

Cover Sheet: Request 13849

Physics BS Specialization in Medical Physics

Info

Process	Specialization New/Modify/Close Ugrad
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Selman Hershfield selman@phys.ufl.edu
Created	4/12/2019 12:38:53 PM
Updated	11/11/2019 12:43:40 PM
Description of request	This is a request to create a specialization for the Physics BS degree in Medical Physics with the goal of increasing opportunities for graduate school and jobs for UF Physics majors. The course work for this new specialization consists of all courses in the present Physics BS degree including a specific choice of Physics Electives, plus three additional elective courses outside of Physics. This is on of three applied physics specializations being proposed simultaneously: Medical Physics, Nanoscience, and Optics.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Physics 011616003	J Ingersent		4/22/2019
ConsultMedicalPhysics.pdf					4/12/2019
CommentConsultsMP.pdf					4/12/2019
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		10/14/2019
No document changes					
Associate Provost for Undergraduate Affairs	Approved	PV - Associate Provost for Undergraduate Affairs	Casey Griffith		10/15/2019
No document changes					
University Curriculum Committee	Commented	PV - University Curriculum Committee (UCC)	Lee Morrison	Added to the November agenda. If approved, this will go into effect for the Summer B 2020 term with the publication of the 2020-2021 undergraduate catalog.	11/4/2019
CatalogCopyMedicalPhysicswTracking.docx					10/29/2019
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			11/4/2019
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Specialization|New for request 13849

Info

Request: Physics BS Specialization in Medical Physics

Description of request: This is a request to create a specialization for the Physics BS degree in Medical Physics with the goal of increasing opportunities for graduate school and jobs for UF Physics majors. The course work for this new specialization consists of all courses in the present Physics BS degree including a specific choice of Physics Electives, plus three additional elective courses outside of Physics. This is one of three applied physics specializations being proposed simultaneously: Medical Physics, Nanoscience, and Optics.

Submitter: Selman Hershfield selman@phys.ufl.edu

Created: 4/12/2019 12:26:08 PM

Form version: 1

Responses

Degree Program Physics

CIP Code 40.0801

Major Name Physics

Major Code PS

Degree Type BS

Existing Specializations None, although this is one of three specializations being submitted simultaneously.

Name of Proposed Specialization Medical Physics

Code(s) MP

Credits 120

Students 9 (3 per year)

Effective Term Earliest Available

Effective Year Earliest Available

Percentage of Credits Available Fully Online <50%

Percentage of Credits Available Off-Campus <25%

Rationale for Proposed Specialization This is one of three specializations being proposed for the BS degree in Physics to enhance the opportunities for Physics majors for both applying to graduate schools and employment after graduating. Increasingly students are going to college not just to study a field that they are interested in, but also to open up career paths. Discussions with our Physics majors show that there is interest in applied physics specializations for precisely this reason.

Many of our Physics majors finish most of the required Physics courses in three years. This leaves room for additional courses. Thus, many of our Physics majors are double majors with the most popular options being Mathematics and Astronomy. This was not always the case, but we now find that most students in our major come to UF having already taken some Calculus and Physics in high school. The applied physics specializations provide another option for students that may be particularly attractive because only about one third of Physics majors actually go on to graduate school in Physics. The most common options for those not continuing on in Physics are to go to graduate school in a related field like engineering or in our present job market enter the workforce.

The Medical Science specialization is also consistent with both what our students have done in the past and a new hiring initiative in biophysics. Every year we seem to have at least one of our graduating students go on to a graduate program in Medical Physics. The Physics department presently has searches to hire 4 assistant professors with a specialization in biophysics.

Most of the schools in our peer group of top 10 public universities have some form of applied physics degree which is similar to what we are proposing. The proposed specializations consists of all the courses in our present Physics BS degree plus a specific set of a electives based on specializations in Nanoscience, Optics, or Medical Physics. This is a brief survey of what other top 10 public universities are doing. Keep in mind that each school has a different title for these degrees, concentrations, or specializations, but when you look at the course work it is consistent with what we are doing.

* The University of California, Berkeley has an Engineering Physics degree which closely tracks our Nanoscience option.

* The University of Michigan has an undergraduate Engineering Physics degree, which follows the model proposed here of the Physics major curriculum plus select electives outside the Physics department.

* The University of North Carolina has an entire Applied Sciences degree program which will start awarding degrees in 2023.

* The University of California at Irvine offers an Applied Physics degree with a specialization in Engineering Physics.

* Georgia Tech. offers an Applied Physics degree, but does not spell out specific electives.

* William and Mary has an Engineering Physics and Applied Design degree, which just started this past year.

* The University of California, Davis offers an Applied Physics degree with specializations in computation, physical electronics, geophysics, materials, and oceanography.

Finally, we note that our Applied Physics degree is not the same as an engineering degree. Students receiving an Applied Physics degree will have all the background in fundamental physics of the regular Physics BS degree plus a few more applied courses to help them in their future career. An engineering degree will have fewer fundamental Physics courses, but many more applied courses.

Most of the schools in our peer group of top 10 public universities have some form of applied physics specialization which is similar to what we are proposing. The nanoscience specialization proposed here consists of all the courses in our present Physics BS degree plus a specific set of a electives described below. Below is a brief survey of what other top 10 public universities are doing relating to applied physics specializations and degrees. Keep in mind that each school has slightly different terminology for these degrees, but when you look at the course options, they are quite similar to our specialization proposals.

* The University of California, Berkeley has an Engineering Physics degree which closely tracks our Nanoscience option.

* The University of Michigan has an undergraduate Engineering Physics degree, which follows the model proposed here of the Physics major curriculum plus select electives outside the Physics department.

* The University of North Carolina has an entire Applied Sciences degree program which will start awarding degrees in 2023.

* The University of California at Irvine offers an Applied Physics degree with a specialization in Engineering Physics.

* Georgia Tech. offers an Applied Physics degree, but does not spell out specific electives.

* William and Mary has an Engineering Physics and Applied Design degree, which just started this past year.

* The University of California, Davis offers an Applied Physics degree with specializations in computation, physical electronics, geophysics, materials, and oceanography.

Finally, we note that this specialization within the Physics BS major is not the same as an engineering degree. Students receiving a Physics BS degree with this specialization will have all the background in fundamental physics of the regular Physics BS degree plus a few more applied courses to help them in their future career. An engineering degree will have fewer fundamental Physics courses, but many more applied courses.

Impacts on Other Programs The number of undergraduate Physics majors graduating per year is 35-40. We expect that approximately 3 of these students will opt for the specialization in Medical Physics.

Physics Bachelor of Science Specialization in Medical Physics

The Physics B.S specialization in Medical Physics requires a minimum of 41 credits in Physics including a specific Physics elective, 3 specific courses outside of Physics (9-11 credits), and 28 other credits of related coursework. Minimum grades of C are required for coursework counted toward the major. The coursework is listed below in three different categories: Physics Required Coursework, Required Electives for the Medical Physics specialization, and Related Coursework required for all Physics B.S. degrees.

[Back to Top](#) .

Required Coursework

Highlighted courses are for the Medical Physics specialization.

PHY 2048 Physics with Calculus 1 or

60 Enriched Physics with Calculus 1 (3 credits)

PHY 2048L Physics with Calculus 1 Laboratory (1 credit)

PHY 2049 Physics with Calculus 2 or

61 Enriched Physics with Calculus 2 (3 credits)

PHY 2049L Physics with Calculus 2 Laboratory (1 credit)

PHY 3101 Introduction to Modern Physics or

63 Enriched Modern Physics (3 credits)

PHY 3221 Mechanics 1 or

13 Introduction to Theoretical Physics (3 credits)

PHY 3323 Electromagnetism 1 (3 credits)

PHY 3513 Thermal Physics 1 (3 credits)

PHY 4222 Mechanics 2 (3 credits)

PHY 4324 Electromagnetism 1 (3 credits)

PHY 4523 Statistical Physics (3 credits)

PHY 4604 Introductory Quantum Mechanics 1 (3 credits)

PHY 4802L Laboratory Physics 1 (3 credits)

PHY 4803L Laboratory Physics 2 (3 credits)

Physics elective (3 credits):

710 Introduction to Biological Physics for Medical Physics specialization

Required Course Outside of Physics – Medical Physics Specialization

APK 2100C - Applied Human Anatomy with Lab (4 credits)

ENU 4612 – Nuclear Radiation Detection and Instrumentation (3 credits)

MAP 4413 - Fourier Analysis (3 credits)

[Back to Top](#)

Related Coursework

Three semesters of Calculus (MAC 2311, MAC 2312, MAC 2313; 12 credits)

One year of college-level general chemistry, including one chemistry laboratory course (CHM 2045 and CHM 2046, CHM 2045L; 7 credits)

Differential Equations MAP 2302 (3 credits)

Six credits minimum in approved math courses beyond MAP 2302 Differential Equations.

Certain computer science courses may substitute for one of the math electives.

Minimum grades of C for coursework counted toward the major

[Back to Top](#)

Recommended Semester Plan

This plan is structured for students taking Calculus 1 the first semester. Students can have different schedules when they enter UF because of their backgrounds. In particular, students are encouraged to take Physics with Calculus 1 (PHY 2048 or PHY 2060) as soon as they have completed Calculus 1, even if this means delaying chemistry. For all physics courses, adequate mathematical preparation is essential and is built into the suggested plans. Physics majors should meet with a department advisor before planning their schedules.

Additional [sample schedules](#) are available from the department and students can email advisors at advising@phys.ufl.edu

Original file: CatalogCopyMedicalPhysicswTracking.docx

Students are expected to complete the writing requirement while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) and diversity (GE-D) requirements concurrently with another general education requirement (typically, GE-C, H or S).

Medical Physics specialization

CHM 2045 and 2045L General Chemistry 1 (3) and General Chemistry 1 Laboratory (1) (State Core GE-P)
MAC 2311 Analytic Geometry and Calculus 1 (State Core GE-M)
Composition (State Core GE-C) (WR)
Social and Behavioral Sciences (State Core GE-S)
CHM 2046 General Chemistry 2 (GE-P)
IDS 1161 What is the Good Life (GE-H)
MAC 2312 Analytic Geometry and Calculus 2 (GE-M)
PHY 2048 Physics with Calculus 1 or
†PHY 2060 Enriched Physics with Calculus 1 (GE-P)
PHY 2048L Physics with Calculus 1 Laboratory (GE-P)
Elective
MAC 2313 Analytic Geometry and Calculus 3 (GE-M)
PHY 2049 Physics with Calculus 2 or
†PHY 2061 Enriched Physics with Calculus 2 (GE-P)
PHY 2049L Physics with Calculus 2 Laboratory (GE-P)
Biological Science (GE-B)
Foreign language
MAP 2302 Elementary Differential Equations (GE-M)
PHY 3101 Introduction to Modern Physics (GE-P)
Biological Science (GE-B)
PHY 3221 Mechanics 1 (GE-P)
Foreign language
PHY 3323 Electromagnetism 1 (GE-P)
PHY 3513 Thermal Physics 1 (GE-P)
PHY 4222 Mechanics 2
Elective (or foreign language if 4-3-3 option)
Social and Behavioral Sciences (GE-S)
PHY 4324 Electromagnetism 2 (GE-P)
APK 2100C Applied Human Anatomy with Lab
Composition (ENC 3254 Professional Writing in the Discipline recommended; GE-C, WR)
Humanities (GE-H)
Mathematics elective

PHY 4604 Introductory Quantum Mechanics 1 (GE-P)
PHY 4802L Laboratory Physics 1
ENU 4612 – Nuclear Radiation Detection and Instrumentation
Social and Behavioral Sciences (GE-S)
Mathematics elective
PHY 4523 Statistical Physics
PHY 4803L Laboratory Physics 2
PHZ 4710 Introduction to Biological Physics
MAP 4413 Fourier Analysis
Humanities (State Core GE-H)



Critical Tracking

The following is the new 8 semester tracking plan for the Physics BS degree with the additional tracking requirements for the Medical Physics specialization highlighted.

Semester 1

- Complete [CHM 1025](#) or [CHM 2045](#) ; or [PHY 2048](#) or [PHY 2060](#) ; and a MAC course with C or better
- 2.0 UF GPA required

Semester 2

- Complete [CHM 2045](#) / [CHM 2045L](#) and [MAC 2311](#) with C or better
- 2.0 UF GPA required

Semester 3

- Complete [CHM 2046](#) , [MAC 2312](#) , and [PHY 2048](#) or [PHY 2060](#) with C or better
- 2.0 UF GPA required

Semester 4

- Complete [MAC 2313](#) ; and [PHY 2049](#) or [PHY 2061](#) with C or better
- 2.5 critical-tracking GPA
- 2.0 UF GPA required

Semester 5

- Complete MAP 2302 with C or better (critical tracking)
- 2.5 critical-tracking GPA required
- Complete two 3000-level physics courses required for Physics Majors with C or better (upper division tracking).
- 2.0 UF GPA required

Semester 6

- Complete the remaining 3000-level physics courses required for Physics Majors with C or better.
- Complete one of four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

Semester 7

- Complete PHY4802L or PHY4803L
- Complete two 4000-level physics courses required for Physics Majors with C or better in addition to PHY4802L.
- Complete two of four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

Semester 8

- Complete the remaining 4000-level physics courses required for Physics Majors with C or better.
- Complete one 4000-level or higher Physics Elective with C or better.
- Complete all four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

Physics Bachelor of Science Specialization in Medical Physics

The Physics B.S specialization in Medical Physics requires a minimum of 41 credits in Physics including a specific Physics elective, 3 specific courses outside of Physics (9-11 credits), and 28 other credits of related coursework. Minimum grades of C are required for coursework counted toward the major. The coursework is listed below in three different categories: Physics Required Coursework, Required Electives for the Medical Physics specialization, and Related Coursework required for all Physics B.S. degrees.

Required Coursework

Highlighted courses are for the Medical Physics specialization.

PHY 2048 Physics with Calculus 1 or

60 Enriched Physics with Calculus 1 (3 credits)

PHY 2048L Physics with Calculus 1 Laboratory (1 credit)

PHY 2049 Physics with Calculus 2 or

61 Enriched Physics with Calculus 2 (3 credits)

PHY 2049L Physics with Calculus 2 Laboratory (1 credit)

PHY 3101 Introduction to Modern Physics or

63 Enriched Modern Physics (3 credits)

PHY 3221 Mechanics 1 or

13 Introduction to Theoretical Physics (3 credits)

PHY 3323 Electromagnetism 1 (3 credits)

PHY 3513 Thermal Physics 1 (3 credits)

PHY 4222 Mechanics 2 (3 credits)

PHY 4324 Electromagnetism 1 (3 credits)

PHY 4523 Statistical Physics (3 credits)

PHY 4604 Introductory Quantum Mechanics 1 (3 credits)

PHY 4802L Laboratory Physics 1 (3 credits)

PHY 4803L Laboratory Physics 2 (3 credits)

Physics elective (3 credits):

710 Introduction to Biological Physics for Medical Physics specialization

Required Course Outside of Physics – Medical Physics Specialization

APK 2100C - Applied Human Anatomy with Lab (4 credits)

ENU 4612 – Nuclear Radiation Detection and Instrumentation (3 credits)

MAP 4413 - Fourier Analysis (3 credits)

Related Coursework

Three semesters of Calculus (MAC 2311, MAC 2312, MAC 2313; 12 credits)

One year of college-level general chemistry, including one chemistry laboratory course (CHM 2045 and CHM 2046, CHM 2045L; 7 credits)

Differential Equations MAP 2302 (3 credits)

Six credits minimum in approved math courses beyond MAP 2302 Differential Equations.

Certain computer science courses may substitute for one of the math electives.

Minimum grades of C for coursework counted toward the major

Recommended Semester Plan

This plan is structured for students taking Calculus 1 the first semester. Students can have different schedules when they enter UF because of their backgrounds. In particular, students are encouraged to take Physics with Calculus 1 (PHY 2048 or PHY 2060) as soon as they have completed Calculus 1, even if this means delaying chemistry. For all physics courses, adequate mathematical preparation is essential and is built into the suggested plans. Physics majors should meet with a department advisor before planning their schedules.

Additional [sample schedules](#) are available from the department and students can email advisors at advising@phys.ufl.edu.

Students are expected to complete the writing requirement while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) and diversity (GE-D) requirements concurrently with another general education requirement (typically, GE-C, H or S).

Medical Physics specialization

CHM 2045 and 2045L General Chemistry 1 (3) and General Chemistry 1 Laboratory (1) (Critical Tracking ; State Core Ge. Ed. P Sciences)
MAC 2311 Analytic Geometry and Calculus 1 (Critical Tracking ; State Core Gen. Ed. Mathematics)
State Core Gen Ed. Composition; Writing Requirement
State Core Social and Behavioral Sciences
CHM 2046 General Chemistry 2 (Critical Tracking ; Gen. Ed. Physical Sciences)
IDS 1161 What is the Good Life (Gen. Ed. Humanities)
MAC 2312 Analytic Geometry and Calculus 2 (Critical Tracking ; Gen. Ed. Mathematics)
PHY 2048 Physics with Calculus 1 or
†PHY 2060 Enriched Physics with Calculus 1 (Critical Tracking ; Gen. Ed. Physical Sciences)
PHY 2048L Physics with Calculus 1 Laboratory (Critical Tracking ; Gen. Ed. Physical Sciences)
Elective
MAC 2313 Analytic Geometry and Calculus 3 (Critical Tracking ; Gen. Ed. Mathematics)
PHY 2049 Physics with Calculus 2 or
†PHY 2061 Enriched Physics with Calculus 2 (Critical Tracking ; Gen. Ed. Physical Sciences)
PHY 2049L Physics with Calculus 2 Laboratory (Critical Tracking ; Gen. Ed. Physical Sciences)
Gen. Ed. Biological Sciences
Foreign language course
MAP 2302 Elementary Differential Equations (Critical Tracking ; Gen. Ed. Mathematics)
PHY 3101 Introduction to Modern Physics (Critical Tracking ; Gen. Ed. Physical Sciences)
Gen. Ed. Biological Sciences
PHY 3221 Mechanics 1 (Critical Tracking ; Gen. Ed. Physical Sciences)
Foreign language course
PHY 3323 Electromagnetism 1 (Critical Tracking ; Gen. Ed. Physical Sciences)
PHY 3513 Thermal Physics 1 (Critical Tracking ; Gen. Ed. Physical Sciences)
PHY 4222 Mechanics 2 (Critical Tracking)
Elective or foreign language if 4-3-3 option
Gen. Ed. Social and Behavioral Sciences
PHY 4324 Electromagnetism 2 (Critical Tracking)
APK 2100C Applied Human Anatomy with Lab (Critical Tracking)
Composition (ENC 3254 Professional Writing in the Discipline recommended; Gen. Ed. Composition; Writing Requirement)
State Core Gen. Ed. Humanities
Mathematics elective

PHY 4604 Introductory Quantum Mechanics 1 (Critical Tracking)
PHY 4802L Laboratory Physics 1 (Critical Tracking)
ENU 4612 – Nuclear Radiation Detection and Instrumentation (Critical Tracking)
Gen. Ed. Social and Behavioral Sciences
Mathematics elective
PHY 4523 Statistical Physics (Critical Tracking)
PHY 4803L Laboratory Physics 2 (Critical Tracking)
PHZ 4710 Introduction to Biological Physics (Critical Tracking)
MAP 4413 Fourier Analysis (Critical Tracking)
Gen. Ed. Humanities



Critical Tracking

.....
 The following is the new 8 semester tracking plan for the Physics BS degree with the additional tracking requirements for the Medical Physics specialization highlighted.

Semester 1

- Complete [CHM 1025](#) or [CHM 2045](#) ; or [PHY 2048](#) or [PHY 2060](#) ; and a MAC course with C or better
- 2.0 UF GPA required

Semester 2

- Complete [CHM 2045](#) / [CHM 2045L](#) and [MAC 2311](#) with C or better
- 2.0 UF GPA required

Semester 3

- Complete [CHM 2046](#) , [MAC 2312](#) , and [PHY 2048](#) or [PHY 2060](#) with C or better
- 2.0 UF GPA required

Semester 4

- Complete [MAC 2313](#) ; and [PHY 2049](#) or [PHY 2061](#) with C or better
- 2.5 critical-tracking GPA
- 2.0 UF GPA required

Semester 5

- Complete MAP 2302 with C or better (critical tracking)
- 2.5 critical-tracking GPA required
- Complete two 3000-level physics courses required for Physics Majors with C or better (upper division tracking).
- 2.0 UF GPA required

Semester 6

- Complete the remaining 3000-level physics courses required for Physics Majors with C or better.
- Complete one of four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

Semester 7

- Complete PHY4802L or PHY4803L
- Complete two 4000-level physics courses required for Physics Majors with C or better in addition to PHY4802L.
- Complete two of four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

Semester 8

- Complete the remaining 4000-level physics courses required for Physics Majors with C or better.
- Complete one 4000-level or higher Physics Elective with C or better.
- Complete all four courses required for the Medical Physics specialization.
- 2.0 UF GPA required

External Consults

We have done external consults with those departments that overlap most strongly with the proposed Physics BS specialization in Medical Physics: Biomedical Engineering and Nuclear Engineering.

They were supportive of this specialization, and they have also made specific recommendations for courses. Both Biomedical Engineering and Nuclear Engineering suggested that we replace ENU 4605 with ENU 4612 in our Medical Physics specialization. We have done that.

External Consultation Results (departments with potential overlap or interest in proposed course, if any)

Department	Name and Title
_____	_____
Phone Number	E-mail
_____	_____
Comments	

Department	Name and Title
_____	_____
Phone Number	E-mail
_____	_____
Comments	

Department	Name and Title
_____	_____
Phone Number	E-mail
_____	_____
Comments	