

**DEGREE/PROGRAM CHANGE
FORM C
Form Number: C1422**

Fields marked with * are required

Name of Initiator: Ylva M Pihlstrom **Email:** 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 Year

Course Information

Select Appropriate Program
Name of New or Existing Program M.S. in Physics with a concentration in Astrophysics
Select Category Degree Type M.S.
Select Action

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)

[mscat.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)

[msjust.txt](#)

[MSAssessment.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)

mecat.txt

M. S. in Physics with a concentration in Astrophysics

The Master of Science in Physics with a concentration in Astrophysics follows the same requirement for Plan I (non-thesis) and Plan II (thesis) M. S. Physics requirements for the number of credit hours. Under the Astrophysics concentration the hours must include ASTR 536 and the choice of three of PHYC 466, 505, 511, 521 and ASTR 537. Details must be discussed with a graduate advisor each semester.

The M.S. Astrophysics concentration is following the motivation of the creation of the Astrophysics Ph.D. concentration. This 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 M.S. program contains two separate plans. Under plan I the student presents a written thesis, and plan II offers a non-thesis option. If they chose the non-thesis plan, they must pass three preliminary exams covering undergraduate physics (thermodynamics and statistical mechanics (SM), electricity and magnetism (EM), classical mechanics (CM) and quantum mechanics (QM)). The M.S. students have to pass these at a 50% level in no more than five sittings. Similarly, the Astrophysics Concentration will require the students under a non-thesis option to pass three preliminary exams, one within the subject of astrophysics, and the choice of two 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 M.S. concentration will exit with a 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 MSAssessment.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**

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 or 277-4130.

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

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*

MS 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 participate in research.* Students are able to participate in 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 have a good understanding of the core areas in physics at the graduate level

- B.1. Students are able to make professional written and oral presentations of research results
- B.2. Students can apply physics to research problems

E. Assessment of Student Learning Three-Year Plan

* 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.).

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):

University of New Mexico Student Learning Goals				
Program SLOs	Knowledge	Skills	Responsibility	Program SLO is conceptually different from university goals.
A.1. <u>Non-thesis option</u> : 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. <u>Thesis option</u> : Students must demonstrate their grasp of UG physics in their written thesis and oral defense (presentation and question/answer section). The thesis will be evaluated by the committee and the scores archived.	X	X	X	
A.2. In Classical Mechanics, Quantum Physics, Electromagnetism and Thermodynamics students must receive a grade of B ⁻ or better.	X	X	X	
B.1. <u>Non-thesis option</u> : The instructor of the problems course evaluates the student's ability to make written and oral presentations. <u>Thesis option</u> : The thesis committee evaluates the written and the oral presentations and submits evaluation sheets.	X	X	X	
B.2. <u>Non-thesis option</u> : Students have to take at least three research hours with a faculty member. The faculty member submits an evaluation of the student's performance.	X	X	X	

<p><u>Thesis option:</u> Students must write a thesis and publicly defend it. The thesis committee evaluates the written and the oral presentation and submits evaluation sheets.</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 obtain an MS degree with and without thesis depending on their preference and the exam scores.
- The faculty advisor provides immediate feedback to the student based on his/her performance in problems courses where written and oral presentations are made.
- In the thesis option, members of the examination committee for the defense must fill out a standard form that evaluates the student performance. 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 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, where our MSs go after receiving their degrees. 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 all MS students in the program. For Exit Interviews, from all students graduating with an MS.

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 two years, unless more urgent modifications are deemed necessary.

Appendices – MS Problems Course Report, Dissertation Exam Report and Exit Interview form

MS Problems Course - Internal Assessment Form

Department of Physics and Astronomy

This form must be filled out by the instructor and returned to the graduate advisor at the end of the semester.

Student Name		
Brief Description of the Problems / Research Course		
Instructor Name		
Semester		Signature _____

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

Score

1. Student's grasp of the material

Comments:

2. Student's ability to communicate scientifically (oral and / or written)

Comments:

3. Quality of the research performed

Comments:

4. Overall performance

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

Comments:

Course grade (A⁺ ... F)

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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Methodology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Originality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Evaluation of the work as a whole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Completeness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Pedagogical quality and style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Response to questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Evaluation of the work as a whole.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

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

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