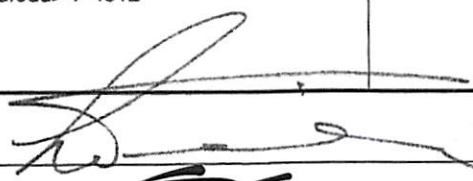

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>NEW/CHANGE PROGRAM REQUEST</b> <b>Graduate Programs</b>	UGPC Approval _____ UFS Approval _____ Banner Posted _____ Catalog _____
	<b>Department</b> Physics <b>College</b> Charles E. Schmidt College of Science	
<b>Program Name</b> M.S. in Physics and Ph.D. in Physics	<input type="checkbox"/> New Program <input checked="" type="checkbox"/> Change Program	<b>Effective Date (TERM &amp; YEAR)</b> Fall 2019
<b>Please explain the requested change(s) and offer rationale below or on an attachment</b> <p>We propose to reduce the credits in two introductory courses in the M.S. program from 4 to 3 so that students can carry a full load of three 3-credit courses during the first year of graduate study without exceeding the allowance of the standard tuition waiver. We will increase the required thesis credits, in the thesis variant, or elective credits, in the non-thesis variant, to maintain the current total credits in the program.</p> <p>We also propose to allow students to choose between two Mathematical Physics courses, rather than the lone course currently required for all students, based on their intended research area.</p> <p>The Physics Ph.D. program subsumes the requirements of the M.S. program. The change to the M.S. will therefore affect the Ph.D. as well.</p> <p>This proposal also includes a number of minor corrections and clarifications to the catalog entry for both programs.</p> <p>Please see the supporting memo and catalog entry for further details.</p>		
<b>Faculty Contact/Email/Phone</b> Chris Beetle <cbeetle@fau.edu> 7-4612	<b>Consult and list departments that may be affected by the change(s) and attach documentation</b>	
<b>Approved by</b> Department Chair _____ College Curriculum Chair _____ College Dean _____ UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	  Bob Stackman 2019.03.12 09:30:34 -05'00'	<b>Date</b> 3/12/19 3/12/19

Email this form and attachments to [UGPC@fau.edu](mailto:UGPC@fau.edu) one week before the UGPC meeting so that materials may be viewed on the UGPC website prior to the meeting.

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**MAR 12 2019**

Received



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## MEMORANDUM

TO: University Faculty Senate Graduate Programs Committee

FROM: Chris Beetle (Chair, Curriculum Committee, Department of Physics)

SUBJECT: Modifications to the M.S. and Ph.D. Programs in the Department of Physics

DATE: March 7, 2019

The Department of Physics proposes a package of changes to its Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degree programs. The most important of these changes are as follows:

1. Change the courses Electromagnetism (PHY 6346) and Statistical Mechanics (PHY 6536), which are required in the M.S. curriculum, to be 3-credit courses instead of 4-credit courses. This will allow our first-year graduate students to take a full load of three 3-credit courses in each of their first two semesters without exceeding the 9-credit limit of the standard tuition waiver or deferring one or more courses to their second year. This will help accelerate time to graduation.
2. Allow students to choose between Mathematical Physics 1 (PHZ 5115) and Mathematical Physics 2 (PHZ 5116) as a required elective in the M.S. curriculum, rather than require Mathematical Physics (PHZ 5115) for all students. Despite the sequential numbering, these courses are entirely independent of one another. This will allow students greater flexibility in choosing topics to study based on their research interests. In addition, some students may opt to take both courses, with the second counted as a general elective in their plan of study.
3. Add two required credits of general electives to the non-thesis variant of the M.S. program, and two required credits of Master's Thesis (PHY 6971) to the thesis variant, to achieve no net change in total credits for either M.S. variant.
4. Modify the FAU Catalog descriptions of the Qualifying Exams and Supervisory Committees for the Ph.D. program to reflect current policy and practice within the Department.

We present the proposed changes to these two programs together because the Ph.D. program explicitly makes all degree requirements for the M.S. part of the its curriculum.

Please find a revised catalog entry attached, with ~~removed or replaced~~ blocks of text grayed out and struck through, and the most **significant additions or changes** highlighted in yellow. A slate of related proposals to change individual courses in various ways accompany this proposal.

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# Physics

## Faculty:

Wille, L. T., Chair; Beetle, C.; Chen, D.; Engle, J. S.; Fuchs, A.; Gross, R.; Han, M.; Hotiu, A.; Kreymerman, G.; Lau, A. W. C.; Leventouri, T.; Miller, W. A.; Qiu, S. L.; Sarajedini, A.; Sarajedini, V.; Sorge, K. D.; Tichy, W.;

## Faculty Emeritus:

Bruenn, S. W.; Dean, N.; Faulkner, J. S.; Jordan, R. G.; McGuire, J.; Medina, F.

## Faculty:

Wille, L. T., Chair; Beetle, C.; Chen, D.; Fuchs, A.; Gross, R.; Lau, A. W. C.; Leventouri, T.; Martinez, L.; Miller, W. A.; Qiu, S. L.; Sorge, K. D.; Tichy, W.;

## Faculty Emeritus:

Bruenn, S. W.; Faulkner, J. S.; Jordan, R. G.; Lamborn, B. N. A.; McGuire, J.

The Department of Physics offers undergraduate programs leading to the Bachelor of Arts (B.A.) and Bachelor of Science (B.S.) degrees. It also offers an Honors program and a Minor in Physics at the undergraduate level. The Department offers graduate programs leading to Master of Science (M.S.), Professional Science Master (P.S.M.) in Medical Physics, Master of Science in Teaching (M.S.T.), and Doctor of Philosophy (Ph.D.) degrees. It also offers a dual-degree program leading to both the B.S. and P.S.M. in Medical Physics on an accelerated schedule requiring only one year of additional study beyond the B.S.

~~The Department of Physics offers undergraduate programs leading to the Bachelor of Arts (B.A.) and Bachelor of Science (B.S.) degrees. An Honors Program and a minor in Physics are also available. A combined program merges the B. S. degree with the Professional Science Master degree (P.S.M.). The department's graduate programs lead to the Master of Science (M.S.), Professional Science Master (P.S.M.) in Medical Physics, Master of Science in Teaching (M.S.T.) and Doctor of Philosophy (Ph.D.) degrees.~~

The Department of Teaching and Learning in the College of Education also offers specialized programs leading to the Bachelor of Arts (B.A.) or Bachelor of Arts in Education (B.A.E.) degrees in Secondary Education with a focus of Physics (6-12) Education. The physics content-area courses required for these degrees are offered through the Department of Physics, and the content-area requirements in both physics and mathematics courses are outlined below. Please contact the Department of Teaching and Learning with questions or to enroll in these degree programs.

~~Another program that is partially described below leads to a specialized Bachelor of Arts (B.A.), Bachelor of Science (B.S.) or Bachelor of Science in Education (B.S.E.) degree and to State of Florida certification for prospective secondary physics teachers. However, this program is offered through the Department of Teaching and Learning in the College of Education. The discussion below is limited to its required physics and mathematics components.~~

...

## Master's Programs

### Master of Science with Major in Physics

The Department of Physics offers the Master of Science (M.S.) degree with major in Physics. This degree should be particularly attractive to those intending to seek jobs in industry or in teaching at the secondary or community college levels. The coursework and research experience provided by the M.S. program will also be of value to students whose eventual goal is a Ph.D., though students interested in pursuing a Ph.D.

within the Department are strongly encouraged to enroll directly into the Ph.D. program if possible. The M.S. in Physics normally requires four semesters of study beyond the B.S. in Physics, or equivalent.

~~The Physics Department offers the Master of Science (M.S.) degree with major in Physics. The degree should be particularly attractive to those whose career paths point to a job in industry or to teaching at the high school or community college level. The coursework and research experience provided by the Master of Science program will also be of value to students whose eventual goal is a Ph.D., although those students are encouraged to enroll directly into the Ph.D. program if possible. The Master of Science degree normally requires four or more semesters after completing the Bachelor of Science requirements.~~

### Admission Requirements

In addition to meeting all of the University and College admission requirements for graduate study, applicants for the M.S. in Physics must meet all of the following the Departmental requirements:

~~In addition to meeting all of the University and College admission requirements for graduate study, applicants for the Master of Science degree must meet all of the following the departmental requirements:~~

1. A B.S. degree in Physics;
2. A recent (within the past five years) score in the GRE Physics Test (Although scores will affect admissions decisions, the Department sets no minimum required score for admission.);
- ~~2. Have taken the physics portion of the GRE. No minimum score is required. (GRE scores more than five years old will not be accepted);~~
3. A 3.0 average or higher for the last 60 credits of undergraduate work;
4. Approval from the Department of Physics; and
5. For any student from a non-English-speaking country, a minimum score of 550 (CBT-213) on the TOEFL exam.

### Degree Requirements

This M.S. degree comes in two variants, one requiring a thesis, and the other requiring a passing grade in a Comprehensive Exam administered by the Department. Both require a total of 30 credits.

M.S. Core Courses	(15 credits required)	
Mechanics	PHY 6247	3
Electromagnetism	PHY 6346	3
Statistical Mechanics	PHY 6536	3
Quantum Mechanics 1	PHY 6645	3
<b>AND EITHER</b>		
Mathematical Physics 1	PHZ 5115	3
<b>OR</b>		
Mathematical Physics 2	PHZ 5116	3
Elective Courses, Thesis Variant	(15 credits required)	

Master's Thesis	PHY 6971	9
Approved Electives*, **		6

Elective Courses, Non-Thesis Variant	(15 credits required)	
Approved Electives*, **		15
<i>Non-Thesis M.S. candidates must pass a written or oral Comprehensive Exam administered by the Department.</i>		

\* All electives must be approved by the Department's Graduate Advisor.

\*\* Only up to 3 credits of Graduate Research (PHY 6918) may be counted toward this degree.

**Degree Requirements - Thesis Option**

Mechanics-	PHY 6247	3
Electromagnetism	PHY 6346	4
Statistical Mechanics	PHY 6536	4
Quantum Mechanics 1	PHY 6645	3
Thesis	PHY 6971	7
Mathematical Physics	PHZ 5115	3
Electives*		6
<b>Total</b>		<b>30</b>

**Degree Requirements - Non-Thesis Option**

Mechanics-	PHY 6247	3
Electromagnetism	PHY 6346	4
Statistical Mechanics	PHY 6536	4
Quantum Mechanics 1	PHY 6645	3
Mathematical Physics	PHZ 5115	3
Electives*		13
<i>Non-Thesis Master's applicants must pass a written or oral examination administered by the department.</i>		
<b>Total</b>		<b>30</b>

\* Approved by the graduate advisor.

**Note:** A maximum of 3 credits in Graduate Research (PHY 6918) will normally be allowed.

...

**Doctoral Program**

**Doctor of Philosophy with Major in Physics**



The Department of Physics offers graduate study leading to a Doctor of Philosophy (Ph.D.) degree. The Department is active in research in experimental, theoretical, and computational physics. The Ph.D. will be conferred only for work of distinction in which the student displays original scholarship, achievement and ability.

~~The Physics Department offers graduate study leading to a Doctor of Philosophy in experimental, theoretical or computational physics. The Ph.D. will be conferred only for work of distinction in which the student displays original scholarship, achievement and ability.~~

### Admission Requirements

The admission requirements for the Ph.D. in Physics are the same as those for the [M.S. in Physics](#).

~~Admission requirements for the doctoral degree in Physics are the same as for the [M.S. degree in Physics](#).~~

### Degree Requirements (minimum of 80 credits)

1. Candidates for the Ph.D. in Physics must satisfy all the course and degree requirements for the M.S. in Physics, as well as the following, additional course requirements:

Additional Ph.D. Courses	(50 credits required)	
Electromagnetic Fields	PHY 6347	3
Quantum Mechanics 2	PHY 6646	3
Graduate Colloquium (taken twice)	PHY 6920	2
Additional Approved Electives*, **		12
Dissertation	PHY 7980	30

\* All electives must be approved by the Department's Graduate Advisor. All 12 elective credits counted toward the Ph.D. in Physics degree must be earned in Physics courses at the 6000 level or above.

\*\* No additional credits of Graduate Research (PHY 6918), beyond the maximum of 3 allowed in the M.S. in Physics program, may be counted toward this degree.

~~1. Ph.D. students must meet all degree requirements and physics course requirements for the M.S. degree.~~

<del>2. Additional course requirements are:</del>	-	-
<del>Electromagnetic Fields</del>	<del>PHY 6347</del>	<del>3</del>
<del>Quantum Mechanics 2</del>	<del>PHY 6646</del>	<del>3</del>
<del>Graduate Colloquium</del>	<del>PHY 6920</del>	<del>2</del>
<del>Physics Electives</del>	-	<del>12</del>

~~At least 12 credits of the 18 required for the M.S. and Ph.D. programs must be from physics courses at the 6000 level approved by the graduate advisor.~~

<del>3. Dissertation</del>	<del>PHY 7980</del>	<del>30</del>
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~~The department may accept up to 30 transfer credits into the program at the discretion of the department graduate advisor.~~

2. The Department may apply up to 30 transfer credits from another institution toward this degree. Approval of transfer credits is at the discretion of the Department's Graduate Advisor.

#### **Admission to Candidacy**

Students must demonstrate mastery of the broad areas of physics covered in the undergraduate and first-year graduate programs before being admitted to candidacy for the Ph.D. in Physics. This mastery will be tested by means of a series of written Qualifying Exams on the following four subjects: Classical Mechanics, Electromagnetism, Quantum Mechanics, and Statistical Mechanics. Qualifying Exams are usually scheduled at the end of the Summer and beginning of the Fall terms, and must be taken after the first year of study in the Ph.D. In Physics program. The Qualifying Exam in each subject area will be waived for students who receive a grade of A or A- in the corresponding first-year graduate course at FAU: Mechanics (PHY 6346), Electromagnetism (PHY 6346), Quantum Mechanics 1 (PHY 6645), and Statistical Mechanics (PHY 6536).

~~Before students are admitted to candidacy, they must demonstrate mastery of the broad areas of physics covered in the undergraduate and first-year graduate programs. This will be tested by means of a comprehensive written examination covering classical mechanics, quantum mechanics, statistical mechanics and electrodynamics. This examination will usually be scheduled at the end of the summer/beginning of fall semester after the first year of graduate work and may be attempted twice at most.~~

#### **Dissertation Advisor and a Supervisory Committee**

Students are expected to form a Supervisory Committee for their Ph.D. research program as soon as possible after being admitted to candidacy, and by no later than the end of the second year of graduate study. The Supervisory Committee must be either chaired or co-chaired by a member of the Graduate Faculty from the Department of Physics. It must include at least four members in total, the majority of whom must be members of the graduate faculty from the Department. The composition of the Supervisory Committee should be decided in consultation with the Committee chair (and co-chair, if applicable), and must be approved the Department's Graduate Advisor. Once approved, the Supervisory Committee shall meet with the student to approve his or her plan of study and dissertation topic.

~~When students have been admitted to candidacy, they must choose a departmental faculty member who is willing to serve as dissertation advisor. A supervisory committee is then requested with the approval of the department graduate advisor. Once approved, the committee meets with the student to approve a preliminary plan of study and dissertation topic.~~

#### **Doctoral Research**

Candidates must complete a significant program of original research, a directed independent study in general theory and participate in advanced seminars in their area of specialization, culminating in a dissertation and a final oral examination. The dissertation must add to the sum of existing knowledge and be expressed with literary skill and clarity. The completed dissertation must be approved by the student's supervisory committee, the department chair, the dean of Science and the Graduate College.