

Program of Study

ANALYTICAL EMPHASIS

Major		Minor	Total Graded
CHEM 526b Fall	3	3 credits minimum choose courses to broaden general knowledge of chemistry or to focus on a secondary area that complements the major	
CHEM 527 Fall	3		
CHEM 528 Spring	3		
CHEM 521A Fall	3		
Choose either CHEM 522 or CHEM 525 Spring	3		
Major Courses Total (minimum):	15	Minor Courses Total (minimum) : 3	Graded Courses Total (minimum): 18

Other Courses

Group Meeting	Seminar	Other	Total units
695b 1 credit/semester (after joining a research group)	696a 1 credit/semester	595a/b Professional Development (Fall and Spring I), 2 credit 695a Research Opportunities (Fall I), 1 credit 696e graded seminar at discretion of GPC 900 Research 1-5 credits per semester	
Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: 27

Graded (min. 18) and ungraded courses listed in above tables must equal at least 45 credits.
CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits.
All students must earn a grade of B or better in all required major coursework.

INORGANIC EMPHASIS

Major		Minor	Total Graded
510 Fall only	3	3 credits minimum choose courses to broaden general knowledge of chemistry or to focus on a secondary area that complements the major	
514	3		
515	3		
6 credits chosen from 512, 513 (multiple times if different topics), 511A, 518 or course approved by committee	6		
Major Courses Total (minimum):	15	Minor Courses Total (minimum) : 3	Graded Courses Total (minimum): 18

Other Courses

Group Meeting	Seminar	Other	Total units
695b 1 credit/semester (after joining a research group)	696b 1 credit/semester	595a/b Professional Development (Fall and Spring I), 2 credit 695a Research Opportunities (Fall I), 1 credit 696e graded seminar at discretion of GPC 900 Research 1-5 credits per semester	
Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded Courses total: 27

Graded (min. 18) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits.

All students must earn a grade of B or better in all required major coursework.

ORGANIC EMPHASIS

Major		Minor	Total Graded
550	3	3 credits minimum choose courses to broaden general knowledge of chemistry or to focus on a secondary area that complements the major	
541	3		
545	4		
Courses chosen from 542A, 542B, 640 or 546, 549b, 548 or course approved by committee	5		
Major Courses Total (minimum):	15	Minor Courses Total (minimum): 3	Graded Courses Total (minimum): 18

Other Courses

Group Meeting	Seminar	Other	Total units
695b 1 credit/semester (after joining a research group)	696c 1 credit/semester	595a/b Professional Development (Fall and Spring I), 2 credit 695a Research Opportunities (Fall I) 1 credit 696e graded seminar at discretion of GPC 900 Research 1-5 credits per semester	
Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: 27

Graded (min. 18) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits

All students must earn a grade of B or better in all required major coursework.

PHYSICAL EMPHASIS

Major		Minor	Total Graded
580 Fall only	3	3 credits minimum choose courses to broaden general knowledge of chemistry or to focus on a secondary area in chemistry or a related department that complements the major	
582 Fall only	3		
587 Spring only	3		
680 Spring Only	3		
Elective course chosen from 581, 583, 682, 684, 686, 687, or course approved by committee	3		
Major Courses Total (minimum):	15	Minor Courses Total (minimum): 3	Graded Courses Total (minimum): 18

Other Courses

Group Meeting	Seminar	Other	Total units
695b 1 credit/semester (after joining a research group)	696d 1 credit/semester	595a/b Professional Development (Fall and Spring I), 2 credit 695a Research Opportunities (Fall I) 1 credit 696e graded seminar at discretion of GPC 900 Research 1-5 credits per semester	
Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: 27

Graded (min. 18) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits

All students must earn a grade of B or better in all required major coursework.

CHEMICAL EDUCATION

The Ph.D. in Chemistry with a research component in Chemical Education is designed for individuals who intend to pursue careers in chemical education research or teaching at the high school, college, or university level. Graduate course work in chemistry is accompanied by courses in education and chemical education, which enable the graduate to undertake research in the teaching and learning of chemistry.

Major	Minor	Total Graded
15 credits minimum complete major course requirements in any of these subject areas: analytical, biological, inorganic, organic, or physical chemistry.	9 credits minimum choose courses to complete a minor in education or science education (must satisfy the requirements of the minor department).	
Major Courses Total (minimum): 15	Minor Courses Total (minimum): 9	Graded Courses Total (minimum): 24

Other Courses

Group Meeting	Seminar	Other	Total units
695b 1 credit/semester (after joining a research group)	696x 1 credit/semester	595a/b Professional Development (Fall I), 1 credit 695a Research Opportunities (Fall I), 1 credit	
Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: min 21

Graded (min. 24) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits

All students must earn a grade of B or better in all required major coursework.

BIOLOGICAL PHYSICS PROGRAM (BPP)

The Biological Physics Program (BPP) is a multidisciplinary graduate training program that can be joined as a track through three departments: Biochemistry & Molecular Biophysics, Chemistry, or Physics. Additional admission requirements correspond to the home department. The degree is granted in Home Department with a focus in Biological Physics.

Major & Distributed Minor		Introduction to Research	Total Graded
Core courses in Biochemistry BIOC 565 Proteins and Enzymes BIOC 585A Biological Structure 1 X-Ray Crystallography BIOC 585B Biological Structure 2 NMR Spectroscopy	3 2 2	BIOC 795a 3 credits/semester Laboratory rotations during first and second semester in residence	
Core courses in Physics PHYS 530 Intro to Biophysics PHYS 531 Molecular Biophysics	3 3		
Core courses in Chemistry Chem 580 Intro to Quantum Chemistry CHEM 582 Statistical Thermodynamics	3 3		
Major Courses Total (minimum):	18		

Other Courses Required

Journal Club	Group Meeting	Seminar	Other	Total units
BIOC 595B 1 credit/semester (Required attendance for students in Biological Physics Program)	695b 1 credit/semester (After joining a research group)	696c 1 credit/semester	595a/b Professional Development 2 credit 695a Research Opportunities 1 credit 696e graded seminar at discretion of GPC	
Maximum counted toward degree: 10	Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: 21

BIOLOGICAL CHEMISTRY PROGRAM (BCP)

The Biological Chemistry Program (BCP) is a multidisciplinary NIH-supported training program at the Chemistry-Biology interface. Students in the program must satisfy their home program requirements (Biochemistry, Chemistry or Pharmaceutical Sciences) and, as part of CBC, will receive a degree in either Biochemistry or Chemistry. Students in the BCP are expected to undertake graduate coursework in both Chemistry and Biology; undertake research rotations both inside and outside their home program; attend the weekly BCP research forum ("Journal Club"); assemble a thesis committee with representation from more than one program; and complete both the online ethics introduction offered during orientation and an ethics course. Students following the BCP path are eligible for our fellowships and may work with any faculty member in the BCPListed below are the approved BCP courses; however, other appropriate graduate courses that provide a foundation in Chemistry or Biology may be substituted with approval from the BCP Director.

Major & Distributed Minor		Introduction to research BIOC 795a	Total Graded
One from the following BIOC 565 Proteins and Enzymes	3	3 credits/semester Laboratory rotations during first and second semester in residence	
BIOC 568 Nucleic Acids and Metabolic Biochemistry	4		
PHSC 530 Proteins and Nucleic Acids as Drug Targets			
Plus one from the following CHEM 550 Synthetic & Mechanistic Organic Chemistry	3		
510 Advanced Inorganic Chemistry			
580 Introduction to Quantum Chemistry			
527 Analytical Separations			
Courses chosen from upper division chemistry or courses approved by committee.	6		
Major Courses Total (minimum):	16	Maximum counted toward degree: 6	Graded Courses Total (minimum): 22

Other Courses Required

Journal Club	Group Meeting	Seminar	Other	Total units
BIOC 595B	695b	696X	CHEM 595a/b Professional Development 2 credit MCB 695e (Science, Society, & Ethics) 1 credit	
1 credit/semester (Required attendance for students in BCP)	1 credit/semester (After joining a research group)	1 credit/semester		
Maximum counted toward degree: 10	Maximum counted toward degree: 10	Maximum counted toward degree: 10		Ungraded total: 21

Graded (minimum 21) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12 credits

CHEMICAL PHYSICS PROGRAM (CPP)

The Chemical Physics Program (CPP) is a multidisciplinary graduate training program that can be joined as a track through either the Chemistry or Physics departments. Students undertake courses and seminars involving both departments that are optimized for individual student interests with a maximum of flexibility. Admission requirements for CPP students correspond to the Home Department (Chemistry or Physics). The degree is granted in the Home Department with a focus in Chemical Physics.

Major	Minor	Total Graded*
Choose any courses from the following options: Quantum Mechanics CHEM 580 & 680 or PHYS 570A and 570B 3/3 Thermodynamics & Statistical Mechanics CHEM 582 or PHYS 528 3 Kinetics CHEM 583 3 Spectroscopy CHEM 584/587/687 3/3/3 Mathematical Methods CHEM 581 3 Electricity & Magnetism PHYS 515A/B 3/3 Condensed Matter PHYS 560A/B or CHEM 686 3 or course approved by committee	Choose courses from the indicated options to broaden general knowledge of chemistry and physics	* CPP students must take at least 2 major graduate courses from the home department.
Major Courses Total (minimum): 15	Minor Courses Total (minimum): 3	Graded Courses Total (minimum): 18

Other Courses Required

Journal Club	Group Meeting	Seminar	Other	Total units
CHEM 599 or PHYS 599 (CPP seminar) 1 credit per semester (Required attendance for students in CPP)	CHEM 695b 1 credit per semester (After joining a research group)	CHEM 696c (Physical Chemistry or Physics Seminar) 1 credit/semester and/or	CHEM 595c (College Teaching, Fall I, 1 credit) CHEM 695a (Research Opportunities, Fall I, 1 credit) CHEM 696e graded seminar at discretion of GPC	
Maximum counted toward degree: 10	Maximum counted toward degree: 10	Maximum counted toward degree 10		Ungraded total: 27

Graded (minimum 18) and ungraded courses listed in above tables must equal at least 45 credits. CHEM 920 Dissertation Research must be taken for a minimum of 18 credits. Total: 45+18=63

All students should register for at least 12.

Certificate in Entrepreneurial Chemistry

This program is only offered to PhD graduate students who want to be successful as entrepreneurs or working in start-up companies.

PhD requirements	Business	Other	Total units
Students must fulfill all requirements for the Chemistry PhD program	BNAD 510 Business for Scientists 3 credits MIS578 Management 3 credits	CHEM 909 One chapter in the doctoral dissertation on the business aspects of the research	
63	6 credits	2 credits	71