

Status: PENDING

**PROGRAM REQUEST**  
Chemical Physics

Last Updated: Myers, Dena Elizabeth  
08/10/2011

<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>	Chemical Physics
<b>Proposed Program/Plan Name</b>	Chemical Physics
<b>Program/Plan Code Abbreviation</b>	CHEMPHY-MS
<b>Current Degree Title</b>	Master 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		45	30.0	30	0.0
Required credit hours offered by the unit	Minimum				
	Maximum				
Required credit hours offered outside of the unit	Minimum				
	Maximum				
Required prerequisite credit hours not included above	Minimum				
	Maximum				

**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**                      •

**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?** No

**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.

**Pre-Major**

**Does this Program have a Pre-Major?** No

**Attachments**

- chemphys transition to semesters-masters final revised.pdf  
*(Program Proposal. Owner: Lafyatis, Gregory Paul)*
- Chemical Physics MS cover letter.doc: NMS Division of Arts and Sciences cover letter  
*(Letter from the College to OAA. Owner: Andereck, Claude David)*

**Comments**

- The attached includes all the required quarter to semester conversion documents in the requested order *(by Lafyatis, Gregory Paul on 07/10/2011 09:15 PM)*

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Lafyatis, Gregory Paul	07/10/2011 09:15 PM	Submitted for Approval
Approved	Hughes, Richard E	07/13/2011 02:50 PM	Unit Approval
Revision Requested	Andereck, Claude David	07/22/2011 03:25 PM	College Approval
Submitted	Lafyatis, Gregory Paul	07/27/2011 02:28 PM	Submitted for Approval
Approved	Hughes, Richard E	08/04/2011 12:46 PM	Unit Approval
Approved	Andereck, Claude David	08/09/2011 11:35 AM	College Approval
Approved	Myers, Dena Elizabeth	08/10/2011 08:36 AM	GradSchool Approval
Pending Approval	Cameron, Erin Marie Soave, Melissa A	08/10/2011 08:36 AM	CAA Approval



College of Arts and Sciences

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August 9, 2011

Dena Myers  
Graduate School  
250 University Hall  
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Campus

Dear Dena:

It is a pleasure to forward to you for your consideration the proposal for the interdisciplinary masters program in Chemical Physics. The program is a relatively straightforward conversion from its quarter version.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at meetings on July 22, 2011. Feedback from these discussions has been incorporated in the proposal.

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

Sincerely,

A handwritten signature in black ink, appearing to read "David Andereck".

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



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July 5, 2011

TO: Office of Academic Affairs  
FROM: Terry A. Miller, Chair, Chemical Physics Program  
RE: Semester Program Proposal for Chemical Physics Masters Program

Chemical Physics has the following programs which will be converted from quarters to semesters:

- 1) The Graduate Chemical Physics Masters
- 2) The Graduate Chemical Physics PhD

The subject of this proposal is the Chemical Physics Masters program; the other program is addressed in a separate proposal.

The Chemical Physics Graduate Studies Committee has worked extensively to produce this proposal, describing the conversion of our current Graduate Masters program from the quarter system to the semester system.

The contents of this proposal have been discussed at length by the Graduate Studies Committee and were unanimously approved June 22.

The proposal was circulated to the entire Chemical Physics faculty with a request for comment or objections. Only one objection was received concerning format issues, which has been resolved. As Chair of the Chemical Physics Graduate Studies Committee, I strongly endorse this proposal.

### Rationale for Changes to the Masters Program from quarters to semesters

Overall, the goals and requirements are essentially unchanged. With minimal exceptions detailed below, the required courses for a Chemical Physics Masters Degree are offered by either the Physics or Chemistry Departments. Each department has supplied a detailed mapping of the quarter to semester conversion. The Chemical Physics program has followed this map to offer nearly equivalent core and elective course requirements under quarters and semesters. The tables below summarize this mapping.

<u>Core Areas</u>	<u>Courses</u>			
	<u>Chemistry</u> <u>Quarters</u>	<u>Chemistry</u> <u>Semesters</u>	<u>Physics</u> <u>Quarters</u>	<u>Physics</u> <u>Semesters</u>
1) Quantum Mechanics	861, 862, 863	6510,6540, 7520	827,828,829, 830	7501,7502, 7503
2) Statistical Mechanics/ Thermodynamics//Kinetics	880, (775 or 876)	6520,6530, 7550	846,847	7601, 7602
3) Spectroscopy	866	7530		* (I)
4) Safety Seminar (to be completed in first year)	685	6781(1)		

\* Depending on topic Physics 880.20 → Physics 8804.1 may satisfy this requirement

<u>Elective Areas</u>	<u>Courses</u>			
	<u>Chemistry</u> <u>Quarters</u>	<u>Chemistry</u> <u>Semesters</u>	<u>Physics</u> <u>Quarters</u>	<u>Physics</u> <u>Semesters</u>
Optics	-	7570(1.5-3)	657	3470
Classical Mechanics	-		821	7601
Kinetics	876	7540		-
Electricity and Magnetism	-		834,835	7401
Condensed Matter Physics	-	7580(1.5-3)	780.06	8806.1
Atomic Physics/ Spectroscopy			780.04	8804.1
Analytical Spectroscopy	823(S)	7140		-
Electrochemistry	821(A)	7120		-
Advanced Topics	-	6550,7570	880.0X	880X.X

Special Topics of Current Interest	996 (I)	8599(1.5-3), 8699(1.5-3)	880.20	6810(4),6820(4)
Mathematics	Appropriate math courses at the 500 level (→4000 level) or above, e.g., Math 601(A), 602(W) (→ Math 4512,4551,4552,4557,4568) or Physics 730,731 (→ Physics 7701)			

Semester courses are all 3 credit hours unless otherwise indicated

Chemical Physics of course offers Doctoral research (CP8999), Masters research, and non-degree research (CP7998) under semesters which map trivially from their counterparts under quarter. Chemical Physics also offers the Frontiers in Spectroscopy course featuring (usually) outside speakers presenting 3 days of lectures on specific topics. Under quarters this course offers 5 speakers with interspersed reading weeks. Under semesters it (CP8880) will be a half semester course offering 4 weeks of lectures plus 3 reading period weeks.

### CHEMICAL PHYSICS SEMESTER COURSES

Semster Course Number	Course Title	Semester Credits	Quarter Equivalent course
CP8880	Frontiers in Spectroscopy	1.5-3	880
CP7998	Research	arranged	
CP7999	Master's Research	arranged	
CP8999	Doctoral Research	arranged	999

## CHEMICAL PHYSICS MASTERS PROGRAM UNDER SEMESTERS

### General Information

The graduate degree program in Chemical Physics has several options:

- I Terminal M.S. degree
- II M.S. degree followed by Ph.D.
- III Ph.D. degree, not preceded by the M.S. degree

The choice among these programs will be determined on the basis of the student's academic record and his/her performance on the Integrated Oral Examination (IOE).

The **IOE** is given on an individual basis, but will normally be taken at the end of Spring Quarter or the beginning of Summer Quarter of the student's first year. At this point, the student should have completed most of the course requirements listed above. The IOE shall be administered by 3 Chemical Physics faculty members appointed by the Graduate Studies Chairperson and will test the depth and integration of understanding of the student's knowledge in the core Chemical Physics areas as indicated above and in selected other areas of the student's specialization. The examination shall be oral. In the case of an overall ambiguous performance, the committee can require a second, written examination.

The Chemical Physics program has both thesis and non-thesis options for the Masters Degree.

### **Graduate School:**

The student must fulfill all of the Graduate School requirements. The current requirements and the order in which they must be fulfilled are listed in the Graduate School Handbook.

### **Foreign Language:**

All international students who are not citizens of countries in which English is the official language are required to be certified in spoken English prior to the end of the second semester of study, not including Summer Term, by the department (Chemistry or Physics) wherein they hold a TA appointment. In addition, the Graduate School requires that English XXXX (a writing course) or its equivalent be completed within one year of entering graduate school.

**M.S. Degree with Thesis.** The student must have a minimum residence of two semesters at The Ohio State University with completion of at least 30 semester hours of graduate work, including credit for research. Course work must be at the 6000-9000 level (6000 or above outside the Physics and Chemistry Departments), and the courses must be acceptable to the Chemical Physics Graduate Studies Committee and the student's advisor, and must include the core courses listed in the Doctoral program. The student's course program should be decided in conjunction with the thesis advisor.

Students will carry out a research program that will culminate in the writing of a thesis. The research program should be initiated as soon as possible after preceptor selection.

At least two weeks prior to the date proposed for conferring the M.S. degree, the candidate must pass an oral examination before a committee, approved by the Graduate Studies Committee Chairperson and composed of at least three Chemical Physics faculty (including the advisor).

Should the graduate record of the candidate be wholly satisfactory to the examining committee, the scope of the examination will be confined to the candidate's field of specialization.

**M.S. Degree without Thesis.** The following provision is made for granting a terminal Master's degree only without the necessity of completing a thesis. Upon application by the student, he/she must have satisfied the course requirements above for the Master's degree, passed the IOE at level 3 (see ChemPhys Ph.D. program requirements) and successfully completed both the written and oral portion of an exam comparable to the General Examination (see ChemPhys Ph.D. program requirements)

The course requirements may be divided into two categories: i) core requirements and ii) elective requirements. Each student must take at least 5 full semester-equivalent courses (15 credit hours) in the core areas. These must include at least one semester-equivalent course (3 credit hours) in each of the three areas. The core areas are:

	<u>Area</u>	<u>Suggested Course</u>	
		<u>Chemistry</u>	<u>Physics</u>
1)	Quantum Mechanics	6510(Au-1), 6540(Au-2), 7520(Sp)	7501(Au), 7502(Sp), 7503(Au)
2)	Statistical Mechanics/ Thermodynamics/Kinetics	6520(Au-1), 6530(Au- 2), 7550(Sp), 7540 (every other year)	7601(Au), 7602(Sp)
3)	Spectroscopy	7530 (every other year)	* (I)

\* Depending on topic 8804.XX may satisfy this requirement

If the student does chemical research, the Safety Seminar, Chem 7681, must be taken.

(Letters in parenthesis indicates semester normally offered: (Au)=autumn; (Sp)=spring; 1, 2 indicates half-semester courses. All full semester courses are 3 credit hour courses; ½ semester courses are 1.5 credit hour courses)

To fulfill the core requirement in each area the student may take the appropriate courses in either department (but not both). These courses will normally be taken during the student's first year of enrollment (except for Physics 7503).

In addition, the student must also demonstrate proficiency in several electives exemplified by the following:

<u>Area</u>	<u>Courses</u>	
	<u>Chemistry</u>	<u>Physics</u>
Frontiers in Spectroscopy	ChemPhys 8880(1.5-3)	
Laser and Optics	7580(1.5-3)	3470
Kinetics	7540	-
Electricity and Magnetism	-	7401
Condensed Matter Physics	7590(1.5-3)	8806.1
Atomic Physics/Spectroscopy		8804.1
Analytic Spectroscopy	7140	-



Electrochemistry	7120	-
Advanced Topics	6550, 7570	880X.X
Special Topics of Current Interest	8599(1.5-3), 8699(1.5-3)	6810(4), 6820(4)
Mathematics	Appropriate math courses at the 4000 level or above, e.g., Math 4512, 4551, 4552, 4557, 4568, Phys 7701	

All courses are 3 credit hour courses unless otherwise indicated. With advisor's permission, other courses may satisfy the elective requirement.

Overall the student must complete the equivalent of 9 credit hours of these elective requirements, with at least one of these being completed within the first year. Credit in the core areas in excess of 5 semester courses may be applied to fulfill up to 2 of the 3 course elective credit requirements. However, for the Chemical Physics degree, a student must accumulate a total of at least 6 credit hours in each of the Chemistry and the Physics Departments. ChemPhys8880-Frontiers in Spectroscopy, taken for a letter grade, will count as one elective.

Chemical Physics also offers research courses as follows:

<u>Research</u>	<u>Course</u>	<u>Hours</u>
Non-Degree Research	ChemPhys7998	By Arrangement
Master's Research	ChemPhys7999	By Arrangement
Doctoral Research	ChemPhys8999	By Arrangement Nominally 3 credit hours/quarter

In summary, degree program will consist of at least 15 credit hours of core courses, at least 9 hours of elective courses with research taking up the balance to a minimum 30 credit hours, total.

### Sample Plan (Thesis Option)

#### **Year 1 (total Hours: 29)**

<b>Autumn</b>	<b>Spring</b>	<b>Summer</b>
Chem 6510/6540* (3)	Chem 7520 (3)	ChemPhys 7998 (8)
Physics 7601 (3)	Physics 7602 (3)	
Physics 7701 (3)	Physics 7401 (3)	IOE → Masters or Ph. D
Chem 8895 (1)	Chem 8895 (1)	Preceptor selection
Chem 6781 (1)		

**Year 2 (total Hours: 24)**

<b>Autumn</b>	<b>Spring</b>
Chem 7530 (3)	ChemPhys 8880 (3)
ChemPhys 7999 (8)	ChemPhys 7999 (8)
Chem 8895 (1)	Chem 8895 (1)

\* Chem 6510 and 6540 are sequential half semester courses.

**Chemical Physics Masters program under quarters****I. MASTERS PROGRAM**

**M.S. Degree with Thesis.** The student must have a minimum residence of three quarters at The Ohio State University with completion of at least 45 quarter hours of graduate work, including credit for research. Course work must be at the 600-900 level (500 or above outside the Physics and Chemistry Departments), and the courses must be acceptable to the Chemical Physics Graduate Studies Committee and the student's advisor, and must include the core courses listed in the Doctoral program. The student's course program should be decided in conjunction with the thesis advisor.

Students will carry out a research program that will culminate in the writing of a thesis. The research program should be initiated as soon as possible after preceptor selection.

At least two weeks prior to the date proposed for conferring the M.S. degree, the candidate must pass an oral examination before a committee, approved by the Graduate Studies Committee Chairperson and composed of at least three Chemical Physics faculty (including the advisor). Should the graduate record of the candidate be wholly satisfactory to the examining committee, the scope of the examination will be confined to the candidate's field of specialization.

**M.S. Degree without Thesis.** The following provision is made for granting a terminal Master's degree only without the necessity of completing a thesis. Upon application by the student, he/she must have satisfied the course requirements above for the Master's degree, passed the IOE at level 3 (see Section VI.B.1) and successfully completed both the written and oral portion of an exam comparable to the General Examination (see VI.B.2)

The course requirements may be divided into two categories: i) core requirements and ii) elective requirements. Each student must satisfy each of the following three core requirements for a total minimum of 6 courses. The core areas are:

<u>Area</u>		<u>Suggested Course</u>	
		<u>Chemistry</u>	<u>Physics</u>
1)	Quantum Mechanics	861(A), 862(W), 863(S)	827(A), 828(W), 829(S), 830(A)
2)	Statistical Mechanics/ Thermodynamics/Kinetics	880(S), (775(A) or 876(W))	846(W), 847(S)
3)	Spectroscopy	866(S odd years)	* (I)
4)	Safety Seminar (to be completed in first year)	685 (W)	

\* Depending on topic 880.20 may satisfy this requirement

(Letter in parenthesis indicates quarter normally offered: (A)=Autumn; (W)=Winter; (S)=Spring; (I)=Irregular)

To fulfill the core requirement in each area the student may take the appropriate courses in either department (but not both). These courses will normally be taken during the student's first year of enrollment (except for Physics 830).

In addition, the student must also demonstrate proficiency in several electives in at least two areas

exemplified by the following:

<u>Area</u>	<u>Suggested Course</u>	
	<u>Chemistry</u>	<u>Physics</u>
Optics	-	657(S)
Classical Mechanics	-	821(A)
Kinetics	876(W)	-
Electricity and Magnetism	-	834(A), 835(W)
Condensed Matter Physics	-	780.06(S)
Atomic Physics/Spectroscopy		780.04((A) also Astron 823)
Analytic Spectroscopy	823(S)	-
Electrochemistry	821(A)	-
Advanced Topics	-	880.0X (I)
Special Topics of Current Interest	996 (I)	880.20 (I)
Mathematics	Appropriate math courses at the 500 level or above, e.g., Math 601(A), 602(W), Phys 730(Su), 731(W)	

Overall the student must complete the equivalent of 4 courses of these elective requirements, with at least half of these being completed within the first year. Credit in the core areas in excess of 6 courses may be applied to fulfill up to 2 courses of the 4 courses elective credit requirements. However, for the Chemical Physics degree, a student must normally accumulate a total of at least 3 courses from the core and elective courses in each of the Chemistry and the Physics Departments. (ChemPhys880(W)-Frontiers in Spectroscopy taken for a grade will count as an elective.)

The **IOE** is given on an individual basis, but will normally be taken at the end of Spring Quarter or the beginning of Summer Quarter of the student's first year. At this point, the student should have completed most of the course requirements listed above. The IOE shall be administered by 3 Chemical Physics faculty members appointed by the Graduate Studies Chairperson and will test the depth and integration of understanding of the student's knowledge in the core Chemical Physics areas as indicated above and in selected other areas of the student's specialization. The examination shall be oral. In the case of an overall ambiguous performance, the committee can require a second, written examination.

## Chemical Physics Masters Transition Policy

**Students who began their degree under quarters will not be penalized as the university moves to semesters, either in terms of progress towards their degree or their expected timing of graduation. The Chemical Physics Graduate Studies Chair is the advisor for all graduate students upon entry to the program, and remains the students' advisor until they join research groups. At this point the student's research advisor also becomes his/her academic advisor. This support structure will continue under semesters.**

The transition plan for the Masters degree details how students who have completed portions of their required coursework under quarters be able to fulfill their coursework requirements under semesters. Nearly all Chemical Physics Masters students take the core-course multi-quarter sequences during a single academic year, in which case a one-year sequence under quarters will be counted as the corresponding one-year sequence under semesters. However, if a student has taken only one or two quarters of a sequence, then the student will take the second semester of the sequence. If the student has only taken one quarter, individual study will be provided to ensure that he/she is ready to take the second semester. The elective courses are all one-semester courses and they will be substituted on a one-to-one basis for quarter courses to satisfy the elective requirements.

### Sample Plan (Thesis Option)

#### Year 1 (Quarters)

Autumn	Winter	Spring	Summer
Chem 861	Chem 862	Chem 863	Physics 816
Physics 834	Physics 835	Physics 836	
Physics 821	Physics 846	Physics 847	IOE
	ChemPhys 880		

#### Year 2 (Semesters)

Autumn	Spring
Chem 7530 (3)	ChemPhys 8880 (3)
ChemPhys 7999 (8)	ChemPhys 7999 (8)
Chem 8895 (1)	Chem 8895 (1)