

The Ohio State University
Department of Chemistry & Biochemistry

Chemistry Graduate Program

**2018 Autumn Registration Guide
For First Year Students**

General Guidelines

We are currently making major revisions to the *Summary of Procedures and Requirements for Graduate Degrees* for 2018. You may still use the [2016 Summary](#) and the [2017 Addendum](#) for general information about procedures and curriculum. This guide will help you pick your classes for Autumn 2018 before the release of 2018 Summary document in August.

Overview

In the initial Autumn semester, most students will take 3-6 credit hours of core classes in their division, 3 credit hours of core electives in another division, 1 credit hour of a faculty research seminar to help you choose a lab, 1 credit hour of a safety course, and 1 credit hour of your divisional seminar course. In addition, you will sign up for enough credit hours of Research so that your total number of credit hours is 18. Most, but not all, lecture classes in the department are offered as 7-week, 1.5 credit hour courses. There are two 7 week sessions per semester. As a result, a typical first semester schedule look like this:

AU Session 1 (7 weeks)	AU Session 2 (7 weeks)
Chem 6xxx in division (core) [1.5]	Chem 6xxx in division (core) [1.5]
Chem 6xxx in division (core) [1.5]	Chem 6xxx in division (core) [1.5]
Chem 6xxx out of division (core elective) [1.5]	Chem 6xxx out of division (core elective) [1.5]
Chem 6780 Faculty Research Presentations [1]	Chem 5781 Laboratory Safety [1]
Chem 889x Divisional Seminar [1]	
Chem 8999 Doctoral Research [6, or whatever is required for a total of 18]	

Course Load

In general, 9 credit hours of chemistry/biochemistry lecture courses (core and core elective) are recommended for the first Autumn. Students who are supported on fellowship may consider taking an additional lecture class, but this is not required, and the time is probably better spent exploring labs.

International students may have requirements to take classes to establish written or spoken proficiency in English. Written English proficiency courses should be deferred to Spring or Summer terms. International students are required to take all recommended English as a Second Language (ESL) courses to achieve spoken English proficiency. These courses may conflict with Chemistry or Biochemistry courses, and also, while they do not involve a lot of homework, they are a lot of class time. Consequently, it is usually best to defer the out-of-division core electives to Autumn of the second year (i.e., to take 6 credit hours of lecture classes instead of 9 in the first Autumn). If time conflicts make it impossible to take all of the divisional 6xxx classes, core electives can be substituted in their place.

Core classes and core electives

In general, you should take all of the Chem 6000-level classes in your division, and 3 credit hours of 6000-level classes in another division of your choosing. It usually makes the most sense to take all core electives in the same outside division, but this is not required. The courses eligible as core and core electives are:

Analytical: Chem 6110, Chem 6120 (not offered in AU18)

Biochemistry: Biochem 6761 (Biochem 6701 can be taken as a core elective)

Inorganic: Chem 6310, Chem 6320, Chem 6330, Chem 6340 (6310/6320 recommended as core electives)

Organic: Chem 6410, Chem 6420, Chem 6430, Chem 6440 (6410/6430 are synthetic and 6420/6440 are physical organic)

Physical: Chem 6510, Chem 6520, Chem 6530, Chem 6540 (6520/6530 recommended as core electives)

Program Requirements

All students in the Ph.D. program should sign up for the following courses:

Chem 6780 Faculty Research Presentations, 1 c.h., S1

Chem 6781 Laboratory Safety, 1 c.h., S2

Chem 8999 Research, approx. 6 c.h.

You should sign up for enough credit hours of 8999 so that your total hours are 18. Sign up for class number 6072 (Magliery).

ESL Classes

Non-native English speakers who receive a 2-2.75 on the OPA generally are recommended to take EDUTL 5040 (4 c.h.), and students who receives a 3-3.75 generally are recommended to take EDUTL 5050 (3 c.h.). EDUTL 5060 (1 c.h.) or Independent Studies (1 c.h.) may also be recommended at any score level. Chemistry graduate students are required to take all recommended spoken English ESL courses until they achieve full teaching certification (OPA or OPCA score of 4+). International students may also be required to take EDUTL 5901 (3 c.h.) and/or EDUTL 5902 (3 c.h.) to demonstrate written English proficiency. In general, EDUTL 5901 should be taken in the Spring and EDUTL 5902 should be taken in the Summer.

Divisional Requirements

We require students to declare to which division they will belong when when they start in Autumn. It is possible to switch divisions later, but in general that will increase the number of classes you have to take to meet the new division's requirements, so this is rarely done. It is also possible to file a Multidisciplinary Track (MDT) application for a custom curriculum that combines classes and requirements from two or more divisions, once you have joined a lab. Please let Kelly Burke (burke.247@osu.edu) know if you intend to enroll in the curriculum of a different division than you previously indicated during admissions. If you are considering labs in two divisions, you should think about taking your core elective classes in the non-major division, so that you can create a MDT curriculum if you wish later on.

Analytical Division

The temporary advisors for the Analytical division are:

Prof. Abraham Badu-Tawiah, badu-tawiah.1@osu.edu, 614-292-4276

Prof. Robert Baker, baker.2364@osu.edu, 614-292-2088

Analytical students should sign up for the following classes:

Chem 6110 Survey of Instrumental Methods, 1.5 c.h., S1

Chem 7120 Electrochemistry, 3 c.h.

Chem 8891 Analytical Chemistry Seminar, 1 c.h.

Chem 6120 Analytical Treatment of Data will tentatively be offered in Spring 2019, or, if it is not, will be offered in Autumn 2019. Because of this, most Analytical students should take 3-4.5 credit hours of classes in other divisions this Autumn, including at least 3 credit hours of core electives. Recommended classes include Biochem 6761, Chem 6320, Chem 6330, Chem 6440, Chem 6520, Chem 6530, and Chem 7540.

Chem 7120 Electrochemistry is not required, but Analytical students must take three Chem 71xx classes (9 c.h.), so it is advisable to take this course now. Other 71xx classes include Chem 7130 Separation Science (to be offered SP19), Chem 7140 Analytical Spectroscopy (to be offered SP19), Chem 7150 Mass Spectrometry (likely to be offered in SP20), and Chem 7160 NMR Spectroscopy (likely to be offered in AU19).

Biochemistry Division

The temporary advisors for the Biochemistry division are:

Prof. Venkat Gopalan, gopalan.5@osu.edu, 614-292-1332

Prof. Kotaro Nakanishi, nakanishi.9@osu.edu, 614-688-2188

Biochemistry students should sign up for the following classes:

Biochem 6761 Macromolecules, 3 c.h.

Chem 8892 Biochemistry Seminar, 1 c.h.

Biochemistry division students are required to do three 5-week laboratory rotations. As a result, Biochem 6761 is the only recommended Biochemistry class in the first Autumn. The Biochemistry division temporary advisors will be in contact about arranging your first rotation before classes begin. If you cannot take Biochem 6761 because of conflicts with ESL courses, Biochem 6701 Molecular Biology is recommended, but Biochem 6761 must then be taken in the fall of the second year.

Biochemistry students must take two core elective classes (3 c.h.) in another division. The division recommends Chem 6520/6530 for students with biophysical interests, or Chem 6420/6440 for students with bioorganic/chemical biology interests.

Inorganic Division

The temporary advisors for the Inorganic division are:

Prof. Claudia Turro, turro.1@osu.edu, 614-292-6708

Prof. Shiyu Zhang, zhang.8941@osu.edu, 614-688-3630

Inorganic students should sign up for the following classes:

Chem 6310 Fundamentals of Coordination Chemistry, 1.5 c.h., S1

Chem 6320 Synthetic Principles in Inorganic Chemistry, 1.5 c.h., S2

Chem 6330 Group Theory and Bonding, 1.5 c.h., S1

Chem 6340 Physical Methods in Inorganic Chemistry, 1.5 c.h., S2

Chem 8893 Inorganic Seminar, 1 c.h.

Inorganic students must take two core elective classes (3 c.h.) in another division. Students with bioinorganic interests should consider Biochem 6761. Students with organic synthetic interests should consider Chem 6410/6430.

Organic Division

The temporary advisors for the Organic division are:

Prof. David Nagib, nagib.1@osu.edu, 614-688-1060

Prof. Jon Parquette, parquette.1@osu.edu, 614-292-5886

Organic students should sign up for the following classes:

Chem 6410 Basic Organic Reaction Mechanisms (Synthesis I), 1.5 c.h., S1

Chem 6420 Stereochemistry and Conformational Analysis (Physical Organic I), 1.5 c.h., S1

Chem 6430 Introduction to Organic Synthesis (Synthesis II), 1.5 c.h., S2

Chem 6440 Introduction to Physical Organic Chemistry (Physical Organic II), 1.5 c.h., S2

Chem 8894 Organic Seminar, 1 c.h.

Organic students must take two core elective classes (3 c.h.) in another division. Students with chemical biology interests should consider Biochem 6761. Students with inorganic materials or inorganic synthesis interests should consider Chem 6310/6320.

Physical Division

The temporary advisors for the Physical division are:

Prof. Steffen Lindert, lindert.1@osu.edu, 614-292-8284 (theory)

Prof. Hannah Shafaat, shafaat.1@osu.edu, 614-688-1982 (experimental)

Physical students should sign up for the following classes:

Chem 6510 Quantum Mechanics and Spectroscopy, 1.5 c.h, S1

Chem 6520 Thermodynamics, 1.5 c.h., S1

Chem 6530 Kinetics, 1.5 ch., S2

Chem 6540 Introduction to Electronic Structure, 1.5 c.h., S2

Chem 8895 Physical Seminar, 1 c.h.

Physical students must take two core electives (3 c.h.) outside the division. Chem 6330 is strongly recommended. Other recommended core electives include Chem 6110, Chem 6340, Chem 6420, and Chem 6440.

Theory students who have not taken linear algebra should consider taking Math 5101. Contact your temporary advisor to discuss other changes to your schedule to accommodate this class.

AU18 Graduate Classes

Biochemistry

Biochem 6701 Advanced Biochemistry: Molecular Biology (Foster) [15278], 3 c.h.

Full Semester, TuTh 9:35-10:55 am, 668 BioSci

An advanced treatment of the biochemical principles of gene and genome function.

Biochem 6761 Advanced Biochemistry: Macromolecular Structure and Function

(Musier-Forsyth/Ottesen) [5329], 3 c.h.

Full Semester, MWF, 10:20-11:15 am, 264 Macquigg

An advanced treatment of the physical and chemical properties, biological function, and structural biology of proteins and nucleic acids.

Biochem 7776.01 Advanced Biochemistry: Nucleic Acids (Gopalan/Jackman) [16241], 2 c.h.

Session 1, MW 10:20-11:15 AM, F 10:20 am-12:10 pm, 676 BioSci

Advanced understanding of the structure and function of nucleic acids, their interactions with other biological molecules, and of the techniques for detailed mechanistic investigation of nucleic acid structure and function.

Biochem 8990 Advanced Topics in Biochemistry (Foster) [16245], 1.5 c.h.

Session 2, TR 12:45-2:05 pm, 668 BioSci

Advanced treatment of areas of current interest in biochemistry; topics will be announced each semester.

Chemistry

Chem 6110 Survey of Instrumental Methods (Dutta) [5992], 1.5 c.h.

Session 1, MoWeFr 1:50-2:45 pm, 1005 McPherson

Introduction to instrumental analytical methods, including optical spectroscopy, mass spectrometry, surface spectrometry, microprobe methods, and separation science concepts relevant to chemical analysis.

Chem 6120 Analytical Data Treatment - *not offered AU18*

Chem 6310 Fundamentals of Coordination Chemistry (Thomas) [5988], 1.5 c.h.

Session 1, MWF 9:10-10:05 AM, 2002 Evans Lab

Fundamental concepts of coordination chemistry, including properties, coordination number & isomerism, complex stability & the chelate effect, ligand substitution reactions, electron transfer, coordination chemistry & catalysis, magnetic phenomena.

Chem 6320 Synthetic Principles in Inorganic Chemistry (Wade) [16401], 1.5 c.h.

Session 2, MWF 9:10-10:05 AM, 2002 Evans Lab

Synthesis, structure, and application of electron counting rules to organometallic clusters. Synthesis and structure of main group and transition metal hydrides. Applications in catalysis.

Chem 6330 Group Theory and Bonding (Turro) [6000], 1.5 c.h.

Session 1, MWF 10:20-11:15 AM, 2003 Evans Lab

Introduction to groups and group representations, application to pi-bonding in organic molecules, molecular orbital theory, bonding in transition metal complexes, molecular vibrations, and electronic spectroscopy.

Chem 6340 Physical Methods in Inorganic Chemistry (Goldberger) [5989], 1.5 c.h.

Session 2, MWF 10:20-11:15 AM, 2003 Evans Lab

Exploration of techniques for measuring structure and properties of small inorganic molecules and assemblies, including elemental composition, structural characterization, and physical properties.

Chem 6410 Basic Organic Reaction Mechanisms (Synthesis I) (Nagib) [5994], 1.5 ch.h.

Session 1, MWF 300-3:55 pm, 2017 McPherson

This course serves as an introduction to organic synthesis. Advanced synthetic chemistry concepts will be discussed including the impact of stereochemistry and molecular conformation in chemo- diastereo- and enantioselectivity of reactions. Carbon-carbon, carbon-heteroatom bond-forming reactions and functional group transformations will be discussed, including fundamental carbonyl chemistry and electrophilic additions to unsaturated systems.

Chem 6420 Stereochemistry and Conformational Analysis (Physical Organic I) (McGrier) [5991], 1.5 c.h.

Session 1, MWF 12:40-1:35 pm, 2002 Evans Lab

This course will cover concepts in physical organic chemistry that focus on how ground state energetics and molecular orbitals influence structure and chemical reactivity. Topics include qualitative molecular orbital analysis, stability of reactive intermediates, thermochemistry, conformational analysis and stereochemistry, acid-base chemistry, molecular-orbital controlled reactions and related topics in physical organic chemistry.

Chem 6430 Introduction to Organic Synthesis (Synthesis II) (Parquette) [5999], 1.5 c.h.

Session 2, MWF 3:00-3:55 pm, 2017 McPherson

This advanced synthetic chemistry course will cover the use of oxidative and reductive transformations in organic synthesis, focusing on important elements of chemo-, regio- and stereoselectivity. In addition, this course will discuss the use of pericyclic reactions such as cycloadditions and electrocyclic reactions in synthesis. Application of these reactions in synthetic routes to a range of organic target molecules will be discussed.

Chem 6440 Introduction to Physical Organic Chemistry (Physical Organic II) (Bong) [5996], 1.5 c.h.

Session 2, MWF 12:40-1:35 pm, 2002 Evans Lab

This class will introduce essential concepts and tools for understanding and probing reaction mechanisms. Topics to be discussed include: mechanistic concepts, postulates, transition \ddagger -state analysis, kinetic analysis, isotope effects, mechanistic probes, linear free energy relationships, application of mechanistic probes to basic organic reactions, catalysis and related topics in physical organic chemistry.

Chem 6510 Quantum Mechanics and Spectroscopy (Herbert) [5993], 1.5 c.h.

Session 1, MWF 3:00-3:55 pm, 1040 McPherson

Introduction to the fundamentals of quantum mechanics with applications to chemical dynamics and spectroscopy, suitable for graduate students and advanced undergraduates from all areas of chemistry.

Chem 6520 Thermodynamics (Grandinetti) [5990], 1.5 c.h.

Session 1, MWF 11:30 am-12:25 pm, 2019 McPherson

Fundamental aspects of chemical thermodynamics, including spontaneous change, 1st, 2nd, and 3rd laws of thermodynamics, free energy, and thermochemical calculations.

Chem 6530 Kinetics (Shafaat) [5995], 1.5 c.h.

Session 2, MWF 11:30 am-12:25 pm, 2019 McPherson

Description of the rate of chemical reactions, including rate equations, mechanism, and transition state theory.

Chem 6540 Introduction to Electronic Structure (Herbert) [5998], 1.5 c.h.

Session 2, MWF 3:00-3:55 pm, 1040 McPherson

Introduction to electronic structure of atoms and molecules, and quantum-chemical calculations, including self-consistent field methods, molecular orbital theory, density functional theory, and other methods for describing electron correlation.

Chem 6780 Faculty Research Presentations (Magliery) [6225], 1 c.h.

Session 1, TR 5:30-7:30 pm, 130 CBEC

Presentation of faculty research programs and projects to incoming doctoral students. Not available for undergraduate credit.

Chem 6781 Laboratory Safety (Herrington) [6005], 1 c.h.

Session 2, TR 5:30-6:25 pm, 130 CBEC

Principles of safety in the chemical laboratory.

Chem 7120 Electrochemistry (Co) [16240], 3 c.h.

Full Semester, TR 12:45-2:05 pm, 80 Derby

Electrochemical methods for trace analysis of species, including current/voltage relationships based on activation and diffusion control, electrode kinetics, and reaction mechanisms.

Chem 7530 Spectra and Structure of Molecules (Brüschweiler) [16242], 3 c.h.

Full Semester, TR 2:20-3:40 pm, 2003 Evans Lab

Application of quantum mechanics to the description and interpretation of molecular spectroscopic data, with an emphasis on the spectra of polyatomic molecules.

Chem 7540 Chemical Dynamics (Zhong) [32955], 3 c.h.

Full Semester, MWF 10:20-11:15 am, 2001 Evans Lab

Advanced chemical dynamics in the gas and condensed phase, including the fundamental theory of chemical reactions, molecular energy transfer, and electron and proton transfer reactions.

Chem 8499 Advanced Topics in Organic Chemistry (RajanBabu) [34195], 1.5 c.h.

Session 2, MWF 4:10-5:05 pm, 1040 McPherson

Advanced, specialized topics in Organic Chemistry.

Chem 8891 Analytical Chemistry Seminar (Badu-Tawiah) [13217], 1 c.h.

Full Semester, M 4:10-5:20 pm, 130 CBEC

Seminar in Analytical Chemistry.

Chem 8892 Biochemistry Seminar (Sotomayor) [33004], 1 c.h.

Full Semester, R 4:10-5:20 pm, TBD

Seminar in Biochemistry.

Chem 8893 Inorganic Chemistry Seminar (Wade) [33140], 1 c.h.

Full Semester, T 11:30 am-12:25 pm, 100 Stillman

Seminar in Inorganic Chemistry.

Chem 8894 Organic Chemistry Seminar (Sevov) [13220], 1 c.h.

Full Semester, T 11:30 am-12:25 pm, 100 Stillman

Seminar in Organic Chemistry.

Chem 8895 Physical Chemistry Seminar (Baker) [16844], 1 c.h.

Full Semester, M 4:10-5:20 pm, 130 CBEC

Seminar in Physical Chemistry.

Chem 8999 Thesis/Dissertation Research (Various)

You should sign up for (Magliery) [6072].