



Department of Physics

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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 options in which the names are more closely tied to the expected outcome for the student. Each of these options leads to a Bachelor of Sciences degree in physics. The options 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 for grad school bound students (formerly Option A). This option 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 Option for premed students (formerly Option D). This option 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 Option for teaching high school physics (formerly Option E). 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.
 - iv) The Applied Physics Options for students interested in Engineering, Law, Journalism, other Sciences, etc. (formerly Options B,C,F). This option 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.
- 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)
Prerequisite Courses:							
Introductory Math	Math 1251	Calc I	5	Math 151	5	Semester sequence has same content as quarter sequence	2
	Math 1258	Calc II	5	Math 152	5		
				Math 153	5		
Upper Division Math	Math 2249	CalcIII	3	Math 254	5	Content of current 254	2
	Math 2431	LinAlg/DiffEq	3	Math 415	4	Some material from 415 and 568 (topics still under discussion)	2
				Math 568	3		
Computing	CSE 1211	Intro to C++	2	CSE 202	4	Same content	3
Physics Core:							
Introductory	Physics 1250/1250H	Mechanics, Thermal Physics, Waves	5	Physics 131/131H	5	Semester sequence has same content as quarter sequence	1,2
	Physics 1251/1251H	E&M, Optics, Modern Physics	5	Physics 132/132H	5		
				Physics 133/133H	5		
Intermediate	Physics 2300	Dynamics of Particles and Waves I	4	Physics 261	4	Semester sequence has same content as quarter sequence	1,2
	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	6
Upper Division	Physics 5400/5400H	E&M I	4	Physics 555	4	Semester course has all of 555 and some of 656	1,2
				Physics 656	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)
<u>Additional Required Courses, Advanced Physics Option</u>							
	Physics 5401H	E&M II	4	Physics 656	4	Semester course has some of 656 and all of 657	1,2
				Physics 657	4		
	Physics 5501H	Quantum II	4	Physics 632	4	Semester course has some of 632 and all of 633	1,2
				Physics 633	4		
	Physics 5600	Statistical Physics	4	Physics 621	4	Semester course has all of 621 and some of 622	1,2
				Physics 622	4		
	Physics 5300	Theoretical Mechanics	4	Physics 664	4	Enhanced content	1,2
<u>Additional Required Courses, Applied Physics Option</u>							
	1 Physics Elective From Above List		3	Elective	4	Same content	1,2
	15 Credit hours from Minor, Double Major		15		18	Enhanced content	7
<u>Additional Required Courses, Physics Teaching Option</u>							
	1 Physics Elective From Above List		3	Elective	3	Enhanced content	1,2
	Physics 5100		4	Physics 670	5	Enhanced content	7
	Bio 113		4	Bio 113	5	Enhanced content	7
	Earth Sci 110		3	Earth Sci 110	3	Same content	7
	Geog 520		3	Geog 520	3	Same content	7
	Astron 291		3	Astron 291	3	Same content	7
	Chem 121		5	Chem 121	5	Semester sequence has same content as quarter sequence	7
	Chem 122		5	Chem 122	5		
				Chem 123	5		

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)
<u>Additional Required Courses, Life Sciences Option</u>							
	1 Physics Elective From Above List		3	Elective	4	Same content	1,2
	Bio 113		4	Bio 113	5	Enhanced content	7
	Bio 114		4	Bio 114	5	Enhanced content	7
	Chem 121		5	Chem 121	5	Semester sequence has same content as quarter sequence	7
	Chem 122		5	Chem 122	5		
				Chem 123	5		
	Chem 251		4	Chem 251	4	Semester sequence has same content as quarter sequence	7
	Chem 252		4	Chem 252	4		
				Chem 253	4		
	Chem 254		2	Chem 254	3	Same content	
	Chem 255		2	Chem 255	3	Same content	7
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					

COLLEGE OF ARTS AND SCIENCES BACHELOR OF SCIENCE: MAJOR PHYSICS

Last name:		Address	
First Name:		City	
Middle:		Zip Code	
OSU ID			
lastname.#			
Expected graduation		(quarter)	(year)
Additional Majors			
Additional Minors			

Have you filed a degree application in the college office? Yes ___ No ___ (NOTE: This form is NOT a degree application)

Major Program minimum grade of "C-" required. All coursework minimum grade average of "C" (2.00).

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.

Intro Physics	Credits	Grade	Physics Tech Elec	Credits	Grade	Required in Options
1250	5		Physics H5501	4		Advanced
1251	5		Physics H5401	4		Advanced
			Physics 5300	4		Advanced
			Physics 5600	4		Advanced
			Physics 3470	4		
			Physics H3455	4		
			Physics 68xx	4		
Intro Math	Credits	Grade	Additional Courses	Credits	Grade	Required in Options
1251	5		Physics 5100	4		Teaching
1258	5		Bio 113	4		LifeSci, Teaching
			Bio 114	4		LifeSci
			Chem 121	5		LifeSci, Teaching
			Chem 122	5		LifeSci, Teaching
			Chem 251	4		LifeSci
			Chem 252	4		LifeSci
			Chem 254	2		LifeSci
			Chem 255	2		LifeSci
			Earth Sci 110	3		Teaching
			Geog 520	3		Teaching
			Astronomy 291	3		Teaching
Core Physics	Credits	Grade				
2095	1					
2300	4					
2301	4					
3700	3					
4700	3					
5400	4					
5500	4					
5700	3					
Prereq Courses	Credits	Grade				
CSE 1222	2					
Math 2249	3					
Math 2431	3					

Option	Additional Required hours	Comments
Advanced	0	
Applied	>=4 plus >=15	one of Physics Tech Elec from above list (list grade above) + applied tech elecs (list below)
Teaching	>=4	one of Physics Tech Elec from above list (list grade above)
Life Sciences	>=4	one of Physics Tech Elec from above list (list grade above)

Applied Physics Option Technical Electives		
Course Name	Credits	Grade

Physics Major Option (Advanced, Applied, Teaching, Life Sciences) _____

Signature of advisor _____ Date _____

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 any 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.

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.

Advanced Physics option: This option 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 Hist Stud	5	GEC	Bio 113	5	GEC	CSE 202	4	Prereq
	Quarter Sum	15		Quarter Sum	15		Quarter Sum	14	
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 Soc Sci 1	5	GEC	Math 568	3	LinAlg, GEC Open
	GEC Lit	5	GEC	GEC Writing 1	5	GEC	GEC Writing 2	5	GEC
	Quarter Sum	15		Quarter Sum	18		Quarter Sum	16	
						Total Qtr Hours:	93		
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
	GEC Culture	3	GEC				Physics 4700	3	Elec Lab
	GEC Soc Sci 2	3	GEC				GEC Lang 1	4	GEC
	Semester Sum	14					Semester Sum	15	
2013-2014	Physics 5600	4	StatMech				Physics 5700	3	Adv Lab
	GEC Lang 2	4	GEC				Physics 5300	4	Theor Mechanics
	Free Elective	3	Free				GEC Lang 3	4	GEC
	GEC Arts	3	GEC				Free Elective	3	Free
	Free Elective	2							
	Semester Sum	16					Semester Sum	14	
						Total SemHours:	59		
						Total Hours:	121		

Majors will be encouraged to seek input from Arts and Sciences Advisors to ensure they satisfy GEC requirements.

Topic Area	Course Name	Quarter/ Semester Planned	QCH = Quarter Credit Hours	CQH = 0.67*QCH	SCH = Semester Credit Hours	CQH+SCH	Minimum Required	Excess Over Minimum
Introductory Math	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 1251					0		
	Math 1258					0		
Advanced Math	Math 254	Au2010	5	3.335		3.335		
	Math 415	Wi2012	4	2.668		2.668		
	Math 513/551 or 568/571	Sp2012	3	2.001		2.001		
	Math 2249					0		
	Math 2431					0		
Total Math:					Total Math Sum=	18.009	>=16	
Computing	CSE 202	Sp2011	4	2.668		2.668		
	CSE 1222					0		
					Total Computing Sum=	2.668	>=2	
GEC: Each Topic Area must be fulfilled:	Double counting allowed per GEC rules							
GEC Writing 1	Course:	Wi2012	5	3.335		3.335		
GEC Writing 2	Course:	Sp2012	5	3.335		3.335		
GEC Soc Sci 1	Course:	Wi2012	5	3.335		3.335		
GEC Lit	Course:	Sp2012	5	3.335		3.335		
GEC Hist Stud	Course:	Au2010	5	3.335		3.335		
GEC Bio	Course:	Wi2011	5	3.335		3.335		
GEC Arts	Course:	Au2013		0	3	3		
GEC Culture	Course:	Au2012		0	3	3		
GEC Soc Sci 2	Course:	Au2012		0	3	3		
GEC Open 1	Course:	Au2013		0	3	3		
GEC Open 2	Course:	Sp2014		0	3	3		
GEC Lang1	Course:	Sp2013		0	4	4		
GEC Lang2	Course:	Au2013		0	4	4		
GEC Lang3	Course:	Sp2014		0	4	4		
GEC Lang4	Course:			0		0		
Total Lang:					Total Lang Sum=	12	>=10	
Total GEC:					Total GEC Sum=	47.01	>=40	

Topic Area	Course Name	Quarter/ Semester Planned	QCH = Quarter Credit Hours	CQH = 0.67*QCH	SCH = Semester Credit Hours	CQH+SCH	Minimum Required	Excess Over Minimum
Physics Teaching Option								
Physics Elective	Course:			0		0	>=3	
Bio 2	Course:			0		0		
Chem 1	Course:			0		0		
Chem 2	Course:			0		0		
Earth Sci	Course:			0		0		
Geog	Course:			0		0		
Astronomy	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
				SUM (All Electives) =		0	>=24	
				Total Credit Sum =		100.031	120	
Life Sciences Option								
Physics Elective	Course:			0		0	>=3	
Bio 2	Course:			0		0		
Chem 1	Course:			0		0		
Chem 2	Course:			0		0		
Chem 3	Course:			0		0		
Chem 4	Course:			0		0		
Chem Lab	Course:			0		0		
Chem Lab	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
Free Elec:	Course:			0		0		
				SUM (All Electives) =		0	>=24	
				Total Credit Sum =		100.031	120	

Advanced Physics option: This option 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
1	Physics 1250H	5	Honors Intro	Physics 1251H	5	Honors Intro
	Math 1251	5	Calc	Math 1258	5	Calc
	GEC Hist Stud	3	GEC	GEC Writing 1	3	GEC
	CSE 1222	2	Prereq	Bio 1113	4	GEC
	Semester Sum	15		Semester Sum	17	
2	Physics 2300	4	26x conv	Physics 2301	4	26x conv
	Physics 2095	1	Survey	Physics 3700	3	Data Ana Lab
	Math 2249	3	Calc III, GE Open	Math 2431	3	Diffeq/LinAlg; GE Open
	GEC Sco Sci 1	3	GEC	GEC Arts	3	GEC
	GEC Writing 2	3	GEC	GEC Lit	3	GEC
	Semester Sum	14		Semester Sum	16	
3	Physics 5500H	4	Quantum	Physics 5501H	4	Quantum
	Physics 5400H	4	E&M	Physics 5401H	4	E&M
	GEC Culture	3	GEC	Physics 4700	3	Elec Lab
	GEC Soc Sci 2	3	GEC	GEC Lang 1	4	GEC
	Semester Sum	14		Semester Sum	15	
4	Physics 4700	3	Elec Lab	Physics 5700	3	Adv Lab
	Physics 5600	4	StatMech	Physics 5300	4	TheoretMechanics
	GEC Lang 2	4	GEC	GEC Lang 3	4	GEC
	Free Elective	3	Free	Free Elective	3	Free
	Free Elective	3	Free			
Semester Sum	17		Semester Sum	14		
				Total Hours:	122	

Applied Physics option: This option 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 1251	5	Calc	Math 1258	5	Calc
	GEC Hist Stud	3	GEC	GEC Writing 1	3	GEC
	CSE 1222	2	Prereq	Bio 1113	4	GEC
	Semester Sum	15		Semester Sum	17	
2	Physics 2300	4	26x conv	Physics 2301	4	26x conv
	Physics 2095	1	Survey	Math 2431	3	Diffeq/LinAlg; GEC Open
	Math 2249	3	Calc III; GEC Open	Physics 3700	3	Data Ana Lab
	Minor Elective	4	Applied Option Req	Minor Elective	4	Applied Option Req
	GEC Writing 2	3	GEC	GEC Lit	3	GEC
	Semester Sum	15		Semester Sum	17	
3	Physics 5500	4	Quantum	Physics 4700	3	Elec Lab
	Physics 5400	4	E&M	Minor Elective	3	Applied Option Req
	Minor Elective	4	Applied Option Req	GEC Lang 1	4	GEC
	GEC Soc Sci 1	3	GEC	Free Elective	3	Free
	Semester Sum	15		Semester Sum	13	
4	Physics 3470	3	Required Elective	Physics 5700	3	Adv Lab
	GEC Sco Sci 2	3	GEC	GEC Arts	3	GEC
	GEC Lang 2	4	GEC	GEC Culture	3	GEC
	Free Elective	3	Free Elective	GEC Lang 3	4	GEC
	Free Elective	3	Free			
Semester Sum	16		Semester Sum	13		
				Total Hours:	121	

Physics Life Sciences option: This option 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
1	Physics 1250	5	Intro	Physics 1251	5	Intro
	Math 1251	5	Calc	Math 1258	5	Calc
	Bio 1113	4	GEC; premed	GEC 1 - Writing 1	3	GEC
	CSE 1222	2	Prereq	Bio 1114	4	premed
	Semester Sum	16		Semester Sum	17	
2	Physics 2300	4	26x conv	Physics 2301	4	26x conv
	Physics 2095	1	Survey	Math 2431	3	Diffeq/LinAlg, GE Open
	GEC Lit	3	GEC	Chem 122	5	Premed
	Math 2249	3	Calc III, GE Open	Physics 3700	3	Data Ana Lab
	Chem 121	5	Premed			
	Semester Sum	16		Semester Sum	15	
3	Physics 5500	4	Quantum	Physics 4700	3	Elec Lab
	Physics 5400	4	E&M	Chem 252	4	Premed
	Chem 251	4	premed	Chem 255	2	Premed
	Chem 254	2	premed	GEC Hist Stud	3	GEC
				GEC Lang2	4	GEC
	Semester Sum	14		Semester Sum	16	
4	Physics 3470	3	Required Elective	Physics 5700	3	Adv Lab
	GEC Sco Sci 2	3	GEC	GEC Lang1	4	GEC
	GEC Lang 3	4	GEC	GEC Arts	3	GEC
	GEC Writing 2	3	GEC	GEC Culture	3	GEC
	GEC Soc Sci 1	3	GEC			
	Semester Sum	16		Semester Sum	13	
			Total Hours:	123		
Students will be advised to seek input from a pre-med advisor when selecting courses labeled "Premed".						

Physics teaching option: This option 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
1	Physics 1250	5	Intro	Physics 1251	5	Intro
	Math 1251	5	Calc	Math 1258	5	Calc
	GEC Hist Stud	3	GEC	Bio 1113	4	GEC; MsEd
	GEC Soc Sci 1	3	GEC	CSE 1222	2	Prereq
	Semester Sum	16		Semester Sum	16	
2	Physics 2300	4	26x conv	Physics 2301	4	26x conv
	Physics 2095	1	Survey	Math 2431	3	Diffeq/LinAlg, GE Open
	Physics 3700	3	Data Ana Lab	GEC 1 - Writing	3	GEC
	Math 2249	3	Calc III, GE open	GEC Lit	3	GEC
	GEC Writing 2	3	GEC	Free Elective	3	Free
	Semester Sum	14		Semester Sum	16	
3	Physics 5500	4	Quantum	Physics 4700	3	Elec Lab
	Physics 5400	4	E&M	GEC 15 - Lang2	4	GEC
	GEC 15 Lang1	4	GEC	Geog 520	3	MsEd
	Earth Sci	3	MsEd	Astro 291	3	MsEd
				Physics 5100	4	MsEd
	Semester Sum	15		Semester Sum	17	
4	Physics 3470	3	Required Elective	Physics 5700	3	Adv Lab
	GEC Sco Sci 2	3	GEC	GEC Arts	3	GEC
	GEC 15 - Lang	4	GEC	GEC Culture	3	GEC
	Chem 121	5	MsEd	Chem 122	5	MsEd
	Semester Sum	15		Semester Sum	14	
			Total Hours:	123		