CHEMISTRY

Office: 169 Chemistry Building; 313-577-7784
Chairperson: Matthew J. Allen
Associate Chairperson: Jeremy Kodanko
Academic Services Officers: Erin Bachert, Jackie Kennedy, Melissa Rochon
https://clas.wayne.edu/chemistry (https://clas.wayne.edu/chemistry/)

Wayne State's doctoral chemistry program provides rigorous education and training for students who find careers in the chemical industry, research laboratories, colleges and universities, government agencies and more. Our Ph.D. program is designed for students interested in becoming independent scientists and leaders in their field. Ph.D. chemists work at the forefront of science creating new knowledge.

General Requirements for Graduate Study in Chemistry

Every student entering the graduate program in chemistry will be required to take a series of entrance (proficiency) examinations covering the major disciplines of chemistry. These examinations, which cover standard undergraduate-level material, will be administered on announced dates in August.

A final oral examination is required of all graduate degree candidates.

ALLEN, MATTHEW: Ph.D., California Institute of Technology; B.S., Purdue University; Professor and Chair

BHAGWAT, ASHOK S.: Ph.D., Pennsylvania State University; M.S., Indian Institute of Technology; B.A., University of Bombay; Professor

BOUR, JAMES: Ph.D., University of Michigan; B.Sc., Hope College; Assistant Professor

BROCK, STEPHANIE L.: Ph.D., University of California, Davis; B.S., University of Washington; Professor

CHA, JIN K.: Ph.D., University of Oxford; B.S., Seoul National University; Professor

CHEKMENEV, EDUARD: Ph.D., University of Louisville; B.S., Perm State University; Professor

CHERNYAK, VLADIMIR: Ph.D., Russian Academy of Science, Institute of Spectroscopy; M.S., Moscow Physics and Technology Institute; Professor

CHOW, CHRISTINE: Ph.D., California Institute of Technology; M.A., Columbia University; B.A., Bowdoin College; Professor

DENT, MATTHEW: Ph.D., University of Wisconsin-Madison; B.S. James Madison University ; Assistant Professor

ENDICOTT, JOHN F.: Ph.D., Johns Hopkins University; B.A., Reed College; Professor Emeritus

FEHL, CHARLIE: Ph.D., University of Kansas; B.S. University of Michigan; Assistant Professor

GROYSMAN, STANISLAV: Ph.D., B.S., Tel Aviv University; Associate Professor

HENDRICKSON, TAMARA: Ph.D., California Institute of Technology; B.A., Wellesley College; Professor

HICKEY, SEAN: Ph.D., B.S., University of New Orleans; M.S., University of Michigan; Assistant Professor of Teaching

KODANKO, JEREMY: Ph.D., University of California at Irvine; B.S., University Wisconsin, Madison; Professor and Associate Chair

KUNTZLEMAN, TOM: Ph.D., University of Michigan-Ann Arbor; M.S., University of North Carolina at Greensboro; B.S.Ed., Bloomsburg University ; Assistant Professor of Teaching

LI, WEN: Ph.D., Stony Brook University; B.S., Peking University; Professor

LINTVEDT, RICHARD L.: Ph.D., University of Nebraska; B.A., Lawrence University; Professor Emeritus

LINZ, THOMAS H.: Ph.D., University of Kansas; B.S., Truman State University; Associate Professor

LIU, ZHENFEI: Ph.D., University of California at Irvine; B.S., Peking University; Associate Professor

LONG, LUO: Ph.D., University of Utah; B.S., Beijing University of Aeronautics and Astronautics; Assistant Professor

MATTI, ANDREA: Ph.D., Michigan State University; B.Sc., Madonna University; Associate Professor of Teaching

NGUYEN, HIEN: Ph.D., University of Illinois at Urbana-Champaign; B.S., Tufts University; Professor

PFLUM, MARY KAY H.: Ph.D., Yale University; B.A., Carleton College; Professor

POOLE, COLIN F.: Ph.D., Keele University; M.Sc., Bristol University; B.Sc., Leeds University; Professor Emeritus

RABUFFETTI, FEDERICO A.: Ph.D., Northwestern University; B.Sc., Universidad de la Republica; Associate Professor

RIGBY, JAMES H.: Ph.D., University of Wisconsin; B.S., Case Western Reserve University; Professor Emeritus

RODGERS, MARY T.: Ph.D., California Institute of Technology; B.S., Illinois State University; Professor

ROMANO, LOUIS J.: Ph.D., B.A., Rutgers University; Professor Emeritus

RORABACHER, DAVID B.: Ph.D., Purdue University; B.S., University of Michigan; Professor Emeritus

RURY, AARON: Ph.D., University of Michigan; B.S., University of Illinois at Urbana-Champaign; Associate Professor

SANTA LUCIA, JOHN: Ph.D., University of Rochester; B.S., Clarkston University; Professor Emeritus

SCHLEGEL, H. BERNHARD: Ph.D., Queen's University; B.Sc., University of Waterloo; Professor Emeritus

TOMCO, DAJENA: Ph.D., B.S., Wayne State University; Associate Professor of Teaching

TRIMPIN, SARAH: Doktor der Naturwissenschaften, Max-Planck-Institute for Polymer Research, University of Mainz; Vor-Diplom, Diplom, University of Konstanz; Professor

VERANI, CLAUDIO N.: Ph.D., Max-Planck-Institut für Strahlenchemie and Ruhr-Universität; M.Sc., B.S., Universidade Federal de Santa Catarina; Professor

WALKER, ALICE: Ph.D., University of North Texas; B.S., University of Michigan_Dearborn; Assistant Professor

WINTER, CHARLES H.: Ph.D., University of Minnesota; B.S., Hope College; Professor

WU, NANCY: Ph.D., University of Michigan; B.S., University of California - Los Angeles; Associate Professor of Teaching

ZIBUCK, REGINA: Ph.D, University of Pennsylvania; M.S., B.S., Bucknell University; Professor of Teaching

- Chemistry (M.A.) (http://bulletins.wayne.edu/graduate/college-liberal-arts-sciences/chemistry/chemistry-ma/)
- Chemistry (M.S.) (http://bulletins.wayne.edu/graduate/college-liberal-arts-sciences/chemistry/chemistry-ms/)
- Chemistry (Ph.D.) (http://bulletins.wayne.edu/graduate/college-liberal-arts-sciences/chemistry/chemistry-phd/)

CHM 5020 Intermediate Inorganic Chemistry II Cr. 3
Transition metal chemistry. Coordination compounds and organometallics. Bonding theories and reactivity. Synthesis, purification, and characterization of inorganic compounds with an emphasis on transition metal compounds. Offered Fall.
Prerequisites: CHM 6070 with a minimum grade of C or (CHM 3020 with a minimum grade of C and CHM 5400-5440 with a minimum grade of C)
Fees: $110

CHM 5160 Instrumental Analytical Chemistry Cr. 3
Application of modern instrumental methods to quantitative analysis. Methods that relate instrumental response to chemical concentrations or content. Calibration, data handling, and data evaluation. Emission, flame, infrared, Raman, fluorescence, and magnetic resonance spectroscopy. Mass spectrometry. Electrochemical methods. Chromatography. Offered Fall.
Prerequisites: (CHM 5400 with a minimum grade of C, CHM 5420 with a minimum grade of C, or CHM 5440 with a minimum grade of C), CHM 3120 with a minimum grade of C, and PHY 2180 with a minimum grade of C

CHM 5400 Biological Physical Chemistry Cr. 3
Presentation of physical chemistry topics: thermodynamics, solution equilibria, chemical kinetics, quantum chemistry, spectroscopy, statistical mechanics, transport processes, and structure with biological applications. Offered Winter.
Prerequisites: CHM 3120 with a minimum grade of C, MAT 2010 with a minimum grade of C, and (PHY 2130 with a minimum grade of C (may be taken concurrently) or PHY 2170 with a minimum grade of C (may be taken concurrently))

CHM 5420 Physical Chemistry I Cr. 3
Chemical thermodynamics, phase equilibrium, solutions, surface chemistry, electrochemistry. Only two credits applicable toward degree after CHM 5400. Offered Fall.
Prerequisites: (CHM 2280 with a minimum grade of C or CHM 3120 with a minimum grade of C), MAT 2020 with a minimum grade of C, and PHY 2170 with a minimum grade of C (may be taken concurrently)

CHM 5440 Physical Chemistry II Cr. 4
Kinetic theory, empirical and theoretical kinetics, quantum theory, atomic and molecular structure, molecular spectroscopy, statistical mechanics. Only three credits applicable to degree after CHM 5400. Offered Winter.
Prerequisites: (CHM 2280 with a minimum grade of C or CHM 3120 with a minimum grade of C), MAT 2020 with a minimum grade of C, and PHY 2170 with a minimum grade of C (may be taken concurrently)

CHM 5510 Chemical Synthesis Laboratory Cr. 3
Advanced techniques for the synthesis, purification and characterization of organic compounds. Offered Fall.
Prerequisites: CHM 1420 with a minimum grade of C or (CHM 2220 with a minimum grade of C and CHM 2230 with a minimum grade of C)
Fees: $110

CHM 5550 Physical Chemistry Laboratory Cr. 2
Satisfies General Education Requirement: Writing Intensive Competency
Principles of measurement. Fundamental investigations of thermodynamics. Fundamental spectroscopic and kinetic measurements. Offered Fall, Winter.
Prerequisites: (CHM 5400 with a minimum grade of C (may be taken concurrently), CHM 5420 with a minimum grade of C (may be taken concurrently), or CHM 5440 with a minimum grade of C (may be taken concurrently)) and PHY 2180 with a minimum grade of C
Fees: $110

CHM 5570 Instrumental Analytical Chemistry Laboratory Cr. 2
Lecture and laboratory experiments covering electronics, measurement, and instrumentation. Principles and analytical applications of electrochemistry, chromatography, and spectroscopy including UV-visible, IR, magnetic resonance, and mass spectroscopy. Offered Winter.
Prerequisites: CHM 5160 with a minimum grade of C
Fees: $110

CHM 5600 Survey of Biochemistry Cr. 3
Protein structure and its relationship to function. Principles of enzyme catalysis. Allosteric regulation of protein function and enzyme catalysis. Pathways of carbohydrate, fat, and protein metabolism in eukaryotic organisms. Introduction to mechanisms of energy coupling and photosynthesis. Information transfer in living systems. Molecular biology. Offered Fall, Winter.
Prerequisites: CHM 1420 with a minimum grade of C, CHM 2220 with a minimum grade of C, or CHM 2225 with a minimum grade of C

CHM 5900 Biomedical Research as Discovery Cr. 2
Solving biochemical research problems using laboratory research tools including computational methods. Offered Yearly.
Prerequisites: CHM 6610 with a minimum grade of C and CHM 6620 with a minimum grade of C
Fees: $100

CHM 5998 Honors Thesis Research in Chemistry Cr. 2-4
Original investigation under direction of senior staff member. Submission of B.S. thesis or manuscript in publication format. Presentation of public lecture on B.S. research. Offered Every Term.
Restriction(s): Enrollment is limited to students with a major in Biochem & Chem Bio Honors or Chemistry Honors.
Repeatable for 8 Credits

CHM 5999 Research in Chemistry Cr. 2-4
Original investigation under the direction of a senior staff member. Submission of B.S. thesis or manuscript in publication format. Offered Every Term.
Restriction(s): Enrollment is limited to students with a major in Biochem & Chem Bio Honors, Biochem & Chemical Biology, Chemistry or Chemistry Honors.
Repeatable for 8 Credits

CHM 6060 Materials Chemistry and Engineering Cr. 3
Solid state structure and bonding. Crystallography, defects, and non-stoichiometry. Phase diagrams. Synthesis and properties of extended solids and nanomaterials. Molecular interactions and statistical physics of soft matter. Synthesis and characterization techniques of polymeric and colloidal material. Physical properties, phase behavior, self-assembly and ordering in synthetic and biological soft matter. Offered Intermittently.
Prerequisites: CHM 3020 with a minimum grade of C

CHM 6070 Advanced Bioinorganic Chemistry Cr. 3
Applications of inorganic chemistry principles to understanding biological systems including metalloenzymes. Offered Winter.
Prerequisite: CHM 3000 with a minimum grade of C

CHM 6090 Organometallic Chemistry Cr. 3
Models and Applications of the Organometallic Chemistry of the Transition Metals including Activation of Small Molecules and Bioorganometallics. Offered Winter.
Prerequisite: CHM 5020 with a minimum grade of C

CHM 6100 Theory of Analytical Chemistry Cr. 3
Provides an overview of the fundamental theory and instruments required to conduct analytical measurements for diverse applications. Offered Yearly.
Prerequisites: (CHM 2280 with a minimum grade of C and CHM 2290 with a minimum grade of C) or (CHM 3120 with a minimum grade of C and CHM 3130 with a minimum grade of C)

CHM 6120 Electroanalytical Chemistry Cr. 3
This course provides an overview of the fundamental concepts of electrochemical science and their applications in catalysis, batteries, electrochemical sensors. Offered Intermittently.
Prerequisites: (CHM 2280 with a minimum grade of C and CHM 2290 with a minimum grade of C) or (CHM 3120 with a minimum grade of C and CHM 3130 with a minimum grade of C)

CHM 6160 Separation Science Cr. 3
Fundamentals, instrumentation, and modern applications in medicine, cannabis and food testing, and environmental monitoring. Offered Intermittently.
Prerequisite: CHM 2280 with a minimum grade of C or CHM 3120 with a minimum grade of C

CHM 6170 Advances in Bioanalytical Chemistry Cr. 3
How analytical methods are used to obtain information regarding biological systems. Offered Intermittently.
Prerequisites: (CHM 2280 with a minimum grade of C and CHM 2290 with a minimum grade of C) or (CHM 3120 with a minimum grade of C and CHM 3130 with a minimum grade of C)

CHM 6180 Mass Spectrometry Cr. 3
This course provides an overview of the fundamental concepts of electrochemical science and their applications in catalysis, batteries, electrochemical sensors. Offered Intermittently.
Prerequisites: ((CHM 2280 with a minimum grade of C and CHM 2290 with a minimum grade of C) or (CHM 3120 with a minimum grade of C and CHM 3130 with a minimum grade of C)) and CHM 5160 with a minimum grade of C

CHM 6200 Organic Structures and Mechanisms Cr. 3
Structure and stereochemistry of organic molecules. Correlations between structure and chemical and physical properties. Reaction mechanisms. Offered Fall.
Prerequisites: CHM 2220 with a minimum grade of C or CHM 2225 with a minimum grade of C

CHM 6220 Organic Reactions and Synthesis Cr. 3
Alkylation, condensation, and Grignard reactions; synthesis of acid derivatives; cycloadditions and unimolecular rearrangements. Scope and limitations of important synthetic methods of organic chemistry. Offered Winter.
Prerequisite: CHM 6200 with a minimum grade of C

CHM 6240 Organic Spectroscopy Cr. 3
Application of IR, NMR, UV, and mass spectrometry to the identification of organic compounds. Emphasis on interpretation of spectra, especially NMR. Recommended for students intending to do graduate or industrial work in organic chemistry. Offered Winter.
Prerequisite: CHM 1420 with a minimum grade of C or CHM 2220 with a minimum grade of C

CHM 6270 Advanced Bioorganic Chemistry and Drug Design Cr. 3
Studies of biological problems using organic synthetic methods and applications to drug design. Offered Fall.
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6410 Statistical Thermodynamics Cr. 3
Statistical methods of determining thermodynamic properties of bulk materials from molecular properties. Real gases at high density, crystals, liquids; phase transitions, transport properties Offered Intermittently.
Prerequisite: CHM 5400 with a minimum grade of C or CHM 5420 with a minimum grade of C or CHM 5440 with a minimum grade of C

CHM 6440 Computational Chemistry Cr. 3
Aspects of computational chemistry pertinent to effective use of molecular modeling techniques. Molecular mechanics, semi-empirical and ab initio calculations, molecular dynamics. Offered Intermittently.
Prerequisite: CHM 5440 with a minimum grade of C
Fees: $95

CHM 6470 Quantum Chemistry Cr. 3
Theorems of quantum mechanics, approximation methods, solutions to simple atomic and molecular systems, electronic structure of many-electron atoms and molecules, chemical bonding. Offered Intermittently.
Prerequisites: CHM 5400 with a minimum grade of C, CHM 5420 with a minimum grade of C, or CHM 5440 with a minimum grade of C

CHM 6610 Biological Chemistry Laboratory Cr. 3
Satisfies General Education Requirement: Writing Intensive Competency
Basic experiments in isolation, purification, and analysis of biomolecules. Techniques currently used in molecular biology and recombinant DNA procedures stressed. Offered Fall, Winter.
Prerequisite: CHM 6620 with a minimum grade of C
Restriction(s): Enrollment is limited to students with a major in Biochem & Chem Bio Honors, Biochem & Chemical Biology, Chemistry or Chemistry Honors.
Fees: $110

CHM 6620 Metabolism: Pathways and Regulation Cr. 3
Major metabolic pathways of carbohydrate, fatty acid, amino acid, and nucleotide synthesis and degradation. Pathways and mechanisms of energy generation. Hormonal and allosteric regulation of enzyme activity. Offered Fall.
Prerequisites: CHM 2220 with a minimum grade of C

CHM 6635 Tools of Molecular Biology Cr. 3
Principles underlying genetic and biochemical methods; complements work in lab CHM 6610. Offered Winter.
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6640 Molecular Biology Cr. 3
Nucleic acid structure and function. Mechanism and control of replication, transcription, and translation. Mutation, genetic recombination, and recombinant DNA. Membranes and organelles. Offered Winter.
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6680 Clinical and Molecular Aspects of Cancer Cr. 3
Current molecular, biochemical, and clinical aspects of human cancer for students without prior exposure to the topic. Offered Yearly.
Prerequisite: CHM 6620 with a minimum grade of C or (CHM 5600 with a minimum grade of C and BIO 1510 with a minimum grade of C)

CHM 6700 Green Chemistry: Mindful Design in Science, Engineering, and Medicine Cr. 3
Green Chemistry is the design of chemical products, processes, and instrumentation that reduce or eliminate the use and generation of hazardous substances. While there are many mechanisms and tools available to assess the impact of materials and processes on human health and the environment, there are few tools available to help design and create products as such. This course will present the fundamentals of the 12 principles of green chemistry and explore relevant examples of their practical use in commercial applications. It will explore examples from a wide spectrum of industrial sectors including research and development, medical applications, and electronics/instrumentation. Students will analyze how chemists and other researchers in the sciences engineering, and medicine can help address global human health and environmental issues. They will also evaluate the extent to which a focus on green chemistry can boost innovation and time to market while lowering costs. Offered Yearly.
Prerequisites: CHM 2220 with a minimum grade of C (may be taken concurrently) or CHM 2225 with a minimum grade of C (may be taken concurrently)

CHM 6740 Laboratory Safety Cr. 1-2
Discussion and demonstration of safe laboratory practice. Use, storage and disposal of ordinary and hazardous substances; personal protection devices; regulations and codes. Required for all graduate degrees in chemistry. Not for chemistry major credit. Offered Fall, Winter.

CHM 6990 Directed Study Cr. 1-4
Offered Every Term.
Repeatable for 8 Credits

CHM 6991 Internship in Chemistry Cr. 1
Practical research experience through visiting a university, industry, or national laboratory. Offered Every Term.
Restriction(s): Enrollment is limited to students with a major in Chemistry; enrollment is limited to Graduate level students.
Repeatable for 2 Credits

CHM 7010 Descriptive Inorganic Chemistry Cr. 3
Reactions and reactivity of inorganic compounds. Emphasizes mechanistic and synthetic approaches to transition metal, organometallic, main group chemistry. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7060 Materials Chemistry and Engineering Cr. 3
Solid state structure and bonding. Crystallography, defects, and non-stoichiometry. Phase diagrams. Synthesis and properties of extended solids and nanomaterials. Molecular interactions and statistical physics of soft matter. Synthesis and characterization techniques of polymeric and colloidal material. Physical properties, phase behavior, self-assembly and ordering in synthetic and biological soft matter. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7070 Advanced Bioinorganic Chemistry Cr. 3
Applications of inorganic chemistry principles to understanding biological systems including metalloenzymes. Offered Intermittently.
Prerequisite: CHM 3000 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7090 Organometallic Chemistry Cr. 3
Models and Applications of the Organometallic Chemistry of the Transition Metals including Activation of Small Molecules and Bioorganometallics. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7100 Theory of Analytical Chemistry Cr. 3
Physicochemical principles applied to reaction equilibria and kinetics of analytical importance. Approaches to problem solving in complex systems, principally in the solution phase. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7120 Electroanalytical Chemistry Cr. 3
The theory and practice of modern voltammetric methods as applied to analytical, kinetic, and mechanistic studies. Offered Every Other Year.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7142 Data Analysis Cr. 3
Application of statistics, chemometrics, and experimental design to the interpretation of chemical measurements; validation of analytical methods; practice and theory of sampling for chemical measurements. Offered Every Other Fall.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7160 Separation Science Cr. 3
Fundamentals, instrumentation, and modern applications in medicine, cannabis and food testing, and environmental monitoring. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7170 Advances in Bioanalytical Chemistry Cr. 3
How analytical methods are used to obtain information regarding biological systems. Offered Intermittently.
Prerequisite: CHM 5160 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7180 Mass Spectrometry Cr. 3
Topics will include ICP, ICP-MS, AA, LIBX, MIPS, etc. Instrumentation concepts. Review of contemporary literature. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7200 Organic Structures and Mechanisms Cr. 3
Structure and stereochemistry of organic molecules. Correlations between structure and chemical and physical properties. Reaction mechanisms. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7220 Organic Reactions and Synthesis Cr. 3
Alkylation, condensation, and Grignard reactions; synthesis of acid derivatives; cycloadditions and unimolecular rearrangements. Scope and limitations of important synthetic methods of organic chemistry. Offered Winter.
Prerequisite: CHM 7200 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7240 Organic Spectroscopy Cr. 3
Application of IR, NMR, UV, and mass spectrometry to the identification of organic compounds. Emphasis on interpretation of spectra, especially NMR. Recommended for students intending to do graduate or industrial work in organic chemistry. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7270 Advanced Bioorganic Chemistry and Drug Design Cr. 3
Studies of biological problems using organic synthetic methods and applications to drug design. Offered Intermittently.
Prerequisite: CHM 6620 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7410 Statistical Thermodynamics Cr. 3
Statistical methods of determining thermodynamic properties of bulk materials from molecular properties. Real gases at high density, crystals, liquids; phase transitions, transport properties. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7430 Chemical Kinetics Cr. 3
Empirical analysis of reaction rates, theories of chemical kinetics, gas phase reactions, molecular collisions and non-thermal reactions, and kinetics in liquids. Offered Every Other Year.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7440 Computational Chemistry Cr. 3
Aspects of computational chemistry pertinent to effective use of molecular modeling techniques. Molecular mechanics, semi-empirical and ab initio calculations, molecular dynamics. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Fees: $15

CHM 7470 Quantum Chemistry Cr. 3
Theorems of quantum mechanics, approximation methods, solutions to simple atomic and molecular systems, electronic structure of many-electron atoms and molecules, chemical bonding. Offered Every Other Year.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7480 Molecular Spectroscopy Cr. 3
Basic theory of interaction of molecules with the electromagnetic field. Rotational, vibrational, and electronic spectra of molecules; elements of lasers, multiphoton spectroscopy. Offered Every Other Year.
Prerequisite: CHM 7470 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7600 Structure and Function of Biomolecules Cr. 3
Introduction to the structure and function of macromolecules of biological importance. Emphasis on bioenergetics, nucleic acid and protein structure and chemical reactivities, enzyme catalysis, enzyme kinetics, carbohydrate and lipid structure and function, and membrane structure. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7620 Metabolism: Pathways and Regulation Cr. 3
Major metabolic pathways of carbohydrate, fatty acid, amino acid, and nucleotide synthesis and degradation. Pathways and mechanisms of energy generation. Hormonal and allosteric regulation of enzyme activity. Offered Fall.
Prerequisite: CHM 7600 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7635 Tools of Molecular Biology Cr. 3
Principles underlying genetic and biochemical methods; complements work in lab CHM 6610. Offered Yearly.
Prerequisite: CHM 7620 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7640 Molecular Biology Cr. 3
Nucleic acid structure and function. Mechanism and control of replication, transcription, and translation. Mutation, genetic recombination, recombinant DNA. Membranes and organelles. Offered Winter.
Prerequisite: CHM 7600 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7680 Clinical and Molecular Aspects of Cancer Cr. 3
Current molecular, biochemical, and clinical aspects of human cancer. Offered Yearly.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7700 Green Chemistry: Mindful Design in Science, Engineering, and Medicine Cr. 3
Green Chemistry is the design of chemical products, processes, and instrumentation that reduce or eliminate the use and generation of hazardous substances. While there are many mechanisms and tools available to assess the impact of materials and processes on human health and the environment, there are few tools available to help design and create products as such. This course will present the fundamentals of the 12 principles of green chemistry and explore relevant examples of their practical use in commercial applications. It will explore examples from a wide spectrum of industrial sectors including research and development, medical applications, and electronics/instrumentation. Students will analyze how chemists and other researchers in the sciences engineering, and medicine can help address global human health and environmental issues. They will also evaluate the extent to which a focus on green chemistry can boost innovation and time to market while lowering costs. Offered Yearly.
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7740 Responsible Conduct of Research Cr. 1
Recognition of and approach to ethical issues that chemistry students may confront during their careers; the tools for dealing with these quandaries; procedures for reporting and resolving such conflicts. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students; enrollment is limited to students in the Department of Chemistry.

CHM 7770 Proposals in Chemical Research Cr. 2
This course is writing-intensive and based on hands-on exercises aiming to conceive and articulate novel scientific ideas in an effective way. Strategies will be taught on how to extract information from peer-reviewed papers, how to develop concise and descriptive research aims, and how to defend their ideas in written and oral formats. Topics in this course include hypothesis-driven research, basics of extramural funding, literature search, the meaning of "Intellectual Merit & Broader Impacts", designing experiments, reporting results, tutorials on relevant scientific software, and the criteria for peer-review. The development of personal statements and biosketches will also be covered. Offered Fall.
Prerequisite: CHM 7100 with a minimum grade of B or CHM 7600 with a minimum grade of B or CHM 7010 with a minimum grade of B or CHM 7200 with a minimum grade of B or CHM 7470 with a minimum grade of B
Restriction(s): Enrollment is limited to Graduate level students.

CHM 7777 Chemistry Biology Interface Seminar Series Cr. 1
The Chemistry Biology Interface (CBI) seminar series will expose students to CBI-related research, CBI-related professional development activities, review of current literature, topics in rigor and reproducibility, and networking social activities. These activities will be in the format of presentations, panel discussions, workshops, small group discussions, or social activities. The goal is for graduate students from discipline-specific fields to move across a multi-disciplinary landscape, or for students already working in inter-disciplinary fields, such as chemical biology, to gain new expertise in specific disciplines. Beyond scholarly goals, the seminar series will enrich the graduate experience by providing career guidance, non-laboratory skill development, training in rigor and reproducibility, and professional networking. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: BIO 7777, PSC 7777

CHM 7990 Directed Study Cr. 1-4
Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 12 Credits

CHM 8700 Research in Chemistry Cr. 1-16
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 40 Credits

CHM 8800 Seminar in Analytical Chemistry Cr. 1
Required of all graduate students in analytical chemistry. Weekly meetings of staff, invited guests, and qualified students to study recent developments. Each seminar member presents papers and enters into the discussion that follows. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 4 Credits

CHM 8810 Seminar in Organic Chemistry Cr. 1
Required of all graduate students in organic chemistry. Weekly meetings of staff, invited guests, and qualified students to study recent developments. Each seminar member presents papers and enters into the discussion that follows. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 4 Credits

CHM 8820 Seminar in Inorganic Chemistry Cr. 1
Required of all graduate students in inorganic chemistry. Weekly meeting of staff, invited guests, and qualified students to study recent developments. Each seminar member presents papers and enters into the discussion that follows. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 4 Credits

CHM 8830 Seminar in Physical Chemistry Cr. 1
Required of all graduate students in physical chemistry. Weekly meetings of staff, invited guests, and qualified students to study recent developments. Each seminar member presents papers and enters into the discussion that follows. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 4 Credits

CHM 8840 Seminar in Biochemistry Cr. 1
Required of all graduate students in biochemistry. Weekly meetings of staff, invited guests, and qualified students to study recent developments. Each seminar member presents papers and participates in discussions. Offered Fall, Winter.
Restriction(s): Enrollment is limited to students with a major in Chemistry; enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy or Master of Science degrees.
Repeatable for 4 Credits

CHM 8850 Frontiers in Chemistry Cr. 1
Fields of fundamental chemistry now under investigation, presented by invited specialists actively engaged in research. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 3 Credits

CHM 8888 Survey of Research at the Chemistry Biology Interface Cr. 3
The Chemistry Biology Interface course will teach students how to apply chemical approaches to study complete biological processes. It will commence with a basic overview of the biochemistry of biomolecules. Next, complex biological processes related to various diseases will be highlighted by introducing cell biology, model cells and organisms, and disease mechanisms. Finally, the course will highlight contemporary examples of how chemical methods are used to answer complex biological questions to show the value and innovation available by taking a multidisciplinary approach. The focus will be on development of skill sets that are applicable for research at the chemistry biology interface, rigor and transparency in data collection and analysis, and identification of cross-disciplinary research at Wayne State. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: BIO 8888, PHC 8888, PSC 8888, PSL 8888

CHM 8999 Master's Thesis Research and Direction Cr. 1-8
Offered Every Term.
Restriction(s): Enrollment limited to students with a class of Candidate Masters; enrollment is limited to Graduate level students.
Repeatable for 8 Credits

CHM 9990 Pre-Doctoral Candidacy Research Cr. 1-8
Research in preparation for doctoral dissertation. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 12 Credits

CHM 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 3-9
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 9 Credits

CHM 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 1-18
Offered Every Term.
Prerequisite: CHM 9991 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 18 Credits

CHM 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: CHM 9992 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 998.99 Credits

CHM 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: CHM 9993 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 998.99 Credits

CHM 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Fees: $434.8
Repeatable for 998.99 Credits