

**DEGREE/PROGRAM CHANGE  
FORM C  
Form Number: C1423**

Fields marked with \* are required

**Name of Initiator:** Ylva M Pihlstrom    **Email:** [ylva@unm.edu](mailto:ylva@unm.edu)    **Phone Number:** 505 277-4492    **Date:** 09-04-2014

Associated Forms exist? Yes  Initiator's Title Associate Professor: Physics Astronomy Department  
Faculty Contact Ylva Pihlstrom    Administrative Contact Lina Sandve  
Department Physics and Astronomy    Admin Email lsandve@unm.edu  
**Branch**    Admin Phone 277-1516

**Proposed effective term**

Semester Fall  Year 2015

**Course Information**

Select Appropriate Program Graduate Degree Program   
Name of New or Existing Program Ph.D. in Physics with a concentration in Astrophysics  
Select Category Concentration  Degree Type Ph.D.  
Select Action New

Exact Title and Requirements as they should appear in the catalog. If there is a change, upload current and proposed requirements.

See current catalog for format within the respective college (upload a doc/pdf file)

[phdcat.txt](#)

**Does this change affect other departmental program/branch campuses? If yes, indicate below.**

Reason(s) for Request (enter text below or upload a doc/pdf file)

We want to create a concentration in Astrophysics within the Physics M.S. and Ph.D. program.

Upload a document that includes justification for the program, impact on long-range planning, detailed budget analysis and faculty workload implications.(upload a doc/pdf file)

[phdjust.txt](#)

[PhDAssessment.pdf](#)

**Are you proposing a new undergraduate degree or new undergraduate certificate? If yes, upload the following documents.**

Upload a two-page Executive Summary authorized by Associate Provost. (upload a doc/pdf file)

Upload memo from Associate Provost authorizing go-ahead to full proposal. (upload a doc/pdf file)

Ph.D. in Physics with a concentration in Astrophysics

The Doctor of Philosophy in Physics with a concentration in Astrophysics requires a minimum of 48 semester hours of graduate work exclusive of dissertation. These hours must include ASTR 536 and 537, the choice of three from PHYC 466, 505, 511 and 521, and four electives of which the following are recommended: ASTR 526, 538, 539 and PHYC 581 when the topic is Cosmology or High Energy Astrophysics. Details must be discussed with a graduate advisor each semester.

phdjust.txt

The Astrophysics concentration is motivated by a goal to create a program that is well aligned with the career goals of Astrophysics students. With a stronger emphasis on astrophysics background in their education, they will be better prepared for their following careers. The creation of an Astrophysics concentration also intends to raise our graduate program profile for students within astrophysics, thereby attracting more, and higher quality astrophysics students to UNM.

The required courses for the concentration already exist, and they are also being taught with the necessary frequency for the proposed concentration. The required classes can thus be completed on the same timescale as for the existing degrees with the same student workload.

Our current Physics PhD program contains four preliminary exams covering undergraduate physics (thermodynamics and statistical mechanics (SM), electricity and magnetism (EM), classical mechanics (CM) and quantum mechanics (QM)) that the students have to pass at 60% level in no more than six sittings. Similarly, the Astrophysics Concentration will require the students to pass four preliminary exams, one within the subject of astrophysics, and the choice of three out of the four SM, EM, CM and QM preliminary exams. The new astrophysics preliminary exam will be prepared and graded by a subcommittee of the astronomy faculty, and is considered a small addition to the present faculty workload. The workload will be rotated amongst the astronomy faculty members.

Students taking the Astrophysics concentration will exit with a PhD degree in Physics, and to ensure that they graduate with a sufficient level of knowledge and exposure to the important physics topics of classical mechanics and quantum mechanics, we will require incoming students to take one semester of undergraduate courses in these subjects (PHYC 491 and/or PHYC 303) unless they have not taken equivalent courses previously.

It is important the new concentration will be assessed properly, and we intend to follow the same assessment procedures as for our existing degrees (see attached pdf named PhDAssessment.pdf).

Budget and faculty workload: The formation of the concentration will not have an effect on the Department's overall budget and/or the total number of graduate students in physics. Other than a minor addition of preparing preliminary exams in astrophysics, there is no significant effect on the workload of the faculty as the required and elective courses already exist and are being taught frequently within the program.

**Template  
Academic Program  
Assessment of Student Learning Plan  
University of New Mexico**

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Instructions:

This template is a suggested guideline for creating three-year plans to assess academic program-level student learning outcomes. The order and format of the information does *not* need to follow the template exactly. Alternative formats (e.g., those used by specialized accreditors) may be acceptable; please check first with the Office of the Provost.\* Regardless of whether you complete the template or use an approved alternate format, the six key sets of questions (D1-D2 and E1-E4) do need to be addressed in the three-year assessment plan.

Please transmit Degree Program Assessment Plans electronically when possible.

\*If you have any questions, please contact the Assessment Office at [assess@unm.edu](mailto:assess@unm.edu) or 277-4130.

Template  
Academic Program  
Plan for Assessment of Student Learning Outcomes  
The University of New Mexico

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**A. College, Department and Date**

1. College: Arts and Science
2. Department: Physics and Astronomy
3. Date: May 1, 2009

**B. Academic Program of Study\***

*PhD Physics*

**C. Contact Person(s) for the Assessment Plan**

*Dinesh Loomba, Associate Professor, Graduate Committee Chair, dloomba@unm.edu*

**D. Broad Program Goals & Measurable Student Learning Outcomes**

*[Attach Cover Sheet for Student Learning Outcomes and associated materials.]*

OR

*[List below:]*

**1. Broad Program Learning Goals for this Degree/Certificate Program**

- A. *Physics knowledge.* Students have a solid foundation of advanced knowledge in broad areas of physics.
- B. *Ability to conduct independent research.* Students are able to conduct independent research in commercial, government and academic settings.

**2. List of Student Learning Outcomes (SLOs) for this Degree/Certificate Program**

- A.1. Students have a thorough grasp of undergraduate physics
- A.2. Students are experts in some particular field of physics
  
- B.1. Students are able to make professional written and oral presentations of research results
- B.2. Students can conduct independent and original scientific research that meets international standards

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\* Academic Program of Study is defined as an approved course of study leading to a certificate or degree reflected on a UNM transcript. A graduate-level program of study typically includes a capstone experience (e.g. thesis, dissertation, professional paper or project, comprehensive exam, etc.).

**E. Assessment of Student Learning Three-Year Plan**

All programs are expected to measure some outcomes annually and to measure all priority program outcomes at least once over two consecutive three-year review cycles. Describe below the plan for the next three years of assessment of program-level student learning outcomes.

**1. Student Learning Outcomes**

*[Insert at least 2-5 priority learning outcomes that will be assessed by the unit over the next three years. Each unit will select which of its learning outcomes to assess.]*

Relationship to UNM Student Learning Goals (insert the program SLOs and check all that apply):

<b>University of New Mexico Student Learning Goals</b>				
<b>Program SLOs</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Responsibility</b>	<b>Program SLO is conceptually different from university goals.</b>
A.1. Students have to pass a written exam that tests advanced undergraduate physics in the areas of Classical Mechanics, Quantum Physics, Electromagnetism and Thermodynamics. The exams are given at the beginning of each semester by the exam committee. The exam scores are archived.	X	X	X	
A.2. Students have to pass a candidacy exam where they must show competency in a particular area of physics or astronomy in which they intend to pursue a PhD. The exam consists of an oral presentation and a question and answer section. The results are documented by the student's candidacy examination committee and become part of the student's file. The students will be examined in the categories listed in Appendix 1.	X	X	X	
B.1. The dissertation committee evaluates the written and the oral presentation and submits evaluation sheets (see Appendix 2).	X	X	X	
B.2. Students have to complete a research project and produce results that can be published in a scientific journal. No later than one year after the thesis defense a paper should be	X	X	X	

<p>submitted. Students must write a dissertation and publicly defend it. The dissertation committee evaluates the written and the oral presentation and submits evaluation sheets (see Appendix 2).</p>				
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**2. How will learning outcomes be assessed?**

A. What:

- i. *For each SLO, briefly describe the means of assessment, i.e., what samples of evidence of learning will be gathered or measures used to assess students' accomplishment of the learning outcomes in the three- year plan?*

All SLOs are assessed in each of the three assessment tools described here. These are based on tools we already employ or have recently employed for our own assessment purposes. They focus, in turn, on narrower course-specific, broader programmatic, and more practical, post-degree educational (and employment) goals, although there is some overlap. Obviously, significant and valuable assessment of our programs and students is carried out in other formal and informal ways less well matched to the University's current assessment effort. The forms used are included as Appendices.

- Students are advised each semester and remedial undergraduate course work is recommended if necessary. Students can transfer to the MS degree program (thesis or non-thesis option) if the exam is not passed at the PhD level.
- Members of the examination committee for the candidacy exam must fill out a standard form that evaluates the student performance. Annually the graduate committee summarizes these evaluations and discusses the results to initiate changes in our curriculum and advisement procedures if necessary.
- Members of the dissertation committee must fill out a standard form that evaluates the student performance during the PhD defense. Annually the graduate committee summarizes these evaluations and provides feedback and recommendations to the faculty.

- ii. *Indicate whether each measure is **direct** or **indirect**. If you are unsure, then write "Unsure of measurement type." There is an expectation that at least **half of the assessment methods/measures will be direct** measures of student learning. [See attached examples of direct and indirect measures.]*

Instructor reports and the preliminary (written) exam, candidacy exam and dissertation defense results are direct assessment and form the majority of our assessment effort. Exit Interviews are indirect.

- iii. *Briefly describe the **criteria for success** related to each direct or indirect means of assessment. What is the program's performance target (e.g., is an "acceptable or better" performance by 60% of students on a given measure acceptable to the program faculty)? If scoring rubrics are used to define*

*qualitative criteria and measure performance, attach them to the plan as they are available.*

To create an assessment report, the Department's Graduate Committee (GC) will synthesize the results from the tools described above. For example, as we have already been doing for several years, we get direct feedback on how the students perform on the written prelim exams. This information is used by graduate advisors to tailor student curricula in order to fill gaps in their knowledge uncovered by the exam. The graduate committee also receives feedback on how well students are performing in their core courses during the semester and this too is used in tailoring their curriculum.

Exit Interviews will be analyzed to determine, for example, how many of our PhDs go into academic positions (e.g. Postdocs) versus industry. Feedback from the students as to the quality of the program will also continue to be synthesized.

- B. Who: State explicitly whether the program's assessment will include evidence from all students in the program or a sample. Address the validity of any proposed sample of students.

For prelim exams, the group will include students in their first 2.5 years in the program. For the candidacy exam it will include all students who successfully passed their prelim exams and remained in the program. For Exit Interviews, from all students graduating with a PhD.

**3. When will learning outcomes be assessed? When and in what forum will the results of the assessment be discussed?**

*[Briefly describe the timeframe over which your unit will conduct the assessment of learning outcomes selected for the three-year plan. For example, provide a layout of the semesters or years (e.g., 2008-2009, 2009-2010, and 2010-2011), list which outcomes will be assessed, and which semester/year the results will be discussed and used to improve student learning (e.g., discussed with program faculty, interdepartmental faculty, advisory boards, students, etc.)]*

The GC will be the body responsible for collecting the assessment reports and analyzing them to identify problem areas that may point to a change in the degree program; major changes will be recommended by the GC to the full faculty for approval. The information will be reviewed, a summary report written, and this report presented to the faculty on 3 year timescales. In this way, a positive feedback loop is maintained.

**4. What is the unit's process to analyze/interpret assessment data and use results to improve student learning?**

*Briefly describe:*

- 1. who will participate in the assessment process (the gathering of evidence, the analysis/interpretation, recommendations).*
- 2. the process for consideration of the implications of assessment for change:*

- a. to assessment mechanisms themselves,*
  - b. to curriculum design,*
  - c. to pedagogy*
- ...in the interest of improving student learning.*
3. *How, when, and to whom will recommendations be communicated?*

As mentioned above, the GC will lead the assessment process, but with input from other faculty involved in teaching the relevant courses. The GC is responsible for gathering the evidence, leading the analysis, and creating recommendations. As a result of such discussions, any significant recommended changes will be presented by the GC to the full faculty for discussion and approval. This will occur every five years, unless more urgent modifications are deemed necessary.

### **Appendices – Candidacy Exam Report, Dissertation Exam Report and Exit Interview**

# PhD Candidacy Exam- Internal Assessment Form

## Department of Physics and Astronomy

This form should be filled out by each member of the dissertation committee following the student's proposal presentation. The form must be signed and returned to the graduate coordinator.

<b>Student Name</b>		
<b>Proposed Dissertation Title</b>		
<b>Committee Chair</b>		
<b>Your Name</b>		
<b>Date of Exam</b>		<b>Signature</b> _____

5=excellent, 4=very good, 3=good, 2=fair, 1=poor

**Score**

**1. Student's grasp of the material:**

(a) **Definition of the problem:** clarity of the statement of the problem and its motivation

(b) **Analysis of related and previous work:**

(c) **Student's knowledge of the field:**

(d) **Research plan:** realistic research plan, clear formulation of tasks, reasonable schedule

Comments:

**2. Student's ability to communicate**

(a) **Quality of the presentation**

(b) **Ability to answer questions**

Comments:

**3. Supervision of the student and resources available for the research**

Comments:

**4. Overall assessment of the proposal**

(score does not have to be an average of the previous scores)

Comments:

**THE UNIVERSITY OF NEW MEXICO**  
**Office of Graduate Studies**  
**Department of Physics and Astronomy**  
**REPORT ON THESIS AND DISSERTATION**

Author: \_\_\_\_\_ ID: \_\_\_\_\_ Unit: Physics and Astronomy

Thesis/Dissertation Director: \_\_\_\_\_ Reader: \_\_\_\_\_

Title to Thesis/Dissertation: \_\_\_\_\_

1a. Please rate the thesis/dissertation on the following:

	<i>Excellent</i>	<i>Very Good</i>	<i>Good</i>	<i>Fair</i>	<i>Inferior</i>
a. Substance	<input type="checkbox"/>				
b. Methodology	<input type="checkbox"/>				
c. Originality	<input type="checkbox"/>				
d. Style	<input type="checkbox"/>				
e. Evaluation of the work as a whole	<input type="checkbox"/>				

1b. Please rate the oral presentation on the following:

	<i>Excellent</i>	<i>Very Good</i>	<i>Good</i>	<i>Fair</i>	<i>Inferior</i>
a. Clarity	<input type="checkbox"/>				
b. Completeness	<input type="checkbox"/>				
c. Pedagogical quality and style	<input type="checkbox"/>				
d. Response to questions	<input type="checkbox"/>				
f. Evaluation of the work as a whole.	<input type="checkbox"/>				

2. Please summarize briefly your reaction to the thesis/dissertation :

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3. Do you recommend the acceptance of this manuscript for the degree?

\_\_\_\_\_ Yes      \_\_\_\_\_ No

*Reader:* Please sign and pass this form on to the committee chairperson.

Reader	Date
Chairperson of Committee	Date
Chairperson, Major Graduate Unit	Date

*Graduate Unit Chairperson:* Please collect all readers' forms and submit to the Graduate Office in a sealed envelope.

**COMMITTEE CHAIR: Please continue thesis/dissertation review on the backside.**

**TO BE COMPLETED BY THE COMMITTEE CHAIR:**

Please identify the sub-field of your student's thesis/dissertation

- Astronomy & Astrophysics
- Biological Physics
- Condensed-Matter Physics
- Optics and Photonics
- Quantum Information Science
- Subatomic Physics
- Other Areas: Please describe

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MS  or PhD

Number of published journal papers: \_\_\_\_\_

Number of conference presentation: \_\_\_\_\_

Number of journal papers submitted and to be submitted: \_\_\_\_\_

**Exit interview data for Physics PhD and MS graduates:**

How long (# months) to PhD/MS? .....

Position after graduation: .....

Plans for the future:            Industry, University, 4-year College, Research Lab

Research Advisor: .....

Research Area:

[Astronomy & Astrophysics](#)

[Biological Physics](#)

[Condensed-Matter Physics](#)

[Optics and Photonics](#)

[Quantum Information Science](#)

[Subatomic Physics](#)

[Other Area](#)                            ...explain

Course work (rate from 1 to 10 (best)): .....

Comments:

Qualifying examination (rate from 1 to 10 (best)):

Comments:

Rate research experience (rate from 1 to 10 (best)):

Comments:

Other comments and suggestions: .....

UNM P&A Alumni Questionnaire  
University of New Mexico Department of Physics & Astronomy