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April 5, 2011

To: W. Randy Smith, Vice Provost, Office of Academic Affairs  
From: Terry L. Gustafson, Special Assistant to the Executive Dean for Semester Conversion

Re: Arts and Sciences Program Proposals from the Natural and Mathematical Sciences Division

Arts and Sciences is pleased to submit the following programs from the Natural and Mathematical Sciences Division to the Office of Academic Affairs for conversion from quarters to semesters. The programs have been approved by the faculty members and chair of the originating unit, and reviewed and approved by the divisional advisory panel, a subcommittee of the ASC Committee on Curriculum and Instruction (CCI), and the full CCI. The vote for approval of all programs at the full CCI was unanimous.

| Program Name                     | Academic Plan Code | Conversion Designation | CCI Approval | Last Revision |
|----------------------------------|--------------------|------------------------|--------------|---------------|
| Astronomy and Astrophysics BS    | ASTRON-BS          | Converted              | 4/2/2011     | 6/12/2009     |
| Astronomy and Astrophysics Minor | ASTRON_MN          | Converted              | 2/28/2011    | Prior to 2006 |
| Evolution and Ecology Minor      | EVOLECO-MN         | Re-envisioned          | 3/6/2011     | Prior to 2006 |
| Microbiology BA                  | MICRBIO-BA         | Re-envisioned          | 3/15/2011    | 3/6/2009      |
| Microbiology BS                  | MICRBIO-BS         | Re-envisioned          | 3/15/2011    | 3/6/2009      |
| Microbiology Minor               | MICROBIO-MN        | Re-envisioned          | 3/11/2011    | Prior to 2006 |
| Physics BS                       | PHYSICS-BS         | Converted              | 4/2/2011     | Prior to 2006 |
| Physics Minor                    | PHYSICS-MN         | Converted              | 3/6/2011     | Prior to 2006 |
| Statistics Minor                 | STAT-MN            | Converted              | 2/21/2011    | Prior to 2006 |
| Zoology BA                       | ZOOLOGY-BA         | Re-envisioned          | 1/31/2011    | Prior to 2006 |
| Zoology BS                       | ZOOLOGY-BS         | Re-envisioned          | 1/31/2011    | Prior to 2006 |
| Zoology Minor                    | ZOOLOGY-MN         | Re-envisioned          | 3/6/2011     | Prior to 2006 |

**Arts and Sciences General Education (GE) Program:** The GE program for untagged B.A. and B.S. degrees in Arts and Sciences was approved by the Council on Academic Affairs on May 26, 2010, after receiving approval from the Arts and Sciences Faculty Senate. All the programs presented here follow the approved GE program.

**College of Arts and Sciences Transition Policy:** The College of Arts and Sciences is committed to the principles outlined in the university's Pledge to Undergraduate Students. Each unit has a plan on how best to assist its majors and minors through the transition. And the Arts and Sciences Academic Advising Services will advise students on how to transition their GE program. Dual advising is the existing process used in Arts and Sciences and will continue under semesters.

Status: PENDING

**PROGRAM REQUEST**  
Physics

Last Updated: Andereck, Claude David  
03/10/2011

|  |  |
|--|--|
| <b>Fiscal Unit/Academic Org</b>                | Physics - D0684  |
| <b>Administering College/Academic Group</b>    | Mathematical And Physical Sci  |
| <b>Co-administering College/Academic Group</b> |  |
| <b>Semester Conversion Designation</b>         | 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) |
| <b>Current Program/Plan Name</b>               | Physics  |
| <b>Proposed Program/Plan Name</b>              | Physics  |
| <b>Program/Plan Code Abbreviation</b>          | PHYSICS-BS   |
| <b>Current Degree Title</b>                    | Bachelor 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 |         | 51  | 34.0   | 36  | 2.0                       |
| Required credit hours offered by the unit                     | Minimum | 36  | 24.0   | 29  | 5.0                       |
|   | Maximum | 64  | 42.7   | 42  | 0.7                       |
| Required credit hours offered outside of the unit             | Minimum | 3   | 2.0  | 0   | 2.0                       |
|   | Maximum | 18  | 12.0   | 15  | 3.0                       |
| Required prerequisite credit hours not included above         | Minimum | 46  | 30.7   | 30  | 0.7                       |
|   | Maximum | 71  | 47.3   | 48  | 0.7                       |

**Explain any change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the above table**

We have 4 different specializations which have differing requirements in the various rows of the above table. To make things more clear, we have attached copies of the above table for each of the 4 specializations.

Inspecting these tables, changes of more than 4 credit hours occur in two of the specializations: the Life Sciences Specialization and the Applied Physics Specialization.

The Life Sciences specialization has 5 more hours required in hours offered by the unit under semesters than under quarters. The primary change here is that we now require all 3 advanced labs for all of our students (which accounts for 3 credit hours of the 5 credit hour difference). Previously we required 3 labs for approximately half of the students in our program, and 2 labs for the other half. Since Physics is an experimental science, our faculty felt strongly that all 3 labs should be required of all students.

The additional of the third lab is a large part of the change for the Applied Physics option as well. In addition, for this option we also have increased the required hours outside the unit (this is the "applied" portion of this option) by 3 semester credit hours, in order that students have a strong foundation in the applied area they are focusing on.

**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**

- Undergraduate Physics majors acquire a basic mastery of fundamental areas of physics, from classical mechanics, through electricity and magnetism, and finally to modern physics including quantum mechanics and relativity.
- Undergraduate Physics majors develop powerful analytical and problem solving skills in areas involving both physics and mathematics.
- Undergraduate Physics majors acquire a basic mastery of experimental physics.
- Undergraduate Physics majors acquire a basic mastery of data reduction and error analysis.
- Undergraduate Physics majors effectively communicate their physical understanding both professionally and colloquially (orally and in writing).
- Undergraduate majors are apprised of and encouraged to participate in academic research, industrial research and/or outreach activities which are consistent with their interest, ability and postgraduate plans.
- Undergraduate majors acquire expertise relevant to their chosen program option.

**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? Yes**

**Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar.**

For our assessment, we use a variety of direct and indirect methods, none of which depend upon whether the program is run under quarters or semesters. As a result, we do not anticipate any changes to our assessment practices under the semester system.

**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.

**Program Specialization/Sub-Plan Name**

Applied Physics (New)

**Program Specialization/Sub-Plan Goals**

- This is a flexible program that combines a strong foundation in physics with a set of technical electives designed for those with special interests.
- The program of technical electives could include courses of study from other sciences such as Astronomy, or other programs such as engineering, meteorology, economics, history of science, or primary education.

**Program Specialization/Sub-Plan Name**

Physics and Life Sciences (New)

**Program Specialization/Sub-Plan Goals**

- This option is designed for those intending to attend medical school. It satisfies typical medical school admission requirements, when combined with the required physics and prerequisite math courses in the physics core curriculum.

**Program Specialization/Sub-Plan Name**

Physics Teaching (New)

**Program Specialization/Sub-Plan Goals**

- This option is designed for those seeking secondary level certification in physics (i.e., to be a high school teacher). It is been designed to satisfy College of Education Master of Education (Physics Certification) curriculum.

**Program Specialization/Sub-Plan Name**

Advanced Physics (New)

**Program Specialization/Sub-Plan Goals**

- This program is designed for those intending graduate level (Ph.D.) studies in physics. It provides an excellent preparation for graduate school in physics.

## Pre-Major

Does this Program have a Pre-Major? No

## Attachments

- CCI subcommittee chair letter--PhysicsMajor.doc: CCI Subcommittee Chair Letter  
*(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)*
- programProposal\_mar10.pdf: Program Proposal  
*(Program Proposal. Owner: Hughes, Richard E)*
- Physics BS cover letter.doc: NMS Division of Arts and Sciences cover letter  
*(Letter from the College to OAA. Owner: Andereck, Claude David)*

## Comments

Status: PENDING

**PROGRAM REQUEST**  
Physics

Last Updated: Andereck,Claude David  
03/10/2011

**Workflow Information**

| Status             | User(s)  | Date/Time           | Step                   |
|--------------------|--|---------------------|------------------------|
| Submitted          | Hughes,Richard E   | 10/11/2010 09:34 PM | Submitted for Approval |
| Revision Requested | Hughes,Richard E   | 10/18/2010 11:47 AM | Unit Approval          |
| Submitted          | Hughes,Richard E   | 10/21/2010 11:12 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 10/26/2010 10:35 AM | Unit Approval          |
| Approved           | Andereck,Claude David  | 10/28/2010 10:59 AM | College Approval       |
| Revision Requested | Vankeerbergen,Bernadette Chantal   | 11/12/2010 08:15 AM | ASCCAO Approval        |
| Submitted          | Hughes,Richard E   | 11/24/2010 03:39 PM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 11/24/2010 03:48 PM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 12/02/2010 02:25 PM | College Approval       |
| Submitted          | Hughes,Richard E   | 12/08/2010 05:50 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 12/08/2010 05:51 AM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 12/08/2010 12:41 PM | College Approval       |
| Submitted          | Hughes,Richard E   | 01/19/2011 12:50 PM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 01/19/2011 01:10 PM | Unit Approval          |
| Approved           | Andereck,Claude David  | 01/19/2011 03:11 PM | College Approval       |
| Revision Requested | Meyers,Catherine Anne  | 01/31/2011 09:24 AM | ASCCAO Approval        |
| Submitted          | Hughes,Richard E   | 02/09/2011 10:51 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 02/09/2011 10:52 AM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 02/14/2011 11:54 AM | College Approval       |
| Submitted          | Hughes,Richard E   | 02/15/2011 05:48 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 02/15/2011 05:49 AM | Unit Approval          |
| Approved           | Andereck,Claude David  | 02/15/2011 11:37 AM | College Approval       |
| Revision Requested | Vankeerbergen,Bernadette Chantal   | 03/07/2011 09:49 AM | ASCCAO Approval        |
| Submitted          | Hughes,Richard E   | 03/08/2011 10:46 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 03/08/2011 10:50 AM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 03/08/2011 01:45 PM | College Approval       |
| Submitted          | Hughes,Richard E   | 03/08/2011 02:47 PM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 03/08/2011 02:48 PM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 03/09/2011 10:47 AM | College Approval       |
| Submitted          | Hughes,Richard E   | 03/10/2011 07:46 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 03/10/2011 08:48 AM | Unit Approval          |
| Revision Requested | Andereck,Claude David  | 03/10/2011 08:52 AM | College Approval       |
| Submitted          | Hughes,Richard E   | 03/10/2011 08:56 AM | Submitted for Approval |
| Approved           | Hughes,Richard E   | 03/10/2011 08:59 AM | Unit Approval          |
| Approved           | Andereck,Claude David  | 03/10/2011 09:39 AM | College Approval       |
| Pending Approval   | Hanlin,Deborah Kay<br>Vankeerbergen,Bernadette Chantal<br>Meyers,Catherine Anne<br>Jenkins,Mary Ellen Bigler<br>Nolen,Dawn | 03/10/2011 09:39 AM | ASCCAO Approval        |

College of Arts and Sciences

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March 10, 2011

Larry Krissek  
Chair, Arts and Sciences CCI

Dear Larry:

It is a pleasure to forward to you the proposal for the BS major in Physics under semesters. The major has been modified from its present quarter version mainly by reduction of the number of tracks offered and by the splitting of upper division courses in quantum mechanics and electromagnetic field theory into honors and non-honors versions to better meet the needs of the students. It is a solid proposal, well conceived.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at meetings on October 13 and 20, 2010, the Sciences Subcommittee of the CCI and the full CCI. Feedback from these discussions has now been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,



David Andereck  
Professor of Physics  
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences

To: Larry Krissek

From: James Fredal

Re: Proposed Semester Conversion Plan for Physics Major

December 30, 2010

The Sciences subcommittee of the CCI considered the semester conversion proposal for the Physics Major on November and voted to approve the proposal with several contingencies outlined below.

Because the Physics Major had not undergone revision since 1998, the Department and the Undergraduate Studies Committee used the conversion process to reconsider the major. The resulting proposal differs from the current Physics major in several ways.

- 1) The major went from 6 options or tracks to 4 specializations. Three of the less popular existing options were folded into one “Applied Physics” specialization for students in Engineering, Law, Journalism, and other sciences. The remaining four options, Advanced Physics, Physics and Life Sciences, and Physics Teaching options remain the same.
- 2) An honors option is now available for two upper division Physics sequences, reducing pressure on the required non-honors sequences and adding an enhanced option for students who are academically advanced.
- 3) A third lab course will now be required for all specializations. Previously, only the Advanced Physics option required the third lab course.
- 4) Material from the 3<sup>rd</sup> level writing course will now be included in the Advanced Lab: presentation of data results and analysis.

The Sciences subcommittee had several concerns about the proposed structural changes. Some of these concerns were minor errors having to do with consistency or clarifications. Other concerns were more substantive.

First, we wondered whether the reduction of options or tracks would put pressure on courses in some tracks with a larger number of students. However, it appears that the new Applied Physics track combined several of the less popular tracks and that in any case the demand for common required courses will remain the same.

Second, we asked about the new requirement for three labs for all specializations. The Physics department feels that with some rearrangement of lab space in Smith labs to allow larger classes, and a slight increase in TA staffing for the larger labs, that they will be able to accommodate the new requirement, and that limitations in lab offerings will not slow students’ time to degree.

Finally, the subcommittee requested a more detailed transition plan. In the revised proposal, the transition plan describes the bridge courses that will be offered to

students who have partially completed the initial Physics sequence (111-112-113 and 131, 132, 133) and possibly also the Mathematical Methods in Physics sequence. The department will also implement a Transition Advising Worksheet, to be filled out for every student in the major to assist them in the transition. The worksheet and the transition process will be discussed in Physics 295 beginning in Autumn 2010. In addition, a website has been developed with descriptions of the changes and a range of sample transition schedules. With the dedicated Staff and Faculty advising, the current transition plan should provide students with ample opportunities to adjust their schedule to the semester system without being penalized.

With the current corrections and revisions to the proposal, I feel the contingencies delineated by the Sciences subcommittee have been met and therefore recommend consideration and approval of the proposed semester conversion plan for the Physics major within the Arts and Sciences CCI.





Department of Physics

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

Phone (614) 292-2653  
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To: Office of Academic Affairs  
From: James J. Beatty, Chair, Department of Physics  
Date: August 19, 2010  
Re: Semester Program Proposal for Undergraduate Physics Major

A handwritten signature in black ink that reads "James J. Beatty".

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 Undergraduate Physics Major; the other programs will be addressed in separate proposals.

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

The contents of this proposal have been discussed at length in a variety of Undergraduate Studies Committee meeting as well as faculty meetings through the 2009-2010 academic year. A preliminary version of the proposal was presented and discussed in a "Town Meeting" with undergraduate Physics and Engineering Physics majors on April 15, 2010. Based on their comments, a revised proposal was unanimously approved in a meeting of the Undergraduate Studies Committee on April 20, 2010. This version was then circulated for faculty review and comments, with a vote on the proposal completed on April 30. The outcome of the vote was 44 in favor, 0 opposed.

## Rationale for Changes to the Undergraduate Physics Major Program

The changes to the physics major program can be summarized as follows:

- A. We have gone from a system of 6 options labeled A through F, to a system of 4 Specializations in which the names are more closely tied to the expected outcome for the student. Each of these specializations leads to a Bachelor of Sciences degree in physics. The specializations each consist of a common core of Physics, Math and prerequisite courses, along with additional required and/or recommended courses in Physics, Math, and/or other departments.
  - i) The Advanced Physics Specialization for grad school bound students (formerly Option A). This specialization is designed for those intending graduate level (Ph.D.) studies in physics. It provides an excellent preparation for graduate school in physics
  - ii) The Physics and Life Sciences Specialization for premed students (formerly Option D). This specialization is designed for those intending to attend medical school. It satisfies all of the OSU medical school admission requirements, when combined with the required physics and math courses in the physics core curriculum.
  - iii) The Physics Teaching Specialization for teaching high school physics (formerly Option E). This specialization is designed for those seeking secondary level certification in physics (i.e., to be a high school teacher). It is designed to satisfy College of Education Master of Education (Physics Certification) curriculum.
  - iv) The Applied Physics Specialization for students interested in Engineering, Law, Journalism, other Sciences, etc. (formerly Options B,C,F). This specialization is a flexible program that combines a strong foundation in physics with a set of technical electives designed for those with special interests. The program of technical electives could include courses of study from other programs in the Colleges of Mathematical and Physical Sciences such as Astronomy, or the Engineering College, or other programs such as meteorology, economics, history of science, or primary education.
- B. We have included an Honors track for two of our upper division Physics sequences. This will reduce the overall class size for the two required subject areas of Quantum Mechanics and Electricity&Magnetism, as well as providing a challenging option for students who are academically more prepared.
- C. We now require 3 upper division lab courses. Previously, only the Option A (now Advanced Physics) students were required to take 3 labs. Since lab experience is potentially even more useful for students who will seek employment immediately after graduation (which is true of most of the students in the other options) this should positively impact their employment prospects.
- D. We include the 3rd writing course material in our Advanced Lab. The new GE template no longer has a 3rd writing requirement, and yet presentation of data results and analysis is an important educational goal for our students. However, there has been for some time a presentation and writing component to our advanced lab, and this change will be formalized under semesters.

The date of the last significant revision to the Physics Major program was in 1998.

Course Listing and Curriculum Map for the Physics Major

| Requirements   | Semester Course Number | Course Title                       | Semester Units | Quarter Equivalent Course Number | Quarter Credits | Notes  | Relevant Learning Goals Achieved (see below) |
|--|------------------------|------------------------------------|----------------|----------------------------------|-----------------|--|--|
| <b>Prerequisite Courses:</b>   |                        |                                    |                |                                  |                 |  |  |
| Introductory Math  | Math 1151              | Calc I                             | 5              | Math 151                         | 5               | Semester sequence has same content as quarter sequence         | 2a   |
|  | Math 1152              | Calc II                            | 5              | Math 152                         | 5               |  |  |
|  |                        |                                    |                | Math 153                         | 5               |  |  |
| Upper Div Math   | Math 2153              | CalcIII                            | 4              | Math 254                         | 5               | Content of current 254   | 2b   |
|  | Math 2174              | LinAlg/DiffEq                      | 3              | Math 415                         | 4               | Some material from 415 and 568 (topics still under discussion) | 2b   |
|  |                        |                                    |                | Math 568                         | 3               |  |  |
| Computing  | CSE 1222               | Intro to C++                       | 3              | CSE 202                          | 4               | Same content   | 3a   |
| Introductory Physics   | Physics 1250/1250H     | Mechanics, Thermal Physics, Waves  | 5              | Physics 131/131H                 | 5               | Semester sequence has same content as quarter sequence         | 1a,2a  |
|  | Physics 1251/1251H     | E&M, Optics, Modern Physics        | 5              | Physics 132/132H                 | 5               |  |  |
|  |                        |                                    |                | Physics 133/133H                 | 5               |  |  |
| Note: Suitable honors and/or advanced versions of all above prerequisite courses are allowed as substitutions. |                        |                                    |                |                                  |                 |  |  |
| <b>Physics Core:</b>   |                        |                                    |                |                                  |                 |  |  |
| Intermediate   | Physics 2300           | Dynamics of Particles and Waves I  | 4              | Physics 261                      | 4               | Semester sequence has same content as quarter sequence         | 1b,2b  |
|  | Physics 2301           | Dynamics of Particles and Waves II | 4              | Physics 262                      | 4               |  |  |
|  |                        |                                    |                | Physics 263                      | 4               |  |  |
|  | Physics 2095           | Introductory Seminar               | 1              | Physics 295                      | 1               | Same Content   | 6a   |
| Upper Division   | Physics 5400/5400H     | E&M I                              | 4              | Physics 555                      | 4               | Sem course has all of 555 and some of 656                      | 1c,2c  |
|  |                        |                                    |                | Physics 656                      | 4               |  |  |
|  | Physics 5500/5500H     | Quantum I                          | 4              | Physics 631                      | 4               | Sem course has all of 631 and some of 632                      | 1c,2c  |
|  |                        |                                    |                | Physics 632                      | 4               |  |  |
| Physics Labs Core  | Physics 3700           | Methods in Experimental Physics    | 3              | Physics 416                      | 4               | Same content   | 3a,4a,5a                                     |
|  | Physics 4700           | Intro Electronics for Physicists   | 3              | Physics 517                      | 4               | Same content   | 3b,4b,5b                                     |

Course Listing and Curriculum Map for the Physics Major

| Requirements  | Semester Course Number | Course Title                           | Semester Units | Quarter Equivalent Course Number | Quarter Credits | Notes  | Relevant Learning Goals Achieved (see below) |
|---|------------------------|--|----------------|----------------------------------|-----------------|--|--|
|   | Physics 5700           | Advanced Laboratory                    | 3              | Physics 616                      | 4               | Same content                                   | 3c,4c,5c                                     |
| <b>Physics Electives:</b>                                   |                        |  |                |                                  |                 |  |  |
|   | Physics 3455H          | Honors Holography                      | 3              | Physics H455                     | 4               | Same content                                   | 3b,4b,5b                                     |
|   | Physics 3470           | Optics                                 | 3              | Physics 570                      | 4               | Same content                                   | 2b   |
|   | Physics 2193           | Individual Studies                     | Var            | Physics 593                      | Var             | Intermed Level                                 | 6b   |
|   | Physics 4193           | Individual Studies                     | Var            | Physics 693                      | Var             | Advanced Level                                 | 6c   |
| Research Courses  | Physics 2998           | Undergrad Research                     | Var            | Physics 699                      | Var             | Intermed Level                                 | 6b   |
|   | Physics 4998           | Undergrad Research                     | Var            | Physics 699                      | Var             | Advanced Level                                 | 6c   |
|   | Physics 4999           | Undergrad Research                     | Var            | Physics 783                      | Var             | Like 4998+Thesis                               | 6c   |
| Grad introductory   | Physics 6802           | Topics in Elementary Particle Physics  | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6803           | Topics in Astroparticle Physics        | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6804           | Topics in Atomic and Molecular Physics | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6805           | Topics in Nuclear Physics              | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6806           | Topics in Condensed Matter Physics     | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6809           | Topics in Biophysics                   | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6810           | Topics in Computational Physics        | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
|   | Physics 6820           | Special Topics                         | 4              | Physics 780.xx                   | 4               | Enhanced content                               | 1c,7c  |
| <b>Additional Required Courses, Advanced Physics Option</b> |                        |  |                |                                  |                 |  |  |
|   | Physics 5401H          | E&M II                                 | 4              | Physics 656                      | 4               | Semester course has some of 656 and all of 657 | 1c,2c  |
|   |                        |  |                | Physics 657                      | 4               |  |  |
|   | Physics 5501H          | Quantum II                             | 4              | Physics 632                      | 4               | Semester course has some of 632 and all of 633 | 1c,2c  |
|   |                        |  |                | Physics 633                      | 4               |  |  |
|   | Physics 5600           | Statistical Physics                    | 4              | Physics 621                      | 4               | Semester course has all of 621 and some of 622 | 1c,2c  |
|   |                        |  |                | Physics 622                      | 4               |  |  |

Course Listing and Curriculum Map for the Physics Major

| Requirements   | Semester Course Number                   | Course Title          | Semester Units | Quarter Equivalent Course Number | Quarter Credits | Notes  | Relevant Learning Goals Achieved (see below) |
|--|--|-----------------------|----------------|----------------------------------|-----------------|--|--|
|  | Physics 5300                             | Theoretical Mechanics | 4              | Physics 664                      | 4               | Enhanced content   | 1c,2c  |
| <b><u>Additional Required Courses, Applied Physics Option</u></b>  |  |                       |                |                                  |                 |  |  |
|  | 1 Physics Elective From Above List       |                       | 3              | Elective                         | 4               | Same content   | Course Depend                                |
|  | 15 Credit hours from Minor, Double Major |                       | 15             |                                  | 18              | Enhanced content   | Course Depend                                |
| <b><u>Additional Required Courses, Physics Teaching Option</u></b> |  |                       |                |                                  |                 |  |  |
|  | 1 Physics Elective From Above List       |                       | 3              | Elective                         | 3               | Enhanced content   | Course Depend                                |
|  | Physics 5100                             |                       | 4              | Physics 670                      | 5               | Enhanced content   | 7c   |
|  | Bio1 1113                                |                       | 4              | Bio 113                          | 5               | Enhanced content   | 7c   |
|  | Earth Sci 1110                           |                       | 3              | Earth Sci 110                    | 3               | Same content   | 7c   |
|  | Geog 5900                                |                       | 3              | Geog 520                         | 3               | Same content   | 7c   |
|  | Astron 2191                              |                       | 3              | Astron 291                       | 3               | Same content   | 7c   |
|  | Chem 1210                                |                       | 5              | Chem 121                         | 5               | Semester sequence<br>has same content as<br>quarter sequence | 7c   |
|  | Chem 1220                                |                       | 5              | Chem 122                         | 5               |  | 7c   |
|  |  |                       |                | Chem 123                         | 5               |  | 7c   |
| <b><u>Additional Required Courses, Life Sciences Option</u></b>    |  |                       |                |                                  |                 |  |  |
|  | 1 Physics Elective From Above List       |                       | 3              | Elective                         | 4               | Same content   | Course Depend                                |
|  | Bio 1113                                 |                       | 4              | Bio 113                          | 5               | Enhanced content   | 7c   |
|  | Bio 1114                                 |                       | 4              | Bio 114                          | 5               | Enhanced content   | 7c   |
|  | Chem 1210                                |                       | 5              | Chem 121                         | 5               | Semester sequence<br>has same content as<br>quarter sequence | 7c   |
|  | Chem 1220                                |                       | 5              | Chem 122                         | 5               |  | 7c   |
|  |  |                       |                | Chem 123                         | 5               |  | 7c   |
|  | Chem 2510                                |                       | 4              | Chem 251                         | 4               | Semester sequence<br>has same content as<br>quarter sequence | 7c   |
|  | Chem 2520                                |                       | 4              | Chem 252                         | 4               |  | 7c   |
|  |  |                       |                | Chem 253                         | 4               |  | 7c   |
|  | Chem 2540                                |                       | 2              | Chem 254                         | 3               | Same content   | 7c   |
|  | Chem 2550                                |                       | 2              | Chem 255                         | 3               | Same content   | 7c   |

**Course Listing and Curriculum Map for the Physics Major**

| Requirements  | Semester Course Number | Course Title   | Semester Units | Quarter Equivalent Course Number | Quarter Credits | Notes | Relevant Learning Goals Achieved (see below) |
|---------------|------------------------|--|----------------|----------------------------------|-----------------|-------|--|
| Learning Goal | 1                      | Undergraduate Physics majors acquire a basic mastery of fundamental areas of physics, from classical mechanics, through electricity and magnetism, and finally to modern physics including quantum mechanics and relativity. |                |                                  |                 |       |  |
|               | 2                      | Undergraduate Physics majors develop powerful analytical and problem solving skills in areas involving both physics and mathematics.   |                |                                  |                 |       |  |
|               | 3                      | Undergraduate Physics majors acquire a basic mastery of experimental physics   |                |                                  |                 |       |  |
|               | 4                      | Undergraduate Physics majors acquire a basic mastery of data reduction and error analysis  |                |                                  |                 |       |  |
|               | 5                      | Undergraduate Physics majors can effectively communicate their physical understanding both professionally and colloquially (orally and in writing).  |                |                                  |                 |       |  |
|               | 6                      | Undergraduate majors are apprised of and encouraged to participate in academic research, industrial research and/or outreach activities which are consistent with their interest, ability and postgraduate plans.            |                |                                  |                 |       |  |
|               | 7                      | Undergraduate majors acquire expertise relevant to their chosen program option   |                |                                  |                 |       |  |
|               | Learning Goal Level    | a: Beginning; b: Intermediate; c: Advanced   |                |                                  |                 |       |  |

| COLLEGE OF ARTS AND SCIENCES BACHELOR OF SCIENCE: MAJOR PHYSICS   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|---|---|---|--|----------------------------|--------|---|--|----------|----|--|---------|---------------|---|----------|------------|--|---------------|---------------|--|--|--|--|--|--|--|
| Last name:  |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| First Name:   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Middle:   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| OSU ID  |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| lastname.#  |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Expected graduation   |   | (quarter)   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Additional Majors   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Additional Minors   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Have you filed a degree application in the college office? Yes ___ No ___ (NOTE: This form is NOT a degree application)   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Major Program minimum grade of "C-" required. All coursework minimum grade average of "C" (2.00).</b>  |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| INSTRUCTIONS: Put grade next to appropriate course. If course substitutions were made, cross out the relevant course and write in the substitution. Current quarter courses should be listed as "IP" below.   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Core Prerequisite Courses</b>  |   |   | <b>Physics Tech Elec</b>   | <b>Credits</b>             |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Course</b>   | <b>Credits</b>  | <b>Grade</b>  | <b>Grade</b>   | <b>Required in Options</b> |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Physics 1250  | 5   |   |  | Advanced                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Physics 1251  | 5   |   |  | Advanced                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Math 1151   | 5   |   |  | Advanced                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Math 1152   | 5   |   |  | Advanced                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| CSE 1222  | 3   |   |  | Advanced                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Math 2153   | 4   |   |  | Not required               |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Math 2174   | 3   |   |  | Not required               |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Note: Suitable honors and/or advanced versions of prerequisite courses are allowed as substitutions. Note the substitution in place of the above listed course and have the advisor initial the substitution.   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Required Core Major Courses</b>  |   |   | <b>Physics 5100</b>  | <b>Credits</b>             |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Core Physics</b>   | <b>Credits</b>  | <b>Grade</b>  | <b>Grade</b>   | <b>Required in Options</b> |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 2095  | 1   |   |  | Teaching                   |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 2300  | 4   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 2301  | 4   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 3700  | 3   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 4700  | 3   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 5400  | 4   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 5500  | 4   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| 5700  | 3   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | <b>Additional Prereq Courses</b>   | <b>Credits</b>             |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | <b>Grade</b>   | <b>Required in Options</b> |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Bio 1113   | 4                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Bio 1114   | 4                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 1210  | 5                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 1220  | 5                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Earth Sci 1110   | 3                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | <b>Additional Major Courses</b>  | <b>Credits</b>             |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | <b>Grade</b>   | <b>Required in Options</b> |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 2510  | 4                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 2520  | 4                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 2540  | 2                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Chem 2550  | 2                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Geog 5900  | 3                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | Astronomy 2191   | 3                          |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:15%;">Option</th> <th style="width:25%;">Additional Required hours beyond the above "Core Prerequisite" and "Core Major" courses</th> <th style="width:60%;"></th> </tr> </thead> <tbody> <tr> <td>Advanced</td> <td>16</td> <td>Advanced Physics option courses listed above</td> </tr> <tr> <td>Applied</td> <td>&gt;=3 plus &gt;=15</td> <td>one of Physics Tech Elec from above list (list grade above) + applied tech elecs (list below)</td> </tr> <tr> <td>Teaching</td> <td>4 + 17 + 6</td> <td>Physics 5100 + above Teaching option courses</td> </tr> <tr> <td>Life Sciences</td> <td>&gt;=3 + 18 + 12</td> <td>one of Physics Tech Elec from above list (list grade above) + above LifeSci option courses</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> |   |   |  |                            | Option | Additional Required hours beyond the above "Core Prerequisite" and "Core Major" courses |  | Advanced | 16 | Advanced Physics option courses listed above | Applied | >=3 plus >=15 | one of Physics Tech Elec from above list (list grade above) + applied tech elecs (list below) | Teaching | 4 + 17 + 6 | Physics 5100 + above Teaching option courses | Life Sciences | >=3 + 18 + 12 | one of Physics Tech Elec from above list (list grade above) + above LifeSci option courses |  |  |  |  |  |  |
| Option  | Additional Required hours beyond the above "Core Prerequisite" and "Core Major" courses |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Advanced  | 16  | Advanced Physics option courses listed above  |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Applied   | >=3 plus >=15   | one of Physics Tech Elec from above list (list grade above) + applied tech elecs (list below) |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Teaching  | 4 + 17 + 6  | Physics 5100 + above Teaching option courses  |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| Life Sciences   | >=3 + 18 + 12   | one of Physics Tech Elec from above list (list grade above) + above LifeSci option courses    |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Applied Physics Option Technical Electives</b>   |   |   | <b>Physics Major Option (Advanced, Applied, Teaching, Life Sciences)</b> _____ |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Course Name</b>  | <b>Credits</b>  | <b>Grade</b>  |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   | <b>Signature of advisor</b> _____ <b>Date</b> _____                            |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
| <b>Prereq Courses</b>   |   |   | <b>Signature of advisor</b> _____ <b>Date</b> _____                            |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |
|   |   |   |  |                            |        |   |  |          |    |  |         |               |   |          |            |  |               |               |  |  |  |  |  |  |  |





## 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. Transition plans are currently being developed for students who will be at a variety of different stages (one year towards degree, two years, etc.). We do not at present see a need for bridge courses in Physics for any students who are beyond the introductory (i.e. first year) Physics classes. However, bridge courses (1-2 credit semester hours) in Mathematical Methods in Physics are being considered for Physics majors who may be somewhat behind in math preparation due to the transition. Bridge courses will be available for students who have completed part of the 3-quarter introductory sequence in either of our service courses in Physics (i.e. Physics 111-2-3 or 131-2-3). The bridge courses will be offered during the summer prior and first year after the transition. They may be offered the 2nd year after the transition.

To address the details of how students who have credits under both semesters and quarters will graduate, we have implemented a “Quarters to Semesters Transition Advising Worksheet”, which will be filled out for every physics major who will graduate with physics courses accumulated under both quarters and semesters.. The basic strategy is to combine credit hours accumulated under quarters, semesters, or both, in broad categories. The credit hours under quarters are weighted by 0.67, summed with semester hours for that same category, and compared to a minimum for that category. In addition, minima are defined for overall hours summed among groups of categories. The minima are chosen so that students are not penalized for course sequences taken partially under quarters and completed under semesters, while ensuring that the requirements of the program are still met.

**This worksheet will be filled out for every Physics Major** as part of the requirements for Physics 295 (or Physics 2095 under semesters), a course all Physics majors take in the first quarter (or first semester) of their second (sophomore) year in the Physics program. **Students who are in Physics 295 in Autumn 2010 are the first group of students expected to graduate under semesters, and we have devoted approximately 20% of our available class time to discussing the semester transition alone.** We are confident that this **individual attention to every physics major who will graduate under semesters** will ensure a smooth transition from quarters to semesters.

As an added help, we have put together a website available for students which has both a description of the changes involved in moving from quarters to semesters, as well as sample plans for the majority of our students. The sample plans include examples for students with the following mix of years under quarters and semesters: (3Q1S, meaning 3 Quarters and 1 Semester), (2Q2S), (1Q3S), and of course (0Q4S). The website is:

<http://www.physics.ohio-state.edu/undergrad/majorSemesters.php>

We have 1 full time staff member and 1 faculty member who are charged with providing advising to all Physics majors. Sample transition plans for all students will be made up by the first quarter (or semester) of their second year in the program (usually the sophomore year), and kept on file. As long as students stick to these plans we do not anticipate any impediment to their graduation date. Students will be encouraged to seek advising help if they change their plans in any significant way.

## **Undergraduate Physics Major Program Supplemental Material**

The following pages contain supplemental material for the conversion of the Undergraduate Physics Major from quarters to semesters:

1. (1 page) An example curriculum plan for a student who spends their first 2 years in the Physics major under quarters, and the final two years under semesters.
2. (4 pages) For this same student, the result of the “Quarters to Semesters Transition Advising Worksheet” which helps the student and advisor confirm that the student has satisfied the program requirements.
3. (4 pages) There are then 4 sample semester plans, one for each of the 4 options we will have for the Physics Major under semesters.

Example Curriculum; 2 years under quarters, plus 2 years under semesters.

**Advanced Physics specialization: This specialization is designed for those intending graduate level (Ph.D.) studies in physics. It provides an excellent preparation for graduate school in physics. Assumes 2 years under quarters and 2 years under semesters.**

| Year   | Autumn Quarter      | Credit Hours | Comment      | Winter Quarter     | Credit Hours | Comment          | Spring Quarter          | Credit Hours | Comment          |
|--|---------------------|--------------|--------------|--------------------|--------------|------------------|-------------------------|--------------|------------------|
| 2010-2011  | Physics H131        | 5            | Honors Intro | Physics H132       | 5            |                  | Physics H133            | 5            | Honors Intro     |
|  | Math 150            | 5            | Calc         | Math 151           | 5            |                  | Math 152                | 5            | Calc             |
|  | GEC                 | 5            | GEC          | Bio 113            | 5            | GEC              | CSE 202                 | 4            | Prereq           |
|  | <b>Quarter Sum</b>  | <b>15</b>    |              | <b>Quarter Sum</b> | <b>15</b>    |                  | <b>Quarter Sum</b>      | <b>14</b>    |                  |
| 2011-2012  | Physics 261         | 4            |              | Physics 262        | 4            |                  | Physics 263             | 4            |                  |
|  | Physics 295         | 1            | Survey       | Math 415           | 4            | Diffeq, GEC Open | Physics 416             | 4            | Data Ana Lab     |
|  | Math 254            | 5            | Calc III     | GEC                | 5            | GEC              | Math 568                | 3            | LinAlg, GEC Open |
|  | GEC                 | 5            | GEC          | GEC                | 5            | GEC              | GEC                     | 5            | GEC              |
|  | <b>Quarter Sum</b>  | <b>15</b>    |              | <b>Quarter Sum</b> | <b>18</b>    |                  | <b>Quarter Sum</b>      | <b>16</b>    |                  |
|  |                     |              |              |                    |              |                  | <b>Total Qtr Hours:</b> | <b>93</b>    |                  |
| Year   | Autumn Semester     | Credit Hours | Comment      |                    |              |                  | Spring Semester         | Credit Hours | Comment          |
| 2012-2013  | Physics 5500H       | 4            | Quantum      |                    |              |                  | Physics 5501H           | 4            | Quantum          |
|  | Physics 5400H       | 4            | E&M          |                    |              |                  | Physics 5401H           | 4            | E&M              |
|  | GE                  | 3            | GE           |                    |              |                  | Physics 4700            | 3            | Elec Lab         |
|  | GE                  | 3            | GE           |                    |              |                  | GE                      | 4            | GE               |
|  | <b>Semester Sum</b> | <b>14</b>    |              |                    |              |                  | <b>Semester Sum</b>     | <b>15</b>    |                  |
| 2013-2014  | Physics 5600        | 4            | StatMech     |                    |              |                  | Physics 5700            | 3            | Adv Lab          |
|  | GE                  | 4            | GE           |                    |              |                  | Physics 5300            | 4            | Theor Mechanics  |
|  | Free Elective       | 3            | Free         |                    |              |                  | GE                      | 4            | GE               |
|  | GE                  | 3            | GE           |                    |              |                  | Free Elective           | 3            | Free             |
|  | Free Elective       | 2            |              |                    |              |                  |                         |              |                  |
|  | <b>Semester Sum</b> | <b>16</b>    |              |                    |              |                  | <b>Semester Sum</b>     | <b>14</b>    |                  |
|  |                     |              |              |                    |              |                  | <b>Total SemHours:</b>  | <b>59</b>    |                  |
|  |                     |              |              |                    |              |                  | <b>Total Hours:</b>     | <b>121</b>   |                  |
| <b>Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GEC/GE requirements.</b> |                     |              |              |                    |              |                  |                         |              |                  |



| Topic Area                                     | Course Name                           | Quarter/<br>Semester<br>Planned | QCH =<br>Quarter<br>Credit<br>Hours | CQH =<br>0.67*QCH | SCH =<br>Semester<br>Credit<br>Hours | CQH+SCH | Minimum<br>Required | Excess<br>Over<br>Minimum |
|--|---------------------------------------|---------------------------------|-------------------------------------|-------------------|--------------------------------------|---------|---------------------|---------------------------|
| <b>Introductory Math</b>                       | Math 151                              | Au2010                          | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
|  | Math 152                              | Wi2011                          | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
|  | Math 153                              | Sp2011                          | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
|  | Math 1151                             |                                 |                                     |                   |                                      | 0       |                     |                           |
|  | Math 1152                             |                                 |                                     |                   |                                      | 0       |                     |                           |
| <b>Advanced Math</b>                           | Math 254                              | Au2010                          | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
|  | Math 415                              | Wi2012                          | 4                                   | 2.668             |                                      | 2.668   |                     |                           |
|  | Math 513/551 or<br>568/571            | Sp2012                          | 3                                   | 2.001             |                                      | 2.001   |                     |                           |
|  | Math 2153                             |                                 |                                     |                   |                                      | 0       |                     |                           |
|  | Math 2174                             |                                 |                                     |                   |                                      | 0       |                     |                           |
| <b>Total Math:</b>                             |                                       |                                 |                                     |                   | Total Math Sum=                      | 18.009  | >=16                |                           |
| <b>Computing</b>                               | CSE 202                               | Sp2011                          | 4                                   | 2.668             |                                      | 2.668   |                     |                           |
|  | CSE 1222                              |                                 |                                     |                   |                                      | 0       |                     |                           |
|  |                                       |                                 |                                     |                   | Total Computing Sum=                 | 2.668   | >=2                 |                           |
| <b>GEC: Each Topic Area must be fulfilled:</b> | Double counting allowed per GEC rules |                                 |                                     |                   |                                      |         |                     |                           |
| <b>GEC Writing 1</b>                           | Course:                               | Wi2012                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Writing 2</b>                           | Course:                               | Sp2012                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Soc Sci 1</b>                           | Course:                               | Wi2012                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Lit</b>                                 | Course:                               | Au2011                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Hist Stud</b>                           | Course:                               | Au2010                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Bio</b>                                 | Course:                               | Wi2011                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Open 1</b>                              | Course:                               | Wi2012                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Open 2</b>                              | Course:                               | Sp2012                          |                                     | 0                 | 3                                    | 3       |                     |                           |
| <b>GEC Arts</b>                                | Course:                               | <b>Au2013</b>                   | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
| <b>GEC Culture</b>                             | Course:                               | <b>Au2012</b>                   | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
| <b>GEC Soc Sci 2</b>                           | Course:                               | <b>Au2012</b>                   | 5                                   | 3.335             |                                      | 3.335   |                     |                           |
| <b>GEC Lang1</b>                               | Course:                               | <b>Sp2013</b>                   |                                     | 0                 | 4                                    | 4       |                     |                           |
| <b>GEC Lang2</b>                               | Course:                               | <b>Au2013</b>                   |                                     | 0                 | 4                                    | 4       |                     |                           |
| <b>GEC Lang3</b>                               | Course:                               | <b>Sp2014</b>                   |                                     | 0                 | 4                                    | 4       |                     |                           |
| <b>GEC Lang4</b>                               | Course:                               |                                 |                                     | 0                 |                                      | 0       |                     |                           |
| <b>Total Lang:</b>                             |                                       |                                 |                                     |                   | Total Lang Sum=                      | 12      | >=12                |                           |
| <b>Total GEC:</b>                              |                                       |                                 |                                     |                   | Total GEC Sum=                       | 46.005  | >=45                |                           |





**Advanced Physics specialization: This specialization is designed for those intending graduate level (Ph.D.) studies in physics. It provides an excellent preparation for graduate school in physics.**

| Year                | Autumn              | Credit Hours | Comment             | Spring              | Credit Hours | Comment          |
|---------------------|---------------------|--------------|---------------------|---------------------|--------------|------------------|
| 2012-2013           | Physics 1250H       | 5            | Honors Intro        | Physics 1251H       | 5            | Honors Intro     |
|                     | Math 1151           | 5            | Calc                | Math 1152           | 5            | Calc             |
|                     | GE                  | 3            | GE                  | GE                  | 3            | GE               |
|                     | CSE 1222            | 3            | Prereq              | Bio 1113            | 4            | GE               |
|                     | <b>Semester Sum</b> | <b>16</b>    |                     | <b>Semester Sum</b> | <b>17</b>    |                  |
| 2013-2014           | Physics 2300        | 4            | 26x conv            | Physics 2301        | 4            | 26x conv         |
|                     | Physics 2095        | 1            | Survey              | Physics 3700        | 3            | Data Ana Lab     |
|                     | Math 2153           | 4            | GE                  | Math 2174           | 3            | GE               |
|                     | GE                  | 3            | GE                  | GE                  | 3            | GE               |
|                     | GE                  | 3            | GE                  | GE                  | 3            | GE               |
| <b>Semester Sum</b> | <b>15</b>           |              | <b>Semester Sum</b> | <b>16</b>           |              |                  |
| 2014-2015           | Physics 5500H       | 4            | Quantum             | Physics 5501H       | 4            | Quantum          |
|                     | Physics 5400H       | 4            | E&M                 | Physics 5401H       | 4            | E&M              |
|                     | GE                  | 3            | GE                  | Physics 4700        | 3            | Elec Lab         |
|                     | GE                  | 3            | GE                  | GE                  | 4            | GE               |
|                     | <b>Semester Sum</b> | <b>14</b>    |                     | <b>Semester Sum</b> | <b>15</b>    |                  |
| 2015-2016           | Physics 5600        | 4            | StatMech            | Physics 5300        | 4            | TheoretMechanics |
|                     | GE                  | 4            | GE                  | Physics 5700        | 3            | Adv Lab          |
|                     | Free Elective       | 3            | Free                | GE                  | 4            | GE               |
|                     | Free Elective       | 3            | Free                | Free Elective       | 3            | Free             |
|                     | <b>Semester Sum</b> | <b>14</b>    |                     | <b>Semester Sum</b> | <b>14</b>    |                  |
|                     |                     |              |                     | <b>Total Hours:</b> | <b>121</b>   |                  |

Courses in **BLUE** can only be scheduled by Robin Wyatt ([wyatt.60@osu.edu](mailto:wyatt.60@osu.edu))

Courses in **YELLOW** are only offered in the quarter/semester shown.

**GE:** We assume there are 11 GE category requirements that physics majors will have to satisfy, beyond those satisfied as part of their major. These are: 2 writing, 1 bio, 1 Lit, 1 Arts 1 Hist, 2 Soc, 1 Cult or Hist, 2 Open (we use upper division Math for this), plus Language. Language is a 3 4-credit hour courses under semesters. Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GE requirements.



**Applied Physics specialization: This specialization is a flexible program that combines a strong foundation in physics with a set of technical electives designed for those with special interests. The program of technical electives could include courses of study from other programs in the Colleges of Mathematical and Physical Sciences, or Engineering, or other programs such as meteorology, economics, history of science, or primary education. Courses utilized in pursuit of a minor, additional major, or dual degree are acceptable and encouraged. A minimum of 15 semester credit hours is required.**

| Year | Autumn              | Credit Hours | Comment           | Spring              | Credit Hours        | Comment          |
|------|---------------------|--------------|-------------------|---------------------|---------------------|------------------|
| 1    | Physics 1250        | 5            | Intro             | Physics 1251        | 5                   | Intro            |
|      | Math 1151           | 5            | Calc              | Math 1152           | 5                   | Calc             |
|      | GE                  | 3            | GE                | GE                  | 3                   | GE               |
|      | CSE 1222            | 3            | Prereq            | Bio 1113            | 4                   | GE               |
|      | <b>Semester Sum</b> | <b>16</b>    |                   | <b>Semester Sum</b> | <b>17</b>           |                  |
| 2    | Physics 2300        | 4            | 26x conv          | Physics 2301        | 4                   | 26x conv         |
|      | Physics 2095        | 1            | Survey            | Math 2174           | 3                   | GE               |
|      | Math 2153           | 4            | GE                | Physics 3700        | 3                   | Data Ana Lab     |
|      | Minor Elective      | 4            | Applied Spec Req  | Minor Elective      | 4                   | Applied Spec Req |
|      | GE                  | 3            | GE                | GE                  | 3                   | GE               |
|      | <b>Semester Sum</b> | <b>16</b>    |                   | <b>Semester Sum</b> | <b>17</b>           |                  |
| 3    | Physics 5500        | 4            | Quantum           | Physics 4700        | 3                   | Elec Lab         |
|      | Physics 5400        | 4            | E&M               | Minor Elective      | 3                   | Applied Spec Req |
|      | Minor Elective      | 4            | Applied Spec Req  | GE                  | 4                   | GE               |
|      | GE                  | 3            | GE                | Free Elective       | 3                   | Free             |
|      | <b>Semester Sum</b> | <b>15</b>    |                   | <b>Semester Sum</b> | <b>13</b>           |                  |
| 4    | Physics Elec        | 3            | Required Elective | Physics 5700        | 3                   | Adv Lab          |
|      | GE                  | 3            | GE                | GE                  | 3                   | GE               |
|      | GE                  | 4            | GE                | GE                  | 3                   | GE               |
|      | Free Elective       | 4            | Free Elective     | GE                  | 4                   | GE               |
|      | <b>Semester Sum</b> | <b>14</b>    |                   | <b>Semester Sum</b> | <b>13</b>           |                  |
|      |                     |              |                   |                     | <b>Total Hours:</b> | <b>121</b>       |

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Courses in **YELLOW** are only offered in the quarter/semester shown.

**GE: We assume there are 11 GE category requirements that physics majors will have to satisfy, beyond those satisfied as part of their major. These are: 2 writing, 1 bio, 1 Lit, 1 Arts 1 Hist, 2 Soc, 1 Cult or Hist, 2 Open (we use upper division Math for this), plus Language. Language is a 3 4-credit hour courses under semesters. Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GE requirements.**

**Physics and Life Sciences specialization: This specialization is designed for those intending to attend medical school. It satisfies all of the OSU medical school admission requirements, when combined with the required physics and math courses in the physics core curriculum.**

| Year   | Autumn              | Credit Hours   | Comment             | Spring              | Credit Hours | Comment             |
|--|---------------------|--|---------------------|---------------------|--------------|---------------------|
| 2012-2013  | Physics 1250        | 5  | Intro               | Physics 1251        | 5            | Intro               |
|  | Math 1151           | 5  | Calc                | Math 1152           | 5            | Calc                |
|  | Bio 1113            | 4  | GE                  | GE                  | 3            | GE                  |
|  | CSE 1222            | 3  | Prereq              | Bio 1114            | 4            | premed              |
|  | <b>Semester Sum</b> | <b>17</b>  |                     | <b>Semester Sum</b> | <b>17</b>    |                     |
| 2013-2014  | Physics 2300        | 4  | 26x conv            | Physics 2301        | 4            | 26x conv            |
|  | Physics 2095        | 1  | Survey              | Math 2174           | 3            | GE                  |
|  | GE                  | 3  | GE                  | Chem 1220           | 5            | Premed              |
|  | Math 2153           | 4  | GE                  | Physics 3700        | 3            | Data Ana Lab        |
|  | Chem 1210           | 5  | Premed              |                     |              |                     |
|  | <b>Semester Sum</b> | <b>17</b>  |                     | <b>Semester Sum</b> | <b>15</b>    |                     |
| 2014-2015  | Physics 5500        | 4  | Quantum             | Physics 4700        | 3            | Elec Lab            |
|  | Physics 5400        | 4  | E&M                 | Chem 2520           | 4            | Premed              |
|  | Chem 2510           | 4  | premed              | Chem 2550           | 2            | Premed              |
|  | Chem 2540           | 2  | premed              | GE                  | 3            | GE                  |
|  | GE                  | 3  | GE                  | GE                  | 4            | GE                  |
|  | <b>Semester Sum</b> | <b>17</b>  |                     | <b>Semester Sum</b> | <b>16</b>    |                     |
| 2015-2016  | Physics Elec        | 4  | Required Elective   | Physics 5700        | 3            | Adv Lab             |
|  | GE                  | 4  | GE                  | GE                  | 4            | GE                  |
|  | GE                  | 3  | GE                  | GE                  | 3            | GE                  |
|  | GE                  | 3  | GE                  | GE                  | 3            | GE                  |
|  | Biochem 4511        | 4  | Premed              | Anatomy 199         | 3            | Premed: recommended |
|  | <b>Semester Sum</b> | <b>18</b>  |                     | <b>Semester Sum</b> | <b>16</b>    |                     |
|  |                     |  | <b>Total Hours:</b> | <b>133</b>          |              |                     |
| Students will be advised to seek input from a pre-med advisor when selecting courses labeled "Premed".   |                     |  |                     |                     |              |                     |
|  |                     | Courses in <b>BLUE</b> can only be scheduled by Robin Wyatt ( <a href="mailto:wyatt.60@osu.edu">wyatt.60@osu.edu</a> ) |                     |                     |              |                     |
|  |                     | Courses in <b>YELLOW</b> are only offered in the quarter/semester shown.   |                     |                     |              |                     |
| <p><b>GE: We assume there are 11 GE category requirements that physics majors will have to satisfy, beyond those satisfied as part of their major. These are: 2 writing, 1 bio, 1 Lit, 1 Arts 1 Hist, 2 Soc, 1 Cult or Hist, 2 Open (we use upper division Math for this), plus Language. Language is a 3 4-credit hour courses under semesters. Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GE requirements.</b></p> |                     |  |                     |                     |              |                     |

**Physics teaching specialization: This specialization is designed for those seeking secondary level certification in physics (i.e., to be a high school teacher). It is intended to satisfy College of Education Master of Education (Physics Certification) curriculum.**

| Year      | Autumn              | Credit Hours | Comment      | Spring              | Credit Hours        | Comment    |
|-----------|---------------------|--------------|--------------|---------------------|---------------------|------------|
| 2012-2013 | Physics 1250        | 5            | Intro        | Physics 1251        | 5                   | Intro      |
|           | Math 1151           | 5            | Calc         | Math 1152           | 5                   | Calc       |
|           | GE                  | 3            | GE           | Bio 1113            | 4                   | GE         |
|           | GE                  | 3            | GE           | CSE 1222            | 3                   | Prereq     |
|           | <b>Semester Sum</b> | <b>16</b>    |              | <b>Semester Sum</b> | <b>17</b>           |            |
| 2013-2014 | Physics 2300        | 4            | 26x conv     | Physics 2301        | 4                   | 26x conv   |
|           | Physics 2095        | 1            | Survey       | Math 2174           | 3                   | GE         |
|           | Physics 3700        | 3            | Data Ana Lab | GE                  | 3                   | GE         |
|           | Math 2153           | 4            | GE           | GE                  | 3                   | GE         |
|           | GE                  | 3            | GE           | Free Elective       | 3                   | Free       |
|           | <b>Semester Sum</b> | <b>15</b>    |              | <b>Semester Sum</b> | <b>16</b>           |            |
| 2014-2015 | Physics 5500        | 4            | Quantum      | Physics 4700        | 3                   | Elec Lab   |
|           | Physics 5400        | 4            | E&M          | GE                  | 4                   | GE         |
|           | GE                  | 4            | GE           | Geog 5900           | 3                   | MsEd       |
|           | Earth Sci 1110      | 3            | MsEd         | Astro 2191          | 3                   | MsEd       |
|           | <b>Semester Sum</b> | <b>15</b>    |              | <b>Semester Sum</b> | <b>13</b>           |            |
| 2015-2016 | Physics 5100        | 4            | MsEd         | Physics 5700        | 3                   | Adv Lab    |
|           | GE                  | 4            | GE           | GE                  | 3                   | GE         |
|           | GE                  | 3            | GE           | GE                  | 3                   | GE         |
|           | Chem 1210           | 5            | MsEd         | Chem 1220           | 5                   | MsEd       |
|           | <b>Semester Sum</b> | <b>16</b>    |              | <b>Semester Sum</b> | <b>14</b>           |            |
|           |                     |              |              |                     | <b>Total Hours:</b> | <b>122</b> |

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**GE:** We assume there are 11 GE category requirements that physics majors will have to satisfy, beyond those satisfied as part of their major. These are: 2 writing, 1 bio, 1 Lit, 1 Arts 1 Hist, 2 Soc, 1 Cult or Hist, 2 Open (we use upper division Math for this), plus Language. Language is a 3 4-credit hour courses under semesters. Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GE requirements.

| <b>Advanced Physics Specialization<br/>(Option A under quarters)</b> |  |   |  |                                  |
|--|--|---|--|----------------------------------|
| <b>Program Credit hour Requirements</b>                              | <b>A) Number of credit hours in current program (Quarter credit hours)</b> | <b>B) Calculated result for 2/3rds of current (Semester credit hours)</b> | <b>C) Number of credit hours required for proposed program (Semester credit hours)</b> | <b>D) Change in Credit hours</b> |
| <b>Total minimum credit hours required for completion of</b>         | 67   | 44.7  | 42   | -2.7                             |
| <b>Minimum required credit hours offered by the unit</b>             | 64   | 42.7  | 42   | -0.7                             |
| <b>Minimum required credit hours offered outside the unit</b>        | 3  | 2.0   | 0  | -2.0                             |
| <b>Minimum required prerequisite credit hours not included above</b> | 46   | 30.7  | 30   | -0.7                             |

| <b>Applied Physics Specialization<br/>(Option F under quarters)</b>  |  |   |  |                                  |
|--|--|---|--|----------------------------------|
| <b>Program Credit hour Requirements</b>                              | <b>A) Number of credit hours in current program (Quarter credit hours)</b> | <b>B) Calculated result for 2/3rds of current (Semester credit hours)</b> | <b>C) Number of credit hours required for proposed program (Semester credit hours)</b> | <b>D) Change in Credit hours</b> |
| <b>Total minimum credit hours required for completion of</b>         | 58   | 38.7  | 44   | 5.3                              |
| <b>Minimum required credit hours offered by the unit</b>             | 40   | 26.7  | 29   | 2.3                              |
| <b>Minimum required credit hours offered outside the unit</b>        | 18   | 12.0  | 15   | 3.0                              |
| <b>Minimum required prerequisite credit hours not included above</b> | 46   | 30.7  | 30   | -0.7                             |

| <b>Life Sciences Specialization<br/>(Option D under quarters)</b>    |  |   |  |                                  |
|--|--|---|--|----------------------------------|
| <b>Program Credit hour Requirements</b>                              | <b>A) Number of credit hours in current program (Quarter credit hours)</b> | <b>B) Calculated result for 2/3rds of current (Semester credit hours)</b> | <b>C) Number of credit hours required for proposed program (Semester credit hours)</b> | <b>D) Change in Credit hours</b> |
| <b>Total minimum credit hours required for completion of</b>         | 54   | 36.0  | 41   | 5.0                              |
| <b>Minimum required credit hours offered by the unit</b>             | 36   | 24.0  | 29   | 5.0                              |
| <b>Minimum required credit hours offered outside the unit</b>        | 18   | 12.0  | 12   | 0.0                              |
| <b>Minimum required prerequisite credit hours not included above</b> | 71   | 47.3  | 48   | 0.7                              |

| <b>Teaching Physics Specialization<br/>(Option E under quarters)</b> |  |   |  |                                  |
|--|--|---|--|----------------------------------|
| <b>Program Credit hour Requirements</b>                              | <b>A) Number of credit hours in current program (Quarter credit hours)</b> | <b>B) Calculated result for 2/3rds of current (Semester credit hours)</b> | <b>C) Number of credit hours required for proposed program (Semester credit hours)</b> | <b>D) Change in Credit hours</b> |
| <b>Total minimum credit hours required for completion of</b>         | 51   | 34.0  | 36   | 2.0                              |
| <b>Minimum required credit hours offered by the unit</b>             | 41   | 27.3  | 30   | 2.7                              |
| <b>Minimum required credit hours offered outside the unit</b>        | 10   | 6.7   | 6  | -0.7                             |
| <b>Minimum required prerequisite credit hours not included above</b> | 71   | 47.3  | 47   | -0.3                             |