



To: Jerry Haky, Chair, University Undergraduate Programs Committee

From: Chris Beetle, Chair, Department of Physics Curriculum Committee

Date: 20 January 2016

Re: Revising the Physics Undergraduate Degree Programs

The Department of Physics is proposing to revise our undergraduate degree programs. This proposal responds to recommendations regarding the Department's undergraduate programs from its recent Program Review. The external review committee's report recommends:

- introducing an undergraduate course in computational physics, and making it easy for undergraduate majors to fit it into their degree programs,
- launching an individual faculty mentoring program for undergraduate majors,
- making meaningful research experiences available to all undergraduate majors, and
- finding ways to leverage the Department's Medical Physics Master's degree program in its undergraduate programs.

The Department believes that the first two initiatives can be incorporated into both the Bachelor of Arts and the Bachelor of Science programs. Undergraduate research and advanced or graduate-level work should be reserved for Bachelor of Science candidates.

We now describe specific measures to address the recommendations above.

Computational Physics

Numerical methods and computer-assisted analysis have become essential tools not only in physics, but also in a wide variety of other technical fields. Providing a solid foundation in these areas in our undergraduate programs will benefit students, regardless of their career plans after graduation.

The Department will introduce **Computational Physics (PHZ 3151C, 4c)** as a *required* course for undergraduate students in the Bachelor of Arts and Bachelor of Science programs, where it will be scheduled early in the program. This will allow faculty to take maximum advantage of students' basic computational skills in subsequent courses, thereby helping to develop those skills further. For Bachelor of Science candidates, particularly, this will also broaden the prospects for meaningful participation in research before graduating.

Faculty Mentoring Program

The Department will pair each student majoring in Physics with a faculty mentor from the Department. Students will be expected to meet with their mentors at least once per semester.

The purpose of the mentor-mentee relationship is twofold. First, it will create a structure for a regular conversation with the Department regarding the student's progress toward timely graduation and preparation for subsequent work or graduate study. Second, it will provide useful feedback to the Department's faculty regarding the preparedness of students for its programs and their experience as Physics majors.

As part of this mentoring program, the Department proposes to add two seminar courses to its curricula aimed at creating stronger links between the undergraduate student body and the Physics faculty. These seminars will also help develop study and job skills that cannot be addressed as directly in the content courses that comprise the current curriculum.

First, we propose a **First-Year Physics Seminar (PHY 1090, 1c)** to be taken as early as possible in a physics major's undergraduate career. This course will introduce Department faculty, facilities, and opportunities to engage in research and other Departmental activities later in students' academic careers. It will also introduce the recommended curriculum, the planned schedule of upcoming courses, and help beginning students set goals and targets for their degree programs. Importantly, this course will also help to establish mentoring relationships early on, when students are still satisfying their lower-division degree requirements. Finally, this course may also include some placement testing to identify background topics perhaps in need of remediation.

Second, we propose a **Third-Year Physics Seminar (PHY 3930, 1c)**. B.S. candidates will take this course in the Spring semester when completing the first year of upper-division course work. It will focus on career issues such as preparing to apply to graduate schools, studying for the GRE, or alternately preparing a CV or résumé while searching for jobs, and identifying research opportunities for the coming Summer and senior year.

Research Experiences

The proposals described above already provide the essential scaffolding for broadening student participation in research among our Bachelor of Science candidates. Specifically, introducing computational techniques as widely as possible in the undergraduate curriculum will give students a set of skills that can be brought to bear on a wide variety of research problems. Second, the two seminar courses will help to focus students' attention on the skills they must develop in order to participate in research.

Medical Physics

The Department is also making a separate proposal at this time to introduce a new dual BS/MS degree program leading to a BS in Physics and MS in Medical Physics. The biggest obstacle to

that proposal under the Department's existing BS curriculum is its large number of specific, required courses. The Department therefore proposes to replace two of those required courses with **upper-division electives (3c)** to be chosen by the student, subject to Departmental approval. This measure will also benefit BS candidates who do not plan to pursue the MS in Medical Physics in that they will have somewhat greater flexibility in designing their curriculum to match their own academic interests and professional goals.

The Department will offer one, 3-credit upper-division elective course per semester targeted at fourth-year Physics majors. The specific electives to be taught will be chosen based in part on student input from the **Third-Year Seminar** course. Students may also opt to meet these requirements with graduate-level Physics courses, including courses that may be double-counted toward the MS in Medical Physics in the dual degree program, or with advanced courses from other departments, with prior approval from the Department of Physics.

Mathematics Requirements

This proposal offers a convenient opportunity to make some timely changes to the background mathematics coursework required in the B.S. program. Specifically, the Department proposes:

- to eliminate **Calculus for Engineers I (MAC 2281, 4c)** and **II (MAC 2282, 4c)** as options to fulfill the lower-division calculus requirements. These courses do not appear on the statewide IFP, and will no longer be offered by FAU's Department of Mathematics.
- to replace **Matrix Theory (MAS 2103, 3c)** as a required math course with the student's choice of either **Differential Equations I (MAP 2302, 3c)** or **Engineering Mathematics I (MAP 3305, 3c)**. We will recommend the latter informally to students as its syllabus is slightly more focused on applications. Furthermore, **Matrix Theory (MAS 2103, 3c)** has not covered some topics in linear algebra that our B.S. candidates need, and other Physics departments in the SUS require **Differential Equations I (MAP 2302, 3c)**.
- to increase the credit hours for **Mathematical Physics (PHZ 3113)** from three to four. This will allow the course to cover additional advanced topics in theoretical and mathematical physics, including a review of linear algebra to compensate for the switch from **Matrix Theory (MAS 2103, 3c)**.

Redistribution of Credits

The proposals above call for introducing 1 new lower-division credit and 12 new upper-division credits in the B.S. program. The Department will relax other requirements in order to accommodate these new courses. Specifically, we propose

- to eliminate **General Physics III (PHZ 2106, 4c)**. The material covered in this course in recent years has overlapped considerably with that covered in **Survey of Modern Physics (PHY 3101C, 4c)**. All other topics from the eliminated course can be incorporated effectively on the syllabi for other courses in the curriculum.

- to combine [Thermodynamics \(PHY 3503, 4c\)](#) and [Statistical Mechanics \(PHY 4523, 3c\)](#) in a single course, [Statistical Physics \(PHY 4523, 4c\)](#). This combined course format is common in Physics B.S. programs around Florida and around the country.
- to eliminate [Quantum Mechanics II \(PHY 4605, 3c\)](#) as a *required* course. This course will continue to be offered periodically as an upper-division elective.

These measures will remove 4 lower-division credits and 6 upper-division credits from the B.S. degree program.

Teaching Loads

The net effects of the measures outlined above are as follows. The Department will teach the same number of lower-division courses and two additional upper-division courses annually. However, one of the lower-division lecture courses will be replaced by a one-credit seminar, and one of the new upper-division courses will also be a one-credit seminar. The two new courses are therefore effectively both one-credit seminars. This will impose a minimal added burden on the Department's faculty.

This proposal also results in a net increase of three credits in the B.S. program, which loses three lower-division credits and gaining six upper-division credits. The shift from lower- to upper-division credits results essentially from replacing the [General Physics III \(PHZ 2016, 4c\)](#) with [Computational Physics \(PHY 3151C, 4c\)](#), which we believe is properly an upper-division course. The net increase in credits is due essentially to the two aforementioned one-credit seminar courses and the one additional credit in [Mathematical Physics \(PHZ 4113, 4c\)](#).

The added flexibility provided by the shift from specific to elective courses in the upper division will help to minimize the burden on students created by these changes.

Laboratory Courses

Finally, the Department proposes to require B.S. candidates to take a two-course laboratory sequence consisting of [Undergraduate Laboratory I \(PHY 4802L, 1c\)](#) and [II \(4803L, 1c\)](#), instead of taking the same course, [Undergraduate Laboratory \(PHY 4811L, 1c\)](#), twice.

Summary

The proposed revisions will also necessitate modifications to the Bachelor of Arts, the Minor in Physics, and the Bachelor of Arts in Education offered by the Department of Teaching and Learning in the College of Education. We include several tables below to help illustrate the overall structure of the proposed changes in all programs. Table 1 compares the current and proposed B.S. degree programs. Table 2 shows a 4-year flight plan for the proposed B.S. degree. Tables 3, 4, and 5 compare the current and proposed B.A., B.A.E., and minor programs. Table 6 shows a 5-year flight plan for the B.S./M.S. dual degree program in Medical Physics, which is the subject of a separate proposal.

Current B.S. Program	31:107¢	Proposed B.S. Program	31:110¢
Intellectual Foundations Program	10:32¢	Intellectual Foundations Program	10:32¢
<ul style="list-style-type: none"> • Written Communication 6¢ • Mathematics and Quantitative Reasoning — • Science and the Natural World — • Foundations of Society and Human Behavior 6¢ • Foundations in Global Citizenship 6¢ • Foundations of Creative Expression 6¢ • Foreign Language 8¢ 		<ul style="list-style-type: none"> • Written Communication 6¢ • Mathematics and Quantitative Reasoning — • Science and the Natural World — • Foundations of Society and Human Behavior 6¢ • Foundations in Global Citizenship 6¢ • Foundations of Creative Expression 6¢ • Foreign Language 8¢ 	
Lower Division Mathematics	4:15¢	Lower Division Mathematics	4:15¢
<ul style="list-style-type: none"> • Calculus for Engineers I (MAC 2281) 4¢ or Calculus with Analytic Geometry I (MAC 2311) • Calculus for Engineers II (MAC 2282) 4¢ or Calculus with Analytic Geometry II (MAC 2312) • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Matrix Theory (MAS 2103) 3¢ 		<ul style="list-style-type: none"> • Calculus with Analytic Geometry I (MAC 2311) 4¢ • Calculus with Analytic Geometry II (MAC 2312) 4¢ • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Differential Equations I (MAP 2302) 3¢ or Engineering Mathematics I (MAP 3305) 	
Lower Division Science	5:22¢	Lower Division Science	5:19¢
<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ • General Physics III (PHZ 2106) 4¢ 		<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • First-Year Physics Seminar (PHY 1090) 1¢ • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ 	
Upper Division Physics	12:38¢	Upper Division Physics	14:44¢
<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Electromagnetism II (PHY 4324) 3¢ • Thermodynamics (PHY 3503) 4¢ • Statistical Mechanics (PHY 4523) 3¢ • Quantum Mechanics I (PHY 4604) 4¢ • Quantum Mechanics II (PHY 4605) 3¢ • Physical Electronics (PHY 3722C) 4¢ • Undergraduate Laboratory (PHY 4811L) 2 × 1¢ • Mathematical Physics (PHZ 3113) 3¢ 		<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Electromagnetism II (PHY 3324) 3¢ • Statistical Physics (PHY 4523) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ • Physical Electronics (PHY 3722C) 4¢ • Undergraduate Laboratory I (PHY 4802L) 1¢ • Undergraduate Laboratory II (PHY 4803L) 1¢ • Third-Year Physics Seminar (PHY 3930) 1¢ • Mathematical Physics (PHZ 4113) 4¢ • Computational Physics (PHZ 3151C) 4¢ • Approved Electives 6¢ 	

Table 1: Comparison of current and proposed B.S. degree programs. Changes are shown in bold. (1¢ = 1 credit)

First Year	Second Year	Third Year	Fourth Year
Fall Semester (5:15¢) <ul style="list-style-type: none"> • First-Year Seminar (PHY 1090, 1¢) • Calculus I (MAC 2311, 4¢) • College Writing I (ENC 1101, 3¢) • Foreign Language I (4¢) • IFP (3¢) 	Fall Semester (4:16¢) <ul style="list-style-type: none"> • General Physics II (PHY 2049+L, 5¢) • Calculus III (MAC 2313, 4¢) • Science I with Lab (4¢) • IFP–WAC (3¢) 	Fall Semester (3:12¢) <ul style="list-style-type: none"> • Classical Mechanics (PHY 3221, 4¢) • Electromagnetism I (PHY 3323, 4¢) • Computational Physics (PHZ 3151C, 4¢) 	Fall Semester (3:8¢) <ul style="list-style-type: none"> • Math. Physics (PHZ 4113, 4¢) • Undergrad. Lab. I (PHY 4802L, 1¢) • Physics Elective (3¢)
Spring Semester (4:16¢) <ul style="list-style-type: none"> • General Physics I (PHY 2048+L, 5¢) • Calculus II (MAC 2312, 4¢) • College Writing II (ENC 1102, 3¢) • Foreign Language II (4¢) 	Spring Semester (4:14¢) <ul style="list-style-type: none"> • Modern Physics (PHY 3101C, 4¢) • Engineering Math I (MAP 3305, 3¢) • Science II with Lab (4¢) • IFP–WAC (3¢) 	Spring Semester (4:12¢) <ul style="list-style-type: none"> • Electromagnetism II (PHY 3324, 3¢) • Quantum Mechanics I (PHY 4604, 4¢) • Physical Electronics (PHY 3722C, 4¢) • Third-Year Seminar (PHY 3930, 1¢) 	Spring Semester (3:8¢) <ul style="list-style-type: none"> • Statistical Physics (PHY 4523, 4¢) • Undergrad. Lab. II (PHY 4803L, 1¢) • Physics Elective (3¢) <p style="text-align: center;">B.S. Awarded (10¢ needed)</p>
Summer Term (6¢) <ul style="list-style-type: none"> • IFP (3¢) • IFP (3¢) 	Summer Term (3¢) <ul style="list-style-type: none"> • IFP (3¢) 	Summer Term <ul style="list-style-type: none"> • Research Opportunity 	

Table 2: Recommended 4-year flight plan under the proposed **B.S. degree** program. (1¢ = 1 credit)

Current B.A. Program	24:89¢	Proposed B.A. Program	25:87¢
Intellectual Foundations Program	10:32¢	Intellectual Foundations Program	10:32¢
<ul style="list-style-type: none"> • Written Communication 6¢ • Mathematics and Quantitative Reasoning — • Science and the Natural World — • Foundations of Society and Human Behavior 6¢ • Foundations in Global Citizenship 6¢ • Foundations of Creative Expression 6¢ • Foreign Language 8¢ 		<ul style="list-style-type: none"> • Written Communication 6¢ • Mathematics and Quantitative Reasoning — • Science and the Natural World — • Foundations of Society and Human Behavior 6¢ • Foundations in Global Citizenship 6¢ • Foundations of Creative Expression 6¢ • Foreign Language 8¢ 	
Lower Division Mathematics	4:15¢	Lower Division Mathematics	4:15¢
<ul style="list-style-type: none"> • Calculus for Engineers I (MAC 2281) 4¢ or Calculus with Analytic Geometry I (MAC 2311) • Calculus for Engineers II (MAC 2282) 4¢ or Calculus with Analytic Geometry II (MAC 2312) • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Matrix Theory (MAS 2103) 3¢ 		<ul style="list-style-type: none"> • Calculus with Analytic Geometry I (MAC 2311) 4¢ • Calculus with Analytic Geometry II (MAC 2312) 4¢ • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Differential Equations I (MAP 2302) 3¢ or Engineering Mathematics I (MAP 3305) 	
Lower Division Science	5:22¢	Lower Division Science	5:19¢
<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ • General Physics III (PHZ 2106) 4¢ 		<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • First-Year Physics Seminar (PHY 1090) 1¢ • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ 	
Upper Division Physics	4:16¢	Upper Division Physics	5:17¢
<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ 		<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ • Third-Year Physics Seminar (PHY 3930) 1¢ 	
Upper Division Elective from:	1:4¢	Upper Division Elective from:	1:4¢
<ul style="list-style-type: none"> • Thermodynamics (PHY 3503) 4¢ • Statistical Mechanics (PHY 4523) 3¢ • Physical Electronics (PHY 3722C) 4¢ 		<ul style="list-style-type: none"> • Statistical Physics (PHY 4523) 4¢ • Physical Electronics (PHY 3722C) 4¢ • Computational Physics (PHZ 3151C) 4¢ 	

Table 3: Comparison of current and proposed B.A. degree programs. Changes are shown in bold. (1¢ = 1 credit)

Current B.A.E. Program	13:54¢	Proposed B.A.E. Program	14:54¢
Lower Division Mathematics	3:12¢	Lower Division Mathematics	4:15¢
<ul style="list-style-type: none"> • Calculus for Engineers I (MAC 2281) 4¢ or Calculus with Analytic Geometry I (MAC 2311) • Calculus for Engineers II (MAC 2282) 4¢ or Calculus with Analytic Geometry II (MAC 2312) • Calculus with Analytic Geometry III (MAC 2313) 4¢ 		<ul style="list-style-type: none"> • Calculus with Analytic Geometry I (MAC 2311) 4¢ • Calculus with Analytic Geometry II (MAC 2312) 4¢ • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Differential Equations I (MAP 2302) 3¢ or Engineering Mathematics I (MAP 3305) 	
Lower Division Science	5:22¢	Lower Division Science	5:19¢
<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ • General Physics III (PHZ 2106) 4¢ 		<ul style="list-style-type: none"> • General Chemistry I with Lab (CHM 2045+L) 4¢ or Biological Principles (BSC 1010+L) • General Chemistry II with Lab (CHM 2046+L) 4¢ or Biodiversity with Lab (BSC 1011+L) • First-Year Physics Seminar (PHY 1090) 1¢ • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ 	
Upper Division Physics	3:12¢	Upper Division Physics	3:12¢
<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Physical Electronics (PHY 3722C) 4¢ 		<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Physical Electronics (PHY 3722C) 4¢ 	
Upper Division Electives from:	2:8¢	Upper Division Electives from:	2:8¢
<ul style="list-style-type: none"> • Classical Mechanics (PHY 3221) 4¢ • Thermodynamics (PHY 3503) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ 		<ul style="list-style-type: none"> • Classical Mechanics (PHY 3221) 4¢ • Statistical Physics (PHY 4523) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ • Computational Physics (PHZ 3151C) 4¢ 	

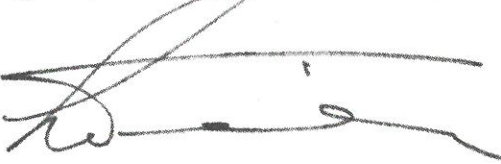
Table 4: Comparison of current and proposed B.A.E. degree programs. Changes are shown in bold. (1¢ = 1 credit)

Current Minor Program	8:34¢	Proposed Minor Program	9:37¢
Lower Division Mathematics	3:12¢	Lower Division Mathematics	4:15¢
<ul style="list-style-type: none"> • Calculus for Engineers I (MAC 2281) 4¢ or Calculus with Analytic Geometry I (MAC 2311) • Calculus for Engineers II (MAC 2282) 4¢ or Calculus with Analytic Geometry II (MAC 2312) • Calculus with Analytic Geometry III (MAC 2313) 4¢ 		<ul style="list-style-type: none"> • Calculus with Analytic Geometry I (MAC 2311) 4¢ • Calculus with Analytic Geometry II (MAC 2312) 4¢ • Calculus with Analytic Geometry III (MAC 2313) 4¢ • Differential Equations I (MAP 2302) 3¢ or Engineering Mathematics I (MAP 3305) 	
Lower Division Physics	3:14¢	Lower Division Science	2:10¢
<ul style="list-style-type: none"> • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ • General Physics III (PHZ 2106) 4¢ 		<ul style="list-style-type: none"> • General Physics I with Lab (PHY 2048+L) 5¢ • General Physics II with Lab (PHY 2049+L) 5¢ 	
Upper Division Physics	1:4¢	Upper Division Physics	1:4¢
<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ 		<ul style="list-style-type: none"> • Survey of Modern Physics (PHY 3101C) 4¢ 	
Upper Division Elective	1:4¢	Upper Division Electives	2:8¢
<ul style="list-style-type: none"> • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Thermodynamics (PHY 3503) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ • Physical Electronics (PHY 3722C) 4¢ 		<ul style="list-style-type: none"> • Classical Mechanics (PHY 3221) 4¢ • Electromagnetism I (PHY 3323) 4¢ • Statistical Physics (PHY 4523) 4¢ • Quantum Mechanics I (PHY 4604) 4¢ • Physical Electronics (PHY 3722C) 4¢ • Computational Physics (PHZ 3151C) 4¢ 	

Table 5: Comparison of current and proposed Physics **Minor** programs. Changes are shown in bold. (1¢ = 1 credit)

First Year	Second Year	Third Year	Fourth Year	Fifth Year
Fall (5:15c) <ul style="list-style-type: none"> • Seminar (PHY 1090, 1c) • Calculus I (MAC 2311, 4c) • Writing I (ENG 1101, 3c) • Language I (4c) • IFP (3c) 	Fall (4:16c) <ul style="list-style-type: none"> • General Phys. II (PHY 2049+L, 5c) • Calculus III (MAC 2313, 4c) • Science I (4c) • IFP-WAC (3c) 	Fall (4:15c) <ul style="list-style-type: none"> • Classical Mech. (PHY 3221, 4c) • E&M I (PHY 3323, 4c) • Comp. Physics (PHZ 3151C, 4c) • Human Morph. (PCB 3703, 3c) 	Fall (3:8c) <ul style="list-style-type: none"> • Math. Physics (PHZ 4113, 4c) • Undergrad. Lab. I (PHY 4802L, 1c) • Radiation Phys. (RAT 6686, 3cc) 	Fall (3:9c) <ul style="list-style-type: none"> • Photon Beam (RAT 6629, 3c) • Nucl. Med. Phys. (RAT 6687, 3c) • Rad. Protection (RAT 6888, 3c)
Spring (4:16c) <ul style="list-style-type: none"> • General Phys. I (PHY 2048+L, 5c) • Calculus II (MAC 2312, 4c) • Writing II (ENG 1102, 3c) • Language II (4c) 	Spring (4:14c) <ul style="list-style-type: none"> • Modern Phys. (PHY 3101C, 4c) • Eng. Math. I (MAP 3305, 3c) • Science II (4c) • IFP-WAC (3c) 	Spring (5:15c) <ul style="list-style-type: none"> • E&M II (PHY 3324, 3c) • Quantum Mech. I (PHY 4604, 4c) • Electronics (PHY 3722C, 4c) • Seminar (PHY 3930, 1c) • Radiation Bio. (BSC 6834, 3cc) 	Spring (3:8c) <ul style="list-style-type: none"> • Statistical Physics (PHY 4523, 4c) • Undergrad. Lab. II (PHY 4803L, 1c) • Rad. Therapy (RAT 6628, 3cc) <p>B.S. Awarded (1c needed)</p>	Spring (3:9c) <ul style="list-style-type: none"> • Med. Img. Phys. (RAT 6616, 3c) • Thesis (RAT 6975, 3c) • Elective (3c)
Summer (6c) <ul style="list-style-type: none"> • IFP (3c) • IFP (3c) 	Summer (3c) <ul style="list-style-type: none"> • IFP (3c) 	Summer (1:3c) <ul style="list-style-type: none"> • Shield. & Comm. (RAT 6376, 3cc) 	Summer (3:7c) <ul style="list-style-type: none"> • Seminar (RAT 6932, 1c) • Practicum (RAT 6947, 3c) • Research (PHY 6918, 3c) 	Summer (1:4c) <ul style="list-style-type: none"> • Thesis (RAT 6975, 4c) <p>M.S. Awarded</p>

Table 6: Proposed Medical Physics BS/MS degree. (1c = 1 credit, 1cc = 1 double-counted credit)

Approved by:  Date: _____
 Department Chair: _____
 College Curriculum Chair: J E Phy 1/29/16
 College Dean: OB Johan 1/29/16
 UUPC Chair: J E Phy 1/29/16
 Undergraduate Studies Dean: Ed Ebratt 2/2/16
 UFS President: _____
 Provost: _____