

Assessment Findings and Curricular Improvements Department of Physics

Undergraduate Programs:

**Bachelor of Science in Physics
Bachelor of Arts in Physics
Bachelor of Science in Chemical Physics**

Because the three programs differ only in courses taken outside the Physics Department, and because the total number of students is small, we make no distinction between the programs in the discussion below. (The majority of students are enrolled in the B.S. in Physics program.)

Assessment Measures

The Department of Physics uses the following measures to assess departmental learning outcomes:

Direct Measures

Senior Seminar (Physics 451-452)
Senior Comprehensive Examination

Indirect Measures

(Grades and course evaluations for Senior Seminar) – not currently implemented

Grades and course evaluations for intermediate courses
Grades and course evaluations for introductory courses
Student surveys
Job and graduate school placement

Assessment Findings

Senior Seminar

Attachments 1 and 2 show the enrollment in the two semesters of Senior Seminar (Physics 451 and 452) from Spring 2003 through Fall 2007, as provided by CPIT. During that period, the number of graduating seniors varied between 0 and 4. It has not been the policy of the Physics Department to grade the work done in Senior Seminar, so the grades of A recorded here are simply acknowledgement of attendance.

The primary activity in the Senior Seminar is a structured review of the physics curriculum in preparation for the Senior Comprehensive Examination, which is given in the spring semester. The seniors take turns presenting summaries of the important concepts studied in the required

physics courses. Other (non-senior) physics majors are invited to participate informally in the seminar, and may ask questions,

In most cases, the seniors initially have difficulty standing in front of an audience (however small and familiar to them) and expressing themselves clearly. This condition improves considerably with experience, and is good preparation for the Comprehensive Examination, which is an oral examination administered by a committee of faculty members.

We have not distributed course evaluation forms in Senior Seminar. If we choose to do so in the future, the form will have to be specially designed to fit the special nature of the seminar, in which preparation and teaching are done primarily by the seniors themselves, and not by the nominal instructor.

Senior Comprehensive Examination

The Senior Comprehensive Examination is a two-hour oral examination, administered by a board of three or four faculty members. The student stands at the blackboard and solves problems based primarily on the material covered in required physics courses. No formal grades are awarded, only “pass with honors,” “pass” or “fail.”

From 2002 to 2008 (Attachment 3), all 12 of the seniors have passed their Senior Comprehensive Examination on the first attempt.

The performance of the students on the examination usually displays acceptable mastery of the physical concepts and methods needed, but often reveals discomfort with (or even fear of) speaking in public, despite the mandatory practice obtained by participation in the Senior Seminar. For this reason, we feel that the oral format of the examination and the preparation in Senior Seminar are important learning opportunities for our students, who appear to have little other experience in oral communication.

Intermediary Course Discussion

Required intermediary course in physics are

506	Introduction to Modern Physics
511-512	Mathematical Physics I, II
525	Thermodynamics and Statistical Physics
531-532	Quantum Theory I, II
535	Analytical Mechanics
536	Electricity and Magnetism

In addition to the undergraduate physics majors, most of these courses also have some graduate students who need additional preparation before taking the corresponding course at 600 level. Physics 511 through 536 are typically taught every second year.

Physics 506 is taught every year, and is the gateway course for physics majors and minors. The enrollment in Physics 506 is made up primarily of physics majors and minors, sometimes with a few graduate students and a few students from the School of Engineering. Attachment 4 presents grade and course evaluation data for Physics 506. Because of the small enrollment in Physics 506, course evaluations have not been performed consistently, but will always be done in the future. The fact that the physics majors consistently outperform the other students in the class is evidence that this course is a good predictor for success in the physics curriculum.

Introductory Course Discussion

Acceptance into the undergraduate physics program requires satisfactory performance in the following courses:

215-216	University Physics I, II
225	Introductory Mechanics Lab
226	Introductory Electricity Lab

These courses also serve as service courses for students in engineering, mathematics and chemistry, so the enrollment is much larger than for any other physics courses taken by majors. Thus the statistics for these courses are not particularly relevant for the physics major programs. A prospective physics major must maintain a B average in these courses.

Perceptions of Outcomes by Physics Majors

We have initiated a policy of requesting that recent physics graduates write an evaluation of their undergraduate experience at CUA, with special emphasis on the Senior Seminar and Comprehensive Examination as components of a capstone experience.

So far we have received one response from our Spring 2008 graduating class of 3, which is very positive about the student's learning experience in general and the Senior Seminar and Comprehensive Examination in particular. Some important comments include the benefits of close interaction with faculty and other students in the Senior Seminar, and the value of the oral examination format in probing the student's depth of understanding.

Job and Graduate School Placement

Most of our recent graduates have continued their education, the majority of these working toward masters degrees or doctorates in physics. Where known, the original destinations are given in the following list. Of the 7 students initially enrolling in graduate school at CUA, the majority earned the M.S. degree within two years or less, and then went on to outside employment in teaching, government or industry.

2008

Law school, University of Texas

Research at Nations Institutes of Health (goal: eventual med school)

MS program at CUA

2006

MS program at CUA

2005

Graduate school - MIT

Graduate school - Embry-Riddle Aeronautical University

U.S. Patent Office

2004

Teaching high school physics at St. Johns College High School, Washington, DC

2003

PhD program at CUA

Graduate school - University of Maryland

2002

Graduate school - Univ of Colorado at Boulder

Graduate school - Harvard University (biophysics)

2001

PhD program at CUA

MS program at CUA

2000

MS program at CUA

MS program at CUA

1999

Graduate school – CUA (electrical engineering)

Curricular Improvements

No major changes in the undergraduate curriculum in physics have been made recently or are contemplated at this time. The Chair reads all course evaluations carefully, and makes recommendations to individual faculty members when appropriate.

List of Attachments

1. Physics 451 (Senior Seminar I) statistics (from CPIT)
2. Physics 452 (Senior Seminar II) statistics (from CPIT)
3. Senior Comprehensive Exam statistics (from CPIT)
4. Course summary data for Physics 506 (Introduction to Modern Physics)

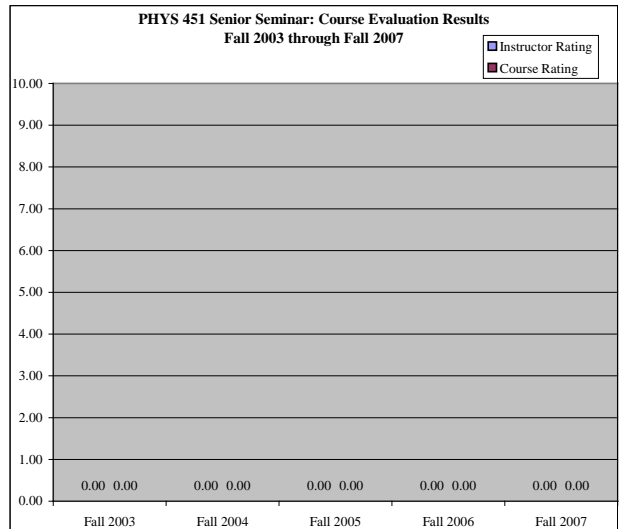
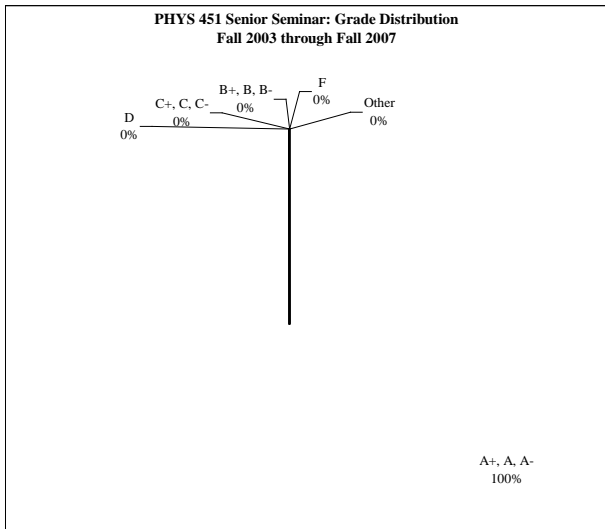
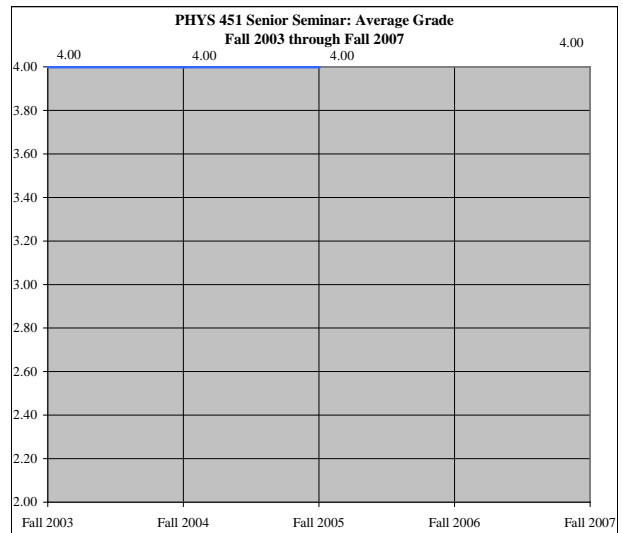
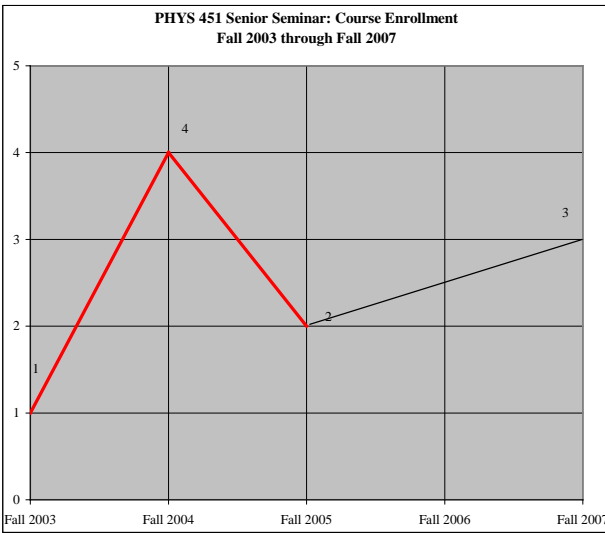
Attachment 1

THE CATHOLIC UNIVERSITY OF AMERICA
Outcomes Assessment

SENIOR SEMINAR SUMMARY DATA: DEPARTMENT OF PHYSICS
PHYS 451 Senior Seminar

Term	Course Enrollment	Course Grade		Course Grades Grade Distribution						Course Evaluation Results					
		Avg.	StDev.	A+, A, A-	B+, B, B-	C+, C, C-	D	F	Other**	Course Eval. #	Course Eval. %	Instructor Rating Avg.	Instructor Rating StDev.	Course Rating Avg.	Course Rating StDev.
Fall 2003	1	4.00		1											
Fall 2004	4	4.00	0.00	4											
Fall 2005	2	4.00	0.00	2											
Fall 2006															
Fall 2007	3	4.00	0.00	3											

**The "Other" category includes grades of I, W, AU, and P.



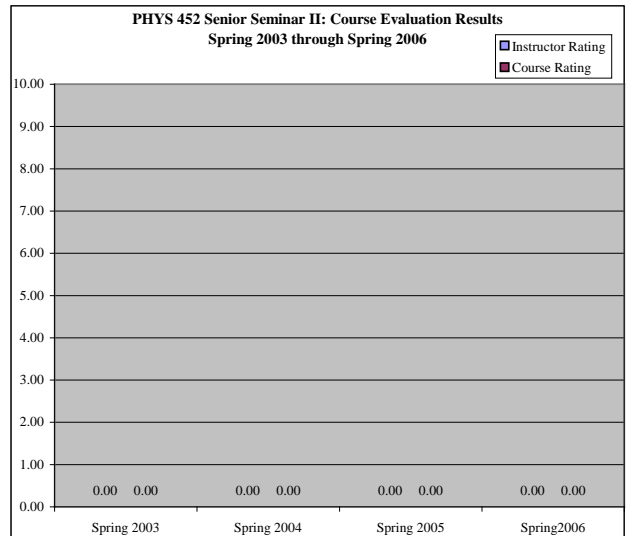
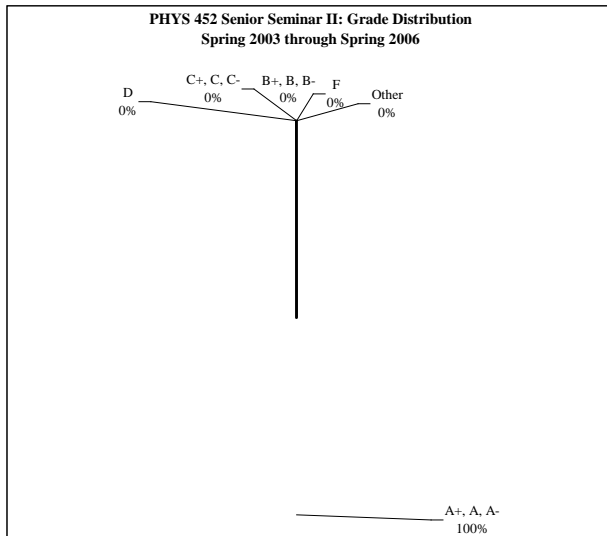
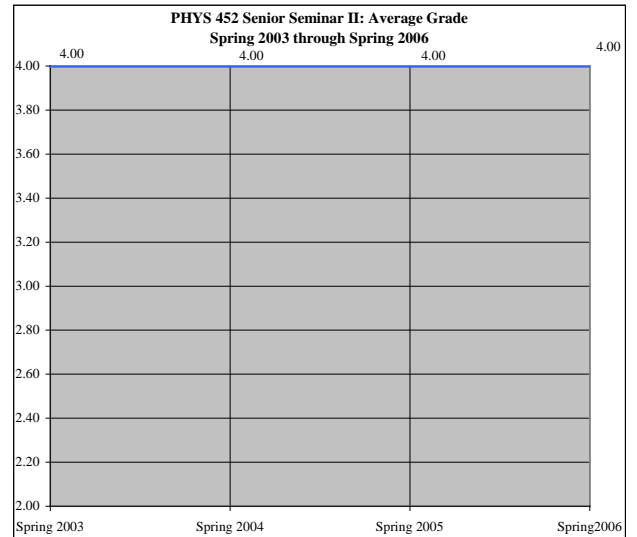
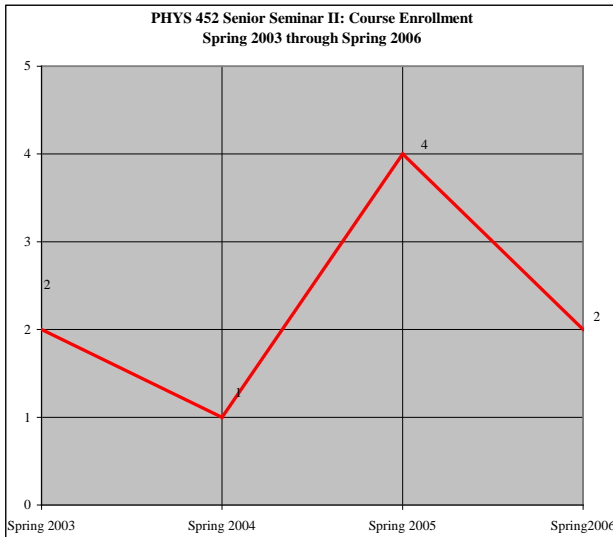
Attachment 2

Outcomes Assessment

SENIOR SEMINAR SUMMARY DATA: DEPARTMENT OF PHYSICS PHYS 452 Senior Seminar II

Term	Course Enrollment	Course Grade		Course Grades						Course Evaluation Results						
		Avg.	StDev.	A+, A, A-	B+, B, B-	C+, C, C-	D	F	Other**	Course Eval. #	Course Eval. %	Instructor Rating Avg.	Instructor Rating StDev.	Course Rating Avg.	Course Rating StDev.	
Spring 2003	2	4.00	0.00	2								0.00%				
Spring 2004	1	4.00		1								0.00%				
Spring 2005	4	4.00	0.00	4								0.00%				
Spring2006	2	4.00	0.00	2								0.00%				

**The "Other" category includes grades of I, W, AU, and P.



Attachment 3

THE CATHOLIC UNIVERSITY OF AMERICA
Institutional Assessment

COMPREHENSIVE EXAMINATION RESULTS
SCHOOL OF ARTS AND SCIENCES: DEPARTMENT OF PHYSICS
AY2002-2003 to AY2006-2007
AY2007-2008 added by D. Sober

	Fail		Pass		High Pass		Pass w/Honors		TOTAL
	#	%	#	%	#	%	#	%	
AY2002-2003		0.00%	2	100.00%		0.00%		0.00%	2
AY2003-2004		0.00%	1	100.00%		0.00%		0.00%	1
AY2004-2005		0.00%	4	100.00%		0.00%		0.00%	4
AY2005-2006		0.00%	1	50.00%		0.00%	1	50.00%	2
AY2006-2007									0
AY2007-2008		0.00%	3	100.00%		0.00%		0.00%	3
TOTAL	0	0.00%	11	91.67%	0	0.00%	1	8.33%	12

Note: Students were included in the categories High Pass and Pass with Honors if these designations were explicitly indicated within the student's milestone record. Please contact the Office of Institutional Assessment if this data can also be determined through the student's final grade in the comprehensive requirement.

Grade and Course Evaluation Statistics -- Physics 506 (Introduction to Modern Physics)

Grades

		All students		Physics majors only	
Semester		Number of students	Mean grade	Number of majors	Mean grade
Spring	2001	4	3.35	2	3.70
Spring	2002	3	3.57	1	3.70
Spring	2003	7	3.39	5	3.42
Spring	2004	9	2.78	3	3.00
Spring	2005	3	2.33	0	
Spring	2006	11	3.04	3	3.23
Spring	2007	7	2.96	2	3.85
Spring	2008	1	3.80	0	

Course evaluations

		All students		Physics majors only		
Semester		Number of evaluations	Teacher average (of 10)	Course average (of 10)	Teacher average (of 10)	Course average (of 10)
Spring	2001					
Spring	2002					
Spring	2003	7	8.8	7.3	8.8	7.3
Spring	2004					
Spring	2005					
Spring	2006					
Spring	2007	6	7.5	7.7	7.3	8.0
Spring	2008					