</strong> General Genetics</td>
</tr>
<tr>
<td></td>
<td><strong>CHM 4010</strong> Biochemistry 1</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4010</strong> Astrophysics 1</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4200</strong> Senior Seminar 1 (Q)</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4210</strong> Senior Seminar 2 (Q)</td>
</tr>
<tr>
<td></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td></td>
<td><strong>BIO 4101</strong> Molecular Biology</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4025</strong> Biochemistry 2</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4030</strong> Physics of the Atmosphere or BIO 3701 Evolution</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4035</strong> Comparative Planetology</td>
</tr>
<tr>
<td></td>
<td><strong>SPS 4210</strong> Senior Seminar 2 (Q)</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL CREDITS REQUIRED</strong></td>
</tr>
</tbody>
</table>

* Students will be block registered into Introduction to Space Sciences (SPS 1020). If a student places into Calculus 2 (MTH 1002), the student is encouraged to take Physics 1 (PHY 1001) in the first semester and SPS 1020 later in the program.

** Students may elect to substitute the 8 credit hours from Physical Chemistry 1 and 2 (CHM 3001, CHM 3002), and Organic Chemistry Lab (CHM 2011) for Quantum Mechanics (PHY 3035) and Thermodynamics, Kinetic Theory and Statistical Mechanics (PHY 3060).
New Program Case Statement, Astrobiology.

I. Program Relevance

- How is this program consistent with the mission of Florida Tech?

This Astrobiology major will replace the Space Sciences: Astrobiology degree option with only minor changes. This is in response to several factors, including increasing the marketability and academic competitiveness of the program. This change is consistent with the mission of Florida Tech in that it reinforces the Department of Physics and Space Sciences focus on student success by providing them with a degree program that will make our graduates competitive in a global workforce.

- How is this program consistent with the mission of the department/college?

One mission of the College of Science is to be an international-class center of teaching and research excellence, and this is reflected in our national and world-class Astrobiology faculty. The refreshed Astrobiology program will become a stand-alone degree program (rather than an option). As far as we know, this would be the only undergraduate degree in Astrobiology in the country. Such an update is in-line with the strategic development plan of the department.

II. Program Demand

- Market: What is the local market for this program?

Our proximity to the Kennedy Space Center and institutional ties with NASA and Northrop Grumman create a natural local market for Brevard county and space coast students. The highly publicized ongoing and planned exploration of bodies in our solar system, and the study of planetary bodies in other star systems, is a compelling path to student enrollment in this type of degree program.

What is the national market?

The nature of this degree makes the case for the national market identical to the local market; astronomy and astrophysics research is a national endeavor.

What is the international market?

The nature of this degree makes the case for the international market identical to the national market; astronomy and astrophysics research is a global endeavor.
• **New Students:** How many new full-time/part-time students are expected to enroll in the first year?

We expect to increase enrollment by 20% for new full-time majors in the first year (2015-16).

*How many new domestic and international students are expected to enroll in the first year?*

Domestic: 1.
International: 1.

*What is the enrollment outlook five years from now?*

After the initial 20% increase, we expect to hold a steady state of 10 incoming freshman per year, for a total of 40 undergraduate students in the whole program. This will firmly plant the Florida Tech Astrobiology degree as the go-to program in the country, and perhaps the world.

• **What other universities offer this program? How large (enrollment) are those programs?**

We know of no other undergraduate degrees in Astrobiology. However, the University of Washington offers a graduate degree in this field, and many other places (Cornell, UCLA, UT Austin) are beginning to offer undergraduate courses in the field, and could possibly introduce full-scale programs in the future.

• **Are there current trends of forecasts for interest in this program? If so, what are they and what are your sources of information?**

Due to the increased interest in, for example, the study of extrasolar planets and the manned exploration of Mars, we expect this Astrobiology degree program to create significant interest in the future.

• **Will this program be offered to a “non-traditional” audience (part-time students, evening/weekend classes, distance learning, other)? Please indicate all that apply.**

Part-time.

• **What are the employment opportunities after graduation?**

Governmental research and mission support, i.e., NASA, as well as the private space industry, i.e., SpaceX, Planetary Resources, Blue Horizons, Virgin Galactic.
• If this is an undergraduate program, what are the graduate program opportunities?

There are some graduate program opportunities, including at Florida Tech. The largest of which is at the University of Washington.

• Is an internship part of the program?

No.

III. Academic Requirements/Considerations

• What are the entrance requirements (GPA, SAT, math/science, etc.)?

The same as for all Physics and Space Sciences majors.

• Is the proposed program a substantive change according to SACS?

No. It is a replacement program.

• Is the proposed program in line with departmental/college accreditation?

Yes. It uses the same Assessment Map, PLOs, Measures and Target as for Space Sciences: Astrobiology.

• What impact will the program have on existing programs? For example, will it replace an existing program or complement/compete with another program? Which programs will be affected?

It will replace Space Sciences: Astrobiology, B.S., (7137).

• How will the new program be financially assessed?

In the same manner of Space Sciences: Astrobiology.

• Student-Learning Assessment (see the APAC Policies and Procedures document at www.fit.edu/apac for the required number and type of assessment items. These must be approved by the APAC before the program is reviewed by any curriculum committees.):

    In what courses will the students be assessed for program-level student learning?
1. PHY3011 Physical Mechanics: Final Exam.
2. PHY3060 Thermodynamics, Kinetic Theory and Statistical Mechanics: Final Exam.
3. PHY3440 Electromagnetic Theory: Final Exam.
4. SPS4010 Astrophysics 1: Final Exam.
5. SPS4030 Physics of the Atmosphere: Final Exam.
6. SPS4039 Astrobiology: Final Exam.
7. SPS4200 Senior Seminar 1 (Q): Oral presentation of research and Design Showcase.
8. SPS4210 Senior Seminar 2 (Q): Oral presentation of research and Design Showcase.

• Programmatic Accreditation:

Is programmatic accreditation required or proposed for the program? If so, what are the minimum requirements for accreditation? What is the timetable for achieving accreditation status?

Accreditation not required.

V. Financial Resources/Uses

• Can the program support itself financially (provide detailed estimates)?

Yes. The program will replace the Space Sciences: Astrobiology program for Space Science majors.

• Will there be any assistantships or fellowships available?

The same assistantship and fellowship resources currently available to Space Sciences: Astrobiology students will be provided.

• What new courses (department and/or service) if any, will be required?

None.

• What new faculty (departmental and/or service), if any, will be required?

None.

• Will new support staff be required?

No.

• Will new GSAs or adjuncts be required?
No.

• What new equipment, laboratories or other facilities will be required?
None.

• What new library resources will be required?
None.
Florida Institute of Technology

ADDING A NEW MAJOR OR MINOR TO THE CURRICULUM

Please provide the following information when requesting a new major or minor (program or option) to be added to the curriculum. Only new majors, minors, and options are assigned a new code and print on the diploma. The code will be assigned by the Office of the Registrar and information emailed to all appropriate personnel.

COLLEGE: Science

DEPARTMENT: Physics & Space Sciences

DELIVERY MODE(S): Classroom (on campus, online)

CAMPUS/SITE(S): Main

PROGRAM TO BE ADDED: ☑ Major ☐ Minor ☐ Option for __________________________ (existing degree program)

NOTE: Only Majors, Minors, and Options receive new codes and print on the diploma; use Option for new program name to appear with existing degree name.

☐ Associate of Arts (A.A.) ☐ Master of Arts in Teaching (M.A.T.) ☐ Master of Science in Aviation (M.S.A.)
☐ Associate of Science (A.S.) ☐ Master of Business Administration (M.B.A.) ☐ Educational Specialist (Ed.S.)
☐ Bachelor of Arts (B.A.) ☐ Master of Education (M.Ed.) ☐ Doctor of Philosophy (Ph.D.)
☒ Bachelor of Science (B.S.) ☐ Master of Public Administration (M.P.A.) ☐ Doctor of Psychology (Psy.D.)
☐ Master of Arts (M.A.) ☐ Master of Science (M.S.) ☐ Graduate Certificate

OTHER ADDITIONS TO THE CURRICULUM (NOTE: Only Majors, Minors, and Options receive new codes and print on the diploma; use Concentration or Specialization if the new program represents less than a full degree curriculum)

☐ Concentration or ☐ Specialization for __________________________ (existing degree program)

PROGRAM TITLE: Restricted to 30 characters, including spaces

Astronomy & Astrophysics

TERM TO BE INITIATED: Fall 2015

(3) ADVISOR FOR NEW PROGRAM: Dr. Daniel Batchelder

(Date program to be initiated must be no sooner than the next term for which registration has not begun)

ROUTING APPROVALS: 1) Department head/program chair and college dean approve and sign form. 2) The associate vice president for institutional compliance reviews and signs form. 3) The executive vice president or his designee approves business plan of the program in terms of financial viability and impact on the university mission and signs form. 4) Undergraduate Curriculum Committee or Graduate Council approves academics and signs form. 5) The executive vice president or his designee gives final approval of program, signs form and forwards to Office of the Registrar.

1) Department Head/Program Chair Date 8/6/14

2) Dean or Associate Dean Date 8/6/14

3) Associate Vice President for Instructional Excellence Date 8/6/14

4) Chair, Graduate Council Date OR

5) Chair, Undergraduate Curriculum Committee Date

6) Executive Vice President Date

REGISTRAR’S USE ONLY

FSA ATLAS SOARREP SMAPREF
STYMAAR SOACURR Major Code Assigned
GNTSDAX CIPC Code Operator Initials/Date

Florida Institute of Technology • Office of the Registrar

150 West University Boulevard, Melbourne, FL 32901-6975 • (321) 674-2100 • Fax (321) 674-7827
General Information – ext. 8111, Graduation – ext. 8116, Records and Transcripts – ext. 8117, Registration – ext. 8118

This is not a "new" major, but just a rebranding effort. There will be a new major code, however.
Astronomy and Astrophysics, B.S.

Major Code: 7192  Degree Awarded: Bachelor of Science
Age Restriction: N  Admission Status: undergraduate
Delivery Mode/s: Classroom only  Location/s: main campus.

The undergraduate space sciences program for the astronomy and astrophysics major is designed for students interested in pursuing a broad range of space-related careers, either upon completion of the bachelor’s degree program or after completing graduate studies. Emphasis in the curriculum is on achieving a broad yet rigorous education in the basic physical, mathematical and engineering sciences as a foundation for successful entry into any of the many subfields of modern space science activity. Because basic physics and introductory space sciences courses form a critically important foundation for all advanced coursework in the space sciences program, the minimum grade for satisfying the prerequisite requirements for a space sciences major is a grade of C for each of the following courses: PHY 1001, PHY 2002, PHY 2003, PHY 2091, PHY 2092, SPS 1020.

This program is designed to meet the needs of students intending to pursue graduate education and a career in the astronomical sciences

**Freshman Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASC 1000</td>
<td>1</td>
</tr>
<tr>
<td>CHM 1101</td>
<td>4</td>
</tr>
<tr>
<td>COM 1101</td>
<td>3</td>
</tr>
<tr>
<td>MTH 1001</td>
<td>4</td>
</tr>
<tr>
<td>PHY 1050</td>
<td>1</td>
</tr>
<tr>
<td>SPS 1020</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 1102</td>
<td>4</td>
</tr>
<tr>
<td>COM 1102</td>
<td>3</td>
</tr>
<tr>
<td>MTH 1002</td>
<td>4</td>
</tr>
<tr>
<td>PHY 1001</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2091</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

**Sophomore Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUM 2051</td>
<td>3</td>
</tr>
<tr>
<td>MTH 2001</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2002</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2092</td>
<td>1</td>
</tr>
<tr>
<td>Restricted Elective (CSE 15xx)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 2223</td>
<td>3</td>
</tr>
<tr>
<td>MTH 2201</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2003</td>
<td>3</td>
</tr>
</tbody>
</table>
SPS 2010  Observational Astronomy  
            Humanities Core Course  
            3  
            3  
            16

**Junior Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 3011 Physical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 3060 Thermodynamics, Kinetic Theory and Statistical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>SPS 3020 Methods and Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>Restricted Elective (MTH 3xxx)</td>
<td>3</td>
</tr>
<tr>
<td>Free Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 3210 Introduction to Partial Differential Equations and Applications</td>
<td>3</td>
</tr>
<tr>
<td>PHY 3035 Quantum Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 3440 Electromagnetic Theory</td>
<td>3</td>
</tr>
<tr>
<td>SPS 3030 Orbital Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Humanities Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Senior Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 3161 Fluid Mechanics or OCE 3030 Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 4020 Optics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 4021 Experiments in Optics</td>
<td>1</td>
</tr>
<tr>
<td>SPS 4010 Astrophysics 1</td>
<td>3</td>
</tr>
<tr>
<td>SPS 4200 Senior Seminar 1 (Q)</td>
<td>1</td>
</tr>
<tr>
<td>Restricted Elective (SPS 3xxx or PHY 3xxx or higher)**</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective or Undergraduate Research</td>
<td>3</td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPS 4020 Astrophysics 2</td>
<td>3</td>
</tr>
<tr>
<td>SPS 4025 Introduction to Space Plasma Physics or SPS 4035 Comparative Planetology***</td>
<td>3</td>
</tr>
<tr>
<td>SPS 4110 Senior Lab</td>
<td>2</td>
</tr>
<tr>
<td>SPS 4210 Senior Seminar 2 (Q)</td>
<td>1</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective or Undergraduate Research</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL CREDITS REQUIRED  128

* Students will be block registered into Introduction to Space Sciences (SPS 1020). If a student places into Calculus 2 (MTH 1002), the student is encouraged to take Physics 1 (PHY 1001) in the first semester and SPS 1020 later in the program.

** Suggested classes include, but are not limited to: PHY 3152, PHY 4030, PHY 4033, SPS 3010, SPS 4030, SPS 4035, SPS 4039

*** Courses taught on an alternate-year basis.
New Program Case Statement, Astronomy and Astrophysics.

I. Program Relevance

• How is this program consistent with the mission of Florida Tech?

This Astronomy and Astrophysics major will replace the Space Sciences: Astronomy and Astrophysics degree option with only minor changes. This is in response to several factors, including increasing the marketability and academic rigor of the program. This change is consistent with the mission of Florida Tech in that it reinforces the Department of Physics and Space Sciences focus on student success by providing them with a degree program that will make our graduates competitive in a global workforce.

• How is this program consistent with the mission of the department/college?

One mission of the College of Science is to be an international-class center of teaching and research excellence, and this is reflected in our national and world-class Astronomy and Astrophysics faculty. The refreshed Astronomy and Astrophysics program will become a stand-alone degree program (rather than an option), as is the case at other universities, that is deserved of the fifth largest program of its type in the country, according to the American Institute of Physics (AIP). Such an update is in-line with the strategic development plan of the department.

II. Program Demand

• Market: What is the local market for this program?

Our proximity to the Kennedy Space Center and institutional ties with NASA and Northrop Grumman create a natural local market for Brevard county and space coast students. The highly publicized ongoing and planned exploration of bodies in our solar system, and the study of planetary bodies in other star systems, is a compelling path to student enrollment in this type of degree program.

What is the national market?

The nature of this degree makes the case for the national market identical to the local market; astronomy and astrophysics research is a national endeavor.

What is the international market?

The nature of this degree makes the case for the international market identical to the national market; astronomy and astrophysics research is a global endeavor.
• New Students: How many new full-time/part-time students are expected to enroll in the first year?

We expect to increase enrollment by 5% for new full-time majors in the first year (2015-16).

How many new domestic and international students are expected to enroll in the first year?

Domestic: 4.
International: 1.

What is the enrollment outlook five years from now?

After the initial 5% increase, we expect to hold a steady state of 25 incoming freshman per year, for a total of 100 undergraduate students in the whole program. This could make our Astronomy & Astrophysics program the largest in the country.

• What other universities offer this program? How large (enrollment) are those programs?

According to the AIP, there are four larger programs than ours: UC Berkeley, University of Colorado at Boulder, University of Washington, and Michigan State University. By implementing this update, our ranking in this list could easily pass MSU and could easily compete with the top three, perhaps even top them.

• Are there current trends of forecasts for interest in this program? If so, what are they and what are your sources of information?

Due to the increased interest in, for example, the study of extrasolar planets and the manned exploration of Mars, we expect this Astronomy and Astrophysics degree program to create significant interest in the future.

• Will this program be offered to a “non-traditional” audience (part-time students, evening/weekend classes, distance learning, other)? Please indicate all that apply.

Part-time.

• What are the employment opportunities after graduation?

Governmental research and mission support, i.e., NASA, as well as the private space industry, i.e., Space X, Planetary Resources, Blue Horizons, Virgin Galactic.
• If this is an undergraduate program, what are the graduate program opportunities?

There are a large number of graduate program opportunities, including at Florida Tech. Previous graduates have attended, for example, Notre Dame, Johns Hopkins, MIT, Dartmouth and Yale.

• Is an internship part of the program?

No.

III. Academic Requirements/Considerations

• What are the entrance requirements (GPA, SAT, math/science, etc.)?

The same as for all Physics and Space Sciences majors.

• Is the proposed program a substantive change according to SACS?

No. It is a replacement program.

• Is the proposed program in line with departmental/college accreditation?

Yes. It uses the same Assessment Map, PLOs, Measures and Target as for Space Sciences: Astronomy and Astrophysics.

• What impact will the program have on existing programs? For example, will it replace an existing program or complement/compete with another program? Which programs will be affected?

It will replace Space Sciences: Astronomy and Astrophysics, B.S., (7136).

• How will the new program be financially assessed?

In the same manner of Space Sciences: Astronomy and Astrophysics.

• Student-Learning Assessment (see the APAC Policies and Procedures document at www.fit.edu/apac for the required number and type of assessment items. These must be approved by the APAC before the program is reviewed by any curriculum committees.):

In what courses will the students be assessed for program-level student learning?
1. PHY3011 Physical Mechanics: Final Exam.
2. PHY3060 Thermodynamics, Kinetic Theory and Statistical Mechanics: Final Exam.
3. PHY3440 Electromagnetic Theory: Final Exam.
4. PHY4020 Optics: Final Exam.
5. PHY4021 Optics lab: Final Exam.
6. SPS3010 Geophysics: Final Exam.
7. SPS3030 Orbital Mechanics: Final Exam.
8. SPS4010 Astrophysics 1: Final Exam.
9. SPS4020 Astrophysics 2: Final Exam.
10. SPS4025 Introduction to Space Plasma Physics: Final Exam.
11. SPS4200 Senior Seminar 1 (Q): Oral presentation of research and Design Showcase.
12. SPS4210 Senior Seminar 2 (Q): Oral presentation of research and Design Showcase.

* Programmatic Accreditation:

Is programmatic accreditation required or proposed for the program? If so, what are the minimum requirements for accreditation? What is the timetable for achieving accreditation status?

Accreditation not required.

V. Financial Resources/Uses

* Can the program support itself financially (provide detailed estimates)?

Yes. The program will replace the Space Sciences: Astronomy and Astrophysics option for Space Science majors.

* Will there be any assistantships or fellowships available?

The same assistantship and fellowship resources currently available to Space Sciences: Astronomy and Astrophysics students will be provided.

* What new courses (department and/or service) if any, will be required?

None.

* What new faculty (departmental and/or service), if any, will be required?

None.

* Will new support staff be required?
No.

- *Will new GSAs or adjuncts be required?*

No.

- *What new equipment, laboratories or other facilities will be required?*

None.

- *What new library resources will be required?*

None.
The addition or removal of any restriction or change in credit hours in a course requires that this form, accompanied by any supporting documentation, be completed and approved as indicated below.

**Request Information**

**College:** Science  
**Department:** Physics & Space Sciences

**Request is for change in course**  
**Prefix:** PHY  
**Number:** 1040-  
**Course Title:** Physics & Space Science Seminar

**To be included in** 2014/2015  
**Catalog**  
**Effective term:** Spring 2015  
**Term:**

**Is request for a change in credits for course listed above?**  
☐ Yes  ☒ No  
If yes, current credits ________ requested credits ________

**Is request to change restrictions for course listed above?**  
☒ Yes  ☐ No  
If yes, please check all that apply:

- ☐ Add  ☐ Remove  ☐ Prerequisite  ☐ Corequisite  
  Prefix ________ Number ________  
  and  ☐ or

- ☐ Add  ☐ Remove  ☐ Prerequisite  ☐ Corequisite  
  Prefix ________ Number ________  
  and  ☐ or

- ☐ Add  ☐ Remove  ☐ Prerequisite  ☐ Corequisite  
  Prefix ________ Number ________  
  and  ☐ or

☐ Add  ☐ Remove  ☐ Other Restrictions*  ☐ Yes  ☐ No  
If yes, please list below:

*Other restrictions may include changing the grades applied to the course (PF, S/A, A-F, CEU), majors or class levels restricted from registration, or other restrictions.

Restricted to Physics & Space Science majors only.

Language to be added to the catalog course description: "(Requirement: major in Physics or Space Science)"

---

**Approvals:** Once appropriate department approvals are completed, submit form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for signatures below and forward to Catalog Director.

1)  
**Originator:**  
**Date:** 8/12/14  
**Chair, Graduate Council:**  
**Date:**

2)  
**Department Head/Program Chair:**  
**Date:** 6/17/14  
**OR**

3)  
**Dean or Associate Dean:**  
**Date:** 8/12/14  
**Chair, Undergraduate Curriculum Committee:**  
**Date:**

**Catalog Director’s Use Only**

SCACRSE  
SCADETL  
SCAPREQ  
SCBASE  
SCARRES  
Operator Initials  
Date

**Distribution:**  
Original – Registrar  
Copy – Academic Unit

Florida Institute of Technology • Office of the Registrar  
150 West University Boulevard, Melbourne, FL 32901-6975 • (321) 674-8114 • Fax (321) 674-7827