| | |
|---|---|
| **Fiscal Unit/Academic Org** | Physics - D0684 |
| **Administering College/Academic Group** | Mathematical And Physical Sci |
| **Co-adminstering College/Academic Group** | |
| **Semester Conversion Designation** | Converted with minimal changes to program goals and/or curricular requirements (e.g., sub-plan/specialization name changes, changes in electives and/or prerequisites, minimal changes in overall structure of program, minimal or no changes in program goals or content) |
| **Current Program/Plan Name** | Physics |
| **Proposed Program/Plan Name** | Physics |
| **Program/Plan Code Abbreviation** | PHYSICS-MS |
| **Current Degree Title** | Master of Science |

## Credit Hour Explanation

| Program credit hour requirements | | A) Number of credit hours in current program (Quarter credit hours) | B) Calculated result for 2/3rds of current (Semester credit hours) | C) Number of credit hours required for proposed program (Semester credit hours) | D) Change in credit hours |
|---|---|---|---|---|---|
| Total minimum credit hours required for completion of program | | 45 | 30.0 | 30 | 0.0 |
| Required credit hours offered by the unit | Minimum | 45 | 30.0 | 30 | 0.0 |
| | Maximum | 45 | 30.0 | 30 | 0.0 |
| Required credit hours offered outside of the unit | Minimum | 0 | 0.0 | 0 | 0.0 |
| | Maximum | 0 | 0.0 | 0 | 0.0 |
| Required prerequisite credit hours not included above | Minimum | 0 | 0.0 | 0 | 0.0 |
| | Maximum | 0 | 0.0 | 0 | 0.0 |

## Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

**Program Learning Goals**

## Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

**Is this a degree program (undergraduate, graduate, or professional) or major proposal?** Yes

**Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs?** No

## Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

## Pre-Major

**Does this Program have a Pre-Major?** No

## Attachments

- mastersProgramProposalFeb15.pdf: proposal

*(Program Proposal. Owner: Hughes,Richard E)*

## Comments

## Workflow Information

| Status | User(s) | Date/Time | Step |
|---|---|---|---|
| Submitted | Hughes,Richard E | 02/15/2011 06:10 AM | Submitted for Approval |
| Approved | Hughes,Richard E | 02/15/2011 06:10 AM | Unit Approval |
| Pending Approval | Andereck,Claude David | 02/15/2011 06:10 AM | College Approval |

THE OHIO STATE UNIVERSITY

**Department of Physics**

Office of the Chair
191 West Woodruff Avenue
Columbus, OH 43210-1117

Phone (614) 292-2653
Fax (614) 292-7557

To: Office of Academic Affairs
From: James J. Beatty, Chair, Department of Physics
Date: February 14, 2011
Re: Semester Program Proposal for Physics Graduate Master Program

The Physics department has the following programs which will be converted from quarters to semesters:
1) The Undergraduate Engineering Physics Major
2) The Undergraduate Physics Major
3) The Undergraduate Physics Minor
4) The Combined Physics BS/MS
5) The Graduate Physics PhD

The subject of this proposal is the Physics Graduate Masters program; the other programs are addressed in separate proposals.

The Graduate Studies Committee of the Department of Physics has worked hard to produce this proposal, describing the conversion of our current Graduate Masters program from the quarter system to the semester system.

The contents of this proposal have been discussed at length in a variety of Graduate Studies Committee meetings as well as faculty meetings through the 2009-2010 academic year.

A vote on this proposal was taken on February 11, 2011. The outcome of the vote was 37 in favor, 0 opposed. As Chair of this department, I strongly endorse this proposal.

# The Physics Masters Program Under Semesters

## Rationale for Changes to the Masters Program from quarters to semesters

There are no significant changes to the Physics Masters Program under semesters, compared to the present program under quarters.

## Masters in Physics program under semesters

i) **General information**

The program for the master's degree is not fixed, but is planned by the student and a member of the Graduate Faculty who acts as an advisor to meet the student's individual needs and interests.
Each candidate for the master's degree must fulfill all Graduate School requirements for that degree. The student should become familiar with the current requirements and the order in which they must be fulfilled.

ii) **Options**

a) **Plan A and Plan B**: These two options require the completion of a minimum amount of coursework, a minimum number of research credits, and a written thesis or report on the students research. In addition, students in these options must pass a Final Oral Examination. These students are not expecting to complete the PhD program. More details on these plans are given below.

b) **Non-thesis, Ph.D. Candidacy**: A student who has been admitted to candidacy (passed the Candidacy Examination) for the Ph.D. degree may be recommended for the M.S. degree by the Departmental Graduate Studies Committee without prejudice to her/his status as a candidate for the doctorate. Students in this situation need to notify the Graduate School that they will be continuing on to the Ph.D. so that they can enroll for the next quarter. Application for the M.S. degree under this option must be initiated by the graduate student on the appropriate Graduate School form which must be signed by her/his advisor and the Vice Chair for Graduate Studies and Research.

iii) **Summary and comparison to the program under quarters**

a) **Program under quarters**

1) Minimum GPA of 3.0 (B average) in all required courses. The required courses include:
   a) 2 physics courses at the 800-level
   b) 3 Physics courses at the 600-level or above

   The total hours in the above required courses is 20 quarter-hours.
2) A minimum of 10 quarter-credit hours of research.
3) A minimum of 45 (Plan A) or 50 (Plan B) quarter-credit hours total.
4) A written thesis (Plan A) or report (Plan B) and final oral examination.

b) **Program under semesters**

1) Minimum GPA of 3.0 (B average) in all required courses. The required courses include:
   a) 1 physics course at the 7000-level or above
   b) 1 physics course at the 6000-level or above
   c) 2 Physics courses at the 5000-level or above

   The total hours in the above required courses ranges from 12-15 semester-credit hours.

2) A minimum of 10 semester-credit hours of research.
3) A minimum of 30 (Plan A) or 33 (Plan B) semester-credit hours total.
4) A written thesis (Plan A) or report (Plan B) and final oral examination.

iv) **Plan A and Plan B Masters Requirements - Details**

a) All students together with their advisor will be responsible for the development of a program of course work and research appropriate to her/his background, abilities, and goals.

b) Plan A students must take a minimum of 30 semester hours of graduate credit, while Plan B students must take a minimum of 33 semester hours of graduate credit.

(1) All students must take a minimum of 10 semester-hours of research credit. These hours are normally satisfied by Physics 7998 or 8998.

(2) Minimum GPA of 3.0 (B average) in all required courses. The required courses include:

- 1 physics course at the 7000-level or above.
- 1 physics course at the 6000-level or above.
- 2 physics courses at the 5000-level or above.

c) Plan A students must present a formal thesis, which follows the formatting guidelines from the graduate school and requires submission of the Thesis Approval form to the Graduate School and electronic submission of the approved thesis to OhioLink and payment of microfilming fees by the published deadline for the quarter of graduation. Plan B students must present a written report which along with their above research hours demonstrates competence in individual research.

d) All students must pass a Final Oral Examination. The oral portion of the Master's Examination is held after the submission for approval of the thesis (plan A) or final written report (plan B) and in the semester the student expects to graduate. An "Application to Graduate" form must be filed with the Graduate School by the appropriate deadline for that semester. The oral examination will be at least one hour in length. It will be conducted by a committee composed of the candidate's advisor (chairperson) and at least one other member of the graduate faculty. The chairperson of the examining committee is responsible for arranging the examination and for certifying its results to the Graduate School and to the departmental Graduate Studies Committee. (There is a form for the report to the Graduate School.) The report of a two-person committee must be unanimous in order to be considered satisfactory. The certification to the Graduate School of the successful completion of the requirements for plan B shall be made by the student's advisor and the Vice Chair for Graduate Studies and Research. A candidate who fails this examination must register in the Graduate School and continue work for an additional semester before an opportunity will be given for a second examination. No student will be permitted a third examination.

## Masters in Physics (Plan B) 1-year sample program under semesters

| Autumn | Spring | May | Summer |
|---|---|---|---|
| Physics 7701 (3) | Physics 68xx (4) | Physics 7998 or 8999(4) | Physics 7998 or 8999(8) |
| Physics 7601 (3) | Physics 68xx (4) | | |
| Physics 7998 (4) | Physics 7998 (3) | | |

## Transition Policy

Students who began their degree under quarters will not be penalized as we move to semesters, either in terms of progress towards their degree or their expected date of graduation. Most Plan A or B Masters students should be able to finish their degree in one year of study.

The overall credit requirements are the same under quarters or semesters for both Plans. The requirements are slightly different for quarters and semesters in the two broad categories of course hours and research hours: more research hours and less coursework hours are required under semesters.

Students who begin their study under quarters but finish under semesters will use the following guidelines:

1) Students will be allowed to graduate under fully quarter requirements or fully semester requirements, with the standard conversion of 1 quarter hour of credit being equal to (2/3) semester hour of credit.
2) 7000-level courses under semesters will count as 800-level courses under quarters and vice versa. Same for 6000-level semester courses and 700-level quarter courses, as well as 5000-level semester courses and 600-level quarter courses.
3) The minimum required coursework hours will be 20 quarter hours for graduating under quarter requirements, and 12 semester hours for graduating under semester requirements.
4) The minimum required research hours will be 10 quarter hours for graduating under quarter requirements, and 10 semester hours for graduating under semester requirements.

Students who begin their study under semesters can only graduate under fully semester requirements.

**Semester Advising Sheet for Masters**

| COLLEGE OF ARTS AND SCIENCES: MASTERS in PHYSICS: Semester Advising Sheet | | | | | | |
|---|---|---|---|---|---|---|
| **Last name:** | | | | | Address | |
| **First Name:** | | | | | City | |
| **Middle:** | | | | | Zip Code | |
| **OSU ID** | | | | | | |
| **lastname.#** | | | | | | |
| **Expected graduation** | | (semester) | | | (year) | |

| **Required courses: Students must complete 1 Physics course at 7000-level , 1 Physics course at 6000-level or above, and 2 Physics courses at 5000-level or above.** | | | **Total Graduate Credit Hours Earned:** | |
|---|---|---|---|---|
| List the courses below, along with the credit hours and grade attained: | | | | |
| | | | **Plan A Requirements:** | **Completed** |
| **Courses** | **Credits** | **Grade** | 1) Minimum GPA of 3.0 (B) in required courses. | |
| **Course 1:** | | | 2) Minimum 10 hours of research | |
| **Course 2:** | | | 3) Minimum of 30 credit hours | |
| **Course 3:** | | | 4) Satisfactory presentation of formal Thesis | |
| **Course 4:** | | | 5) Pass Final Oral Examination | |
| **Course 5:** | | | | **Completed** |
| | | | **Plan B Requirements:** | |
| **A minimum of 10 hours of research required** | | | 1) Minimum GPA of 3.0 (B) in required courses. | |
| **Course** | **Credits** | **Grade** | 2) Minimum 10 hours of research | |
| **Physics 7998** | | | 3) Minimum of 33 credit hours | |
| **Physics 8998** | | | 4) Demonstration of competence in individual research | |
| | | | 5) Pass Final Oral Examination | |
| **List any other graduate-level courses** | | | | |
| **Course** | **Credits** | **Grade** | Masters Option Plan Chosen (circle one): Plan A Plan B | |
| **Course 1:** | | | **Signature of Advisor:** | |
| **Course 2:** | | | | |
| **Course 3:** | | | | |
| **Course 4:** | | | | |
| **Course 5:** | | | **Signature of Grad Vice Chair:** | |
| | | | | |
| | | | | |
| | | | | |

**The Master's Examination written portion:**
A student working for a Master's degree under plan B (non-thesis option) is required by the Graduate School to pass a written portion of the Master's Examination designed to test the candidate's ability in physics. In the Department of Physics, the final written report is used to satisfy this requirement.

**The Master's Examination Oral Portion**
The oral portion of the Master's Examination is held after the submission for approval of the thesis (plan A) or final written report (plan B) and in the quarter the student expects to graduate. An "Application to Graduate" form must be file with the Graduate School by the appropriate deadline for that semester.
The oral examination will be at least one hour in length. It will be conducted by a committee composed of the candidate's advisor (chairperson) and at least one other member of the graduate faculty.
The chairperson of the examining committee is responsible for arranging the examination and for certifying its results to the Graduate School and to the departmental Graduate Studies Committee. (There is a form for the report to th Graduate School.) The report of a two-person committee must be unanimous in order to be considered satisfactory. The certification to the Graduate School of the successful completion of the requirements for plan B shall be made by the student's advisor and the Vice Chair for Graduate Studies and Research.
A candidate who fails this examination must register in the Graduate School and continue work for an additional semester before an opportunity will be given for a second examination. No student will be permitted a third examination.

## Quarter Advising Sheet for Masters

| COLLEGE OF ARTS AND SCIENCES: MASTERS in PHYSICS: Quarter Advising Sheet | | | | | | |
|---|---|---|---|---|---|---|
| **Last name:** | | | | | Address | |
| **First Name:** | | | | | City | |
| **Middle:** | | | | | Zip Code | |
| **OSU ID** | | | | | | |
| **lastname.#** | | | | | | |
| **Expected graduation** | | (quarter) | | | (year) | |

All Masters students must complete at least 5 of the courses below, including two at the 800-level:

**Total Graduate Credit Hours Earned:**

| Courses | Credits | Grade |
|---|---|---|
| **Physics 617** | | |
| **Physics 821** | | |
| **Physics 822** | | |
| **Physics 846** | | |
| **Physics 847** | | |
| **Physics 827** | | |
| **Physics 828** | | |
| **Physics 829** | | |
| **Physics 834** | | |
| **Physics 835** | | |
| **Physics 836** | | |
| **Physics 780.xx** | | |
| **Physics 780.xx** | | |
| **Physics 780.xx** | | |
| **Physics 780.xx** | | |
| **Physics 780.xx** | | |
| | | |

**A minimum of 10 hours of research required**

| Course | Credits | Grade |
|---|---|---|
| **Physics 816** | | |
| **Physics 999** | | |

**Plan A Requirements:**

1) Minimum GPA of 3.0 (B) in required courses.
2) Minimum 10 hours of research
3) Minimum of 45 credit hours
4) Satisfactory presentation of formal Thesis
5) Pass Final Oral Examination

**Plan B Requirements:**

1) Minimum GPA of 3.0 (B) in required courses.
2) Minimum 10 hours of research
3) Minimum of 50 credit hours
4) Demonstration of competence in individual research
5) Pass Final Oral Examination

Masters Option Plan Chosen (circle one): Plan A Plan B

**Signature of Advisor:**

_____

**Signature of Grad Vice Chair:**

_____

**The Master's Examination written portion:**
A student working for a Master's degree under plan B (non-thesis option) is required by the Graduate School to pass a written portion of the Master's Examination designed to test the candidate's ability in physics. In the Department of Physics, the final written report is used to satisfy this requirement.

**The Master's Examination Oral Portion**
The oral portion of the Master's Examination is held after the submission for approval of the thesis (plan A) or final written report (plan B) and in the quarter the student expects to graduate. An "Application to Graduate" form must be filed with the Graduate School no later than the second Friday of that quarter.
The oral examination will be at least one hour in length. It will be conducted by a committee composed of the candidate's advisor (chairperson) and at least one other member of the graduate faculty.
The chairperson of the examining committee is responsible for arranging the examination and for certifying its results to the Graduate School and to the departmental Graduate Studies Committee. (There is a form for the report to the Graduate School.) The report of a two-person committee must be unanimous in order to be considered satisfactory. The certification to the Graduate School of the successful completion of the requirements for plan B shall be made by the student's advisor and the Vice Chair for Graduate Studies and Research.
A candidate who fails this examination must register in the Graduate School and continue work for an additional quarter before an opportunity will be given for a second examination. No student will be permitted a third examination.

| Semester Course Number | Course Title | Semester Units | | Quarter Equivalent Course Number | Quarter Credits | Notes |
|---|---|---|---|---|---|---|
| **Combined Undergrad/Grad Level Courses** | | | | | | |
| Physics 5400/5400H | E&M I | 4 | | Physics 555 | 4 | Semester course has all of 555 and some of 656 |
| | | | | Physics 656 | 4 | |
| Physics 5500/5500H | Quantum I | 4 | | Physics 631 | 4 | Semester course has all of 631 and some of 632 |
| | | | | Physics 632 | 4 | |
| Physics 5700 | Advanced Laboratory | 3 | | Physics 616 | 4 | Same content |
| Physics 5401H | E&M II | 4 | | Physics 656 | 4 | Semester course has some of 656 and all of 657 |
| | | | | Physics 657 | 4 | |
| Physics 5501H | Quantum II | 4 | | Physics 632 | 4 | Semester course has some of 632 and all of 633 |
| | | | | Physics 633 | 4 | |
| Physics 5600 | Statistical Physics | 4 | | Physics 621 | 4 | Semester course has all of 621 and some of 622 |
| | | | | Physics 622 | 4 | |
| Physics 5300 | Theoretical Mechanics | 4 | | Physics 664 | 4 | Enhanced content |
| | | | | | | |
| **Graduate Introductory** | | | | | | |
| Physics 6802 | Topics in Elementary Particle Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6803 | Topics in Astroparticle Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6804 | Topics in Atomic and Molecular Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6805 | Topics in Nuclear Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6806 | Topics in Condensed Matter Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6809 | Topics in Biophysics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6810 | Topics in Computational Physics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6820 | Special Topics | 4 | | Physics 780.xx | 4 | Enhanced content |
| Physics 6780 | Special Topics Seminar | 1 | | Physics 795 | 1 | Same content |

| Semester Course Number | Course Title | Semester Units | | Quarter Equivalent Course Number | Quarter Credits | Notes |
|---|---|---|---|---|---|---|
| **Graduate Core** | | | | | | |
| | | | | | | |
| 7701 | Analytic and Numeric methods of Physics | 3.00 | | Physics 730 | 4 | Semester course has some of 730 and some of 834 |
| | | | | Physics 834 | 4 | |
| 7401 | Electromagnetic Field Theory | 3.00 | | Physics 835 | 4 | Semester course has some of 835 and some of 836 |
| | | | | Physics 836 | 4 | |
| 7501 | Quantum Mechanics 1 | 3.00 | | Physics 827 | 5 | Semester course has some of 827 and some of 828 |
| | | | | Physics 828 | 5 | |
| 7502 | Quantum Mechanics 2 | 3.00 | | Physics 828 | 5 | Semester course has some of 828 and some of 829 |
| | | | | Physics 829 | 5 | |
| 7601 | Classical and Statistical Physics I | 3.00 | | Physics 821 | 4 | Semester course has all of 821 and some of 846 |
| | | | | Physics 846 | 4 | |
| 7602 | Classical and Statistical Physics II | 3.00 | | Physics 846 | 4 | Semester course has some of 846 and some of 847 |
| | | | | Physics 847 | 4 | |
| | | | | | | |
| | | | | | | |
| **Graduate Advanced** | | | | | | |
| 7503 | Quantum Mechanics 3 | 3.00 | | Physics 830 | 4 | Enhanced content |
| 7603 | Advanced Statistical Physics | 3.00 | | Physics 848 | 4 | Enhanced content |
| 7891 | Departmental Seminar or Workshop | Variable | | Physics 816 | Variable | Semester version |
| 7998 | Graduate Research | Variable | | Physics 816 | Variable | Semester version |
| 8301 | Elasticity and Fluid Mechanics | 3.00 | | Physics 822 | 4 | Content of 822 |
| 8802.1 | Topics in Elementary Particle Physics 1 | 3.00 | | Physics 880.02 | 3 | Enhanced content |
| 8802.2 | Topics in Elementary Particle Physics 2 | 3.00 | | Physics 880.02 | 3 | Enhanced content |
| 8803.1 | Topics in Astroparticle Physics 1 | 3.00 | | Physics 880.20 | 3 | Enhanced content |

| Semester Course Number | Course Title | Semester Units | | Quarter Equivalent Course Number | Quarter Credits | Notes |
|---|---|---|---|---|---|---|
| 8803.2 | Topics in Astroparticle Physics 2 | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8804.1 | Topics in Atomic and Molecular Physics 1 | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8804.2 | Topics in Atomic and Molecular Physics 2 | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8805.1 | Topics in Nuclear Physics | 3.00 | | Physics 880.05 | 3 | Enhanced content |
| 8805.2 | Topics in Nuclear Physics | 3.00 | | Physics 880.05 | 3 | Enhanced content |
| 8806.1 | Topics in Condensed Matter Physics 1 | 3.00 | | Physics 880.06 | 3 | Enhanced content |
| 8806.2 | Topics in Condensed Matter Physics 2 | 3.00 | | Physics 880.06 | 3 | Enhanced content |
| 8808.1 | Topics in the theory of Quantized Fields 1 | 3.00 | | Physics 880.08 | 3 | Enhanced content |
| 8808.2 | Topics in the theory of Quantized Fields 2 | 3.00 | | Physics 880.08 | 3 | Enhanced content |
| 8809.1 | Topics in Biophysics | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8809.2 | Topics in Biophysics | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8820 | Special Topics | 3.00 | | Physics 880.20 | 3 | Enhanced content |
| 8999 | Research in Physics | Variable | | Physics 999 | Variable | Semester version |

| Comparison of Masters and BS/MS Programs under quarters and semesters. | | | | | | |
|---|---|---|---|---|---|---|
| **Requirements** | **BS/MS under semesters** | **BS/MS under Quarters** | **Masters Plan A under semesters** | **Masters Plan A under quarters** | **Masters Plan B under semesters** | **Masters Plan B under quarters** |
| | | | | | | |
| **Physics Courses** | 1 at 7000 level or above | 2 at 800 level | 1 at 7000 level or above | 2 at 800 Level | 1 at 7000 level or above | 2 at 800 Level |
| | 2 at 5000 level or above | 3 at 600 level or above (see note 1) | 2 at 5000 level or above | 3 at 600 or above (see note 2) | 2 at 5000 level or above | 3 at 600 or above (see note 2) |
| | | | | | | |
| **Other grad Courses (could be physics)** | 2 approved grad courses | 2 approved grad courses | 1 at 6000 level or above (see note 3) | none | 1 at 6000 level or above (see note 3) | none |
| | | | | | | |
| **Credit hours in courses QH: Quarter hours SH: Semester hours** | 15-19 SH (=22.5-28.5 QH) | 26-28 QH | 12-15 SH (=18-22.5 QH) | 20 QH | 12-15 SH (=18-22.5 QH) | 20 QH |
| **Research hours** | 10 | 14 | 10 | 10 | 10 | 10 |
| **Maximum double counted hours** | 12 for BS | 20 for BS | None | None | None | None |
| **Total hours** | 33 | 50 | 30 | 45 | 33 | 50 |
| | | | | | | |
| **Thesis** | No | No | Yes | Yes | No | No |
| | | | | | | |
| **Note 1:** | Physics courses required for the BS/MS are allowed to be any 600-level course or above. Note that only 20 of these hours can be double counted for the BS and MS degrees. | | | | | |
| **Note 2:** | Physics courses required for the Masters (Plans A and B) under quarters are specified in a list, which included Physics 617, Physics 780.xx, and Physics 8xx courses. So the requirement is not exactly 3 courses at 600-level or above. | | | | | |
| **Note 3:** | This course is expected to be a 6000-level or higher Physics course. Exceptions to this (e.g. 5000-level Statistics course) are allowed if approved by the student's faculty advisor. | | | | | |