CHEMISTRY AND BIOCHEMISTRY

Department Website: Chemistry and Biochemistry (https://www.gonzaga.edu/college-of-arts-sciences/departments/chemistry-biochemistry/)

Students are encouraged to visit the Departmental (https://www.gonzaga.edu/college-of-arts-and-science/departments/chemistry-biolchemistry/) website to learn more about careers in chemistry and biochemistry. For those interested in teaching chemistry at the secondary level, the Department suggests the B.A. degree along with the teacher certification program in the School of Education.

Although Gonzaga University does not currently offer a program in chemical engineering, students interested in chemical engineering are encouraged to combine a B.S. degree in Chemistry with supporting courses from the School of Engineering and Applied Science. This plan of study would position students to further their education with an M.S. or Ph.D. in Chemical Engineering from an additional institution.

Chemistry (BS) Major Program Requirements

Code	Title	Hours
Lower Division		
CHEM 101	General Chemistry I	3
CHEM 101L	General Chemistry I Lab	1
CHEM 102	General Chemistry II	3
CHEM 102L	General Chemistry II Lab	1
CHEM 230	Organic Chemistry I	3
CHEM 230L	Organic Chemistry Lab I	1
CHEM 231	Organic Chemistry II	3
CHEM 231L	Organic Chemistry Lab II	1
CHEM 285	Introduction to Chemical Sciences	1
MATH 157	Calculus and Analytic Geometry I	4
MATH 258	Calculus and Analytic Geometry II	4
PHYS 121	Physics I	4
PHYS 121L	Physics I Lab	1
PHYS 122	Physics II	4
PHYS 122L	Physics II Lab	1
PHYS 201	Mathematical Methods	3
Upper Division		**29-31**
CHEM 305	Inorganic Chemistry	3
CHEM 307	Biochemistry I	3
CHEM 307L	Biochemistry I Lab	1
CHEM 310	Analytical Chemistry	3
CHEM 310L	Analytical Chemistry Lab	2
CHEM 356	Thermodynamics & Kinetics	3
CHEM 356L	Thermodynamics & Kinetics Lab	1
CHEM 357	Quantum Chemistry	3
CHEM 357L	Quantum Chemistry Lab	1
CHEM 358L	Advanced Chemistry Lab	2
CHEM 399	Advanced Topics:	2
Select one of the following:		
CHEM 405-CHEM 480		2
CHEM 308	Biochemistry II	3
PHYS 300 (or above) approved Physics Topics		
CHEM 485	Seminar	1
Select one of the following:		1-2
CHEM 488	Senior Literature Review	
CHEM 498A & CHEM 498B	Thesis I and Thesis II [1]	
Total Hours		**98-101**

[1] CHEM 498A Thesis I & CHEM 498B Thesis II required for ACS Approved Degree.

Biochemistry (BS) Major Program Requirements

Code	Title	Hours
Lower Division		
CHEM 101	General Chemistry I	3
CHEM 101L	General Chemistry I Lab	1
CHEM 102	General Chemistry II	3
CHEM 102L	General Chemistry II Lab	1
CHEM 230	Organic Chemistry I	3
CHEM 230L	Organic Chemistry Lab I	1
CHEM 231	Organic Chemistry II	3
CHEM 231L	Organic Chemistry Lab II	1
CHEM 285	Introduction to Chemical Sciences	1
BIOL 105	Information Flow in Biological Systems	3
BIOL 105L	Information Flow in Biological Systems Lab	1
BIOL 106	Energy Flow in Biological Systems	3
MATH 157	Calculus and Analytic Geometry I	4
MATH 258	Calculus and Analytic Geometry II	4
PHYS 121	Physics I	4
PHYS 121L	Physics I Lab	1
PHYS 122	Physics II	4
PHYS 122L	Physics II Lab	1
Upper Division		**29-31**
CHEM 305	Inorganic Chemistry	3
CHEM 307	Biochemistry I	3
CHEM 307L	Biochemistry I Lab	1
CHEM 308	Biochemistry II	3
CHEM 310	Analytical Chemistry	3
CHEM 310L	Analytical Chemistry Lab	2
CHEM 345L	Advanced Biochemistry Lab	3
CHEM 356	Thermodynamics & Kinetics	3
CHEM 356L	Thermodynamics & Kinetics Lab	1
CHEM 399	Advanced Topics:	2
Select one of the following:		2-3
CHEM 405-480 Special Topics in Chemistry		
BIOL 300 (or above) approved Biology Topics		
PHYS 300 (or above) approved Physics Topics		
CHEM 485	Seminar	1

Select one of the following:		1-2
CHEM 488	Senior Literature Review	
CHEM 498A & CHEM 498B	Thesis I and Thesis II [1]	
Total Hours		**99-103**

[1] CHEM 498A Thesis I & CHEM 498B Thesis II required for ACS Approved Degree

Chemistry (BA) Major Program Requirements

Code	Title	Hours
Lower Division		
CHEM 101	General Chemistry I	3
CHEM 101L	General Chemistry I Lab	1
CHEM 102	General Chemistry II	3
CHEM 102L	General Chemistry II Lab	1
CHEM 230	Organic Chemistry I	3
CHEM 230L	Organic Chemistry Lab I	1
CHEM 231	Organic Chemistry II	3
CHEM 231L	Organic Chemistry Lab II	1
CHEM 285	Introduction to Chemical Sciences	1
MATH 157	Calculus and Analytic Geometry I	4
MATH 258	Calculus and Analytic Geometry II	4
One of the following sets of four (4) courses:		10
PHYS 111 & 111L & PHYS 112 & PHYS 112L	General Physics I and General Physics I Lab and General Physics II and General Physics II Lab	
PHYS 121 & 121L & PHYS 122 & PHYS 122L	Physics I and Physics I Lab and Physics II and Physics II Lab	
Upper Division		
CHEM 305	Inorganic Chemistry	3
CHEM 307	Biochemistry I	3
CHEM 307L	Biochemistry I Lab	1
CHEM 310	Analytical Chemistry	3
CHEM 310L	Analytical Chemistry Lab	1
CHEM 356	Thermodynamics & Kinetics	3
CHEM 356L	Thermodynamics & Kinetics Lab	1
Select one of the following:		
CHEM 405-CHEM 480 Special Topics		4
CHEM 308	Biochemistry II	3
PHYS 300 (or above) approved Physics Topics		
CHEM 485	Seminar	1
CHEM 488	Senior Literature Review	1
Total Hours		**59**

Chemistry Minor Program Requirements

Code	Title	Hours
Required Foundational Courses		
CHEM 101	General Chemistry I	3
CHEM 101L	General Chemistry I Lab	1
CHEM 102	General Chemistry II	3
CHEM 102L	General Chemistry II Lab	1
CHEM 230	Organic Chemistry I	3
CHEM 230L	Organic Chemistry Lab I	1
MATH 157	Calculus and Analytic Geometry I	4
CHEM 305	Inorganic Chemistry	3
PHYS 111	General Physics I	4
or PHYS 121	Physics I	
Select one of the following options:		12-17
Option One: Biochemistry		
CHEM 231	Organic Chemistry II	
CHEM 231L	Organic Chemistry Lab II	
CHEM 307	Biochemistry I	
CHEM 307L	Biochemistry I Lab	
CHEM 308	Biochemistry II	
CHEM 4XX Special Topics (405-480)		
Option Two: Physical Chemistry [1]		
CHEM 310	Analytical Chemistry	
CHEM 310L	Analytical Chemistry Lab	
CHEM 356 & 356L	Thermodynamics & Kinetics and Thermodynamics & Kinetics Lab	
MATH 258	Calculus and Analytic Geometry II	
PHYS 122	Physics II	
Option Three: Environmental Chemistry		
ENVS 202	Applied Environmental Chemstry	
ENVS 202L	Applied Environmental Chemistry Lab	
CHEM 310	Analytical Chemistry	
CHEM 310L	Analytical Chemistry Lab	
CHEM 358L	Advanced Chemistry Lab	
CHEM (405-480) Special Topics		
Total Hours		**35-40**

[1] Note: CHEM 357 Quantum Chemistry requires both PHYS 121 Physics I and PHYS 201 Mathematical Methods as prereqs

Courses

CHEM 101. General Chemistry I. (3 Credits)
This course will offer an introduction to the fundamental laws and theories of chemistry and heir applications. Topics will include atomic and molecular structure, properties of elements and molecules, chemical reactions, gases, thermochemistry, and chemical equilibrium. Designed for science and engineering majors. Taken concurrently with CHEM 101L. Fall and Spring.
Corequisites: CHEM 101L
Equivalent: CHEM 105

CHEM 101L. General Chemistry I Lab. (1 Credit)
This laboratory course that emphasizes experimental techniques designed to accompany General Chemistry I. Taken concurrently with CHEM 101. One laboratory per week. Fall and Spring.
Corequisites: CHEM 101
Equivalent: CHEM 105L
Course Fee: 140

CHEM 102. General Chemistry II. (3 Credits)
This course will offer further study and a quantitative treatment of the fundamental laws and theories of chemistry and their applications. Topics will include thermochemistry, phase transitions, kinetics, equilibrium, thermodynamics, acid-base chemistry, electrochemistry, and nuclear chemistry. Designed for science majors. Taken concurrently with CHEM 102L. Spring.
Prerequisites: CHEM 101 with a minimum grade of C-
Corequisites: CHEM 102L

CHEM 102L. General Chemistry II Lab. (1 Credit)
This is a laboratory course that emphasizes experimental techniques designed to accompany General Chemistry II. Wherever appropriate, computer skills are introduced and applied to data collection and analysis. Taken concurrently with CHEM 102. One laboratory per week. Spring.
Prerequisites: CHEM 101L with a minimum grade of C-
Corequisites: CHEM 102
Course Fee: 140

CHEM 104. Scientific Inquiry. (2 Credits)
This lecture and lab course content will be determined by the instructor to meet the learning objectives of the Scientific Inquiry requirement of the University Core. Fall and Spring.
Corequisites: CHEM 104L
Enrollment limited to students with a semester level of First Year (0-25.99 credits).

CHEM 104L. Scientific Inquiry Lab. (1 Credit)
May be repeated for credit.
Taken concurrently with CHEM 104. Fall and Spring.
Corequisites: CHEM 104
Course Fee: 140

CHEM 123. Environmental Chemistry. (3 Credits)
This course will cover the fundamental principles of chemistry necessary to understand the source, transport, and fate of substances in the environment due to human activity. Additional topics will be chosen by the instructor but may include the environmental implications of various energy-generation methods; the chemistry of the atmosphere, hydrosphere, and lithosphere; climate change; and water quality, pollution, and treatment of water sources. Taken concurrently with CHEM 123L. Spring.
Corequisites: CHEM 123L

CHEM 123L. Environmental Chemistry Lab. (1 Credit)
See CHEM 123 course description. Taken concurrently with CHEM 123. Spring.
Corequisites: CHEM 123
Course Fee: 140

CHEM 190. Study Abroad Special Topics. (0-6 Credits)
May be repeated for credit.
Topic to be determined by instructor.

CHEM 193. FYS:. (3 Credits)
The First-Year Seminar (FYS) introduces new Gonzaga students to the University, the Core Curriculum, and Gonzaga's Jesuit mission and heritage. While the seminars will be taught by faculty with expertise in particular disciplines, topics will be addressed in a way that illustrates approaches and methods of different academic disciplines. The seminar format of the course highlights the participatory character of university life, emphasizing that learning is an active, collegial process.

CHEM 198. Topics in Chemistry. (3 Credits)
May be repeated for credit.
This lecture-only course is designed for non-science majors. Different subfields of chemistry will be explored depending on the instructor. Upon sufficient demand.

CHEM 205. Inorganic Chemistry. (3 Credits)
Introduction to foundational concepts in inorganic chemistry with emphasis on atomic structure, bonding, and reactivity. Topics will include nuclear chemistry, quantum mechanics, periodic trends, covalent bonding, ionic bonding, metallic bonding, coordinate covalent bonding, acid-base chemistry, electrochemistry, and thermodynamics. Three lectures per week. No longer offered.
Prerequisites: CHEM 101 with a minimum grade of C-

CHEM 230. Organic Chemistry I. (3 Credits)
Essential concepts in bonding and structure, acid-base chemistry, reactivity and synthesis of functional groups, nomenclature, and mechanisms of fundamental organic reactions. Three lectures and one recitation per week. Taken concurrently with CHEM 230L. Fall.
Prerequisites: CHEM 101 with a minimum grade of C-
Corequisites: CHEM 230L

CHEM 230L. Organic Chemistry Lab I. (1 Credit)
Preparation and analysis of representative organic compounds. One laboratory per week. Taken concurrently with CHEM 230. Fall.
Prerequisites: CHEM 101L with a minimum grade of C-
Corequisites: CHEM 230
Course Fee: 150

CHEM 231. Organic Chemistry II. (3 Credits)
Continuation of CHEM 230. A significant focus of the course is on aromatic compounds and carbonyl chemistry. Other topics include organometallic chemistry, radicals, mass spectrometry and synthetic polymers. Three lectures per week. Spring.
Prerequisites: CHEM 230 with a minimum grade of C-
Corequisites: CHEM 231L

CHEM 231L. Organic Chemistry Lab II. (1 Credit)
Preparation and analysis of representative organic compounds. Taken concurrently with CHEM 231. One laboratory per week. Spring.
Prerequisites: CHEM 230L with a minimum grade of C-
Corequisites: CHEM 231
Course Fee: 150

CHEM 245. Biochemistry. (3 Credits)
Structure and function of the major classes of biomolecules (carbohydrates, lipids, proteins and nucleic acids). Fundamental concepts of protein structure and function, kinetics and enzymology, bioenergetics and thermodynamics, metabolism and regulation are discussed. Three lectures per week. Final Offering Fall 2025. See CHEM 307 for Fall 2025 and later.
Prerequisites: CHEM 231 (may be taken concurrently) with a minimum grade of D
Corequisites: CHEM 245L

CHEM 245L. Biochemistry Lab. (1 Credit)
Laboratory methods and techniques relevant to biochemistry. One laboratory per week. Final Offering Fall 2025. See CHEM 307L for Fall 2025 and later.
Prerequisites: CHEM 231L (may be taken concurrently) with a minimum grade of D
Corequisites: CHEM 245
Course Fee: 150

CHEM 285. Introduction to Chemical Sciences. (1 Credit)
This course introduces Chemistry and Biochemistry majors to the chemical sciences with an overview of specific subdisciplines in chemistry, research opportunities, varies career paths, degree options, and professional organizations. This course also includes a focus on scientific ethics, the use of primary literature, and written science communication. One lecture per week. Fall.
Enrollment is limited to students with a program in Biochemistry, Chemistry or Chemistry.

CHEM 290. Directed Reading. (1-3 Credits)
Topic to be determined by instructor.

CHEM 295. Science Outreach. (0 Credits)
May be repeated for credit.
The Biology and Chemistry departments run a variety of outreach programs that include class visits, field trip tours, special summer programs and more. All of our programs strive to engage participants with opportunities for hands-on scientific discovery and inspiration.
Equivalent: BIOL 295

CHEM 304. Practice in Lab Teaching. (1 Credit)
May be repeated for credit.
Introduction to the methods of laboratory teaching. Emphasis on safety, time management, direct student-teacher interaction, and class presentation.
Prerequisites: CHEM 230 with a minimum grade of D

CHEM 305. Inorganic Chemistry. (3 Credits)
This course builds from foundational concepts in inorganic chemistry to a more advanced understanding of atomic structure, bonding, and reactivity. Topics include periodic relationships, acid/base chemistry, electrochemistry, coordination compounds, inorganic reaction mechanisms, molecular symmetry, group theory, and nuclear chemistry. Spring.
Prerequisites: CHEM 102 with a minimum grade of C- and CHEM 230 with a minimum grade of C-

CHEM 307. Biochemistry I. (3 Credits)
Structure and function of the major classes of biomolecules (carbohydrates, lipids, proteins, and nucleic acids). Fundamental concepts of protein structure and functions, kinetics and enzymology, bioenergetics and thermodynamics, metabolism and regulation are discussed. Taken concurrently with CHEM 307L. Fall and Spring. First offering Spring 2026.
Prerequisites: CHEM 231 (may be taken concurrently) with a minimum grade of C- and CHEM 102 with a minimum grade of C-
Corequisites: CHEM 307L

CHEM 307L. Biochemistry I Lab. (1 Credit)
Laboratory methods and techniques relevant to biochemistry. Taken concurrently with CHEM 307. One laboratory per week. Fall and Spring. First offering Spring 2026.
Prerequisites: CHEM 231L (may be taken concurrently) with a minimum grade of C- and CHEM 102L with a minimum grade of C-
Corequisites: CHEM 307
Course Fee: 150

CHEM 308. Biochemistry II. (3 Credits)
Structure, function, mechanism and regulation of electron transport processes, core metabolism and information flow at an atomic and molecular level. Topics include electron transport chain, photosynthesis, core metabolic pathways of major macromolecules, and information flow from DNA to RNA proteins. Fall only.
Prerequisites: CHEM 307 with a minimum grade of C-

CHEM 310. Analytical Chemistry. (3 Credits)
Principles of foundational analytical techniques and methods are presented in three lectures per week. These include gravimetric, volumetric, electrochemical, spectrometric, chromatographic, and mass spectrometry topics as well as basic descriptive statistics. Spring.
Prerequisites: (CHEM 205 with a minimum grade of C- and CHEM 230 with a minimum grade of C-)
Corequisites: CHEM 310L

CHEM 310L. Analytical Chemistry Lab. (2 Credits)
Laboratory experiments including titrations, gravimetric analysis, molecular and atomic spectroscopy, potentiometry, and chromatography. Sample preparation, instrument calibration, data analysis, and reporting are emphasized. Two laboratory periods per week. Spring.
Prerequisites: CHEM 230L with a minimum grade of C-
Corequisites: CHEM 310
Course Fee: 150

CHEM 345L. Advanced Biochemistry Lab. (3 Credits)
In-depth exploration of concepts and techniques used to study biomolecules and biomolecular systems with additional emphasis on scientific writing and communication in biochemistry. Two laboratories per week. Fall and Spring.
Prerequisites: CHEM 245 with a minimum grade of D and CHEM 245L with a minimum grade of D
Course Fee: 150

CHEM 355. Physical Chemistry. (3 Credits)
Introduction to foundational concepts in physical chemistry with emphasis on quantum mechanics, gases, thermodynamics, and kinetics. Fall. Pre-requisite: CHEM 310, minimum grade: C- and MATH 157, minimum grade: C- and MATH 258, minimum grade: C- and PHYS 103, minimum grade: C- Co-requisite or Pre-requisite: PHYS 204, minimum grade: C-
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: CHEM 355L

CHEM 355L. Physical/Inorganic Chem Lab. (1 Credit)
Experiments that emphasize synthesis and characterization of inorganic compounds, as well as physical chemistry methods ranging from spectroscopy to thermodynamics and kinetics. One laboratory period per week. Fall.
Prerequisites: CHEM 310L with a minimum grade of C-
Corequisites: CHEM 355
Course Fee: 150

CHEM 356. Thermodynamics & Kinetics. (3 Credits)
Kinetic theory of gases, thermodynamics, solutions, equilibrium, and statistical mechanics. Taken concurrently with CHEM 356L. Spring.
Prerequisites: CHEM 310 with a minimum grade of C- and MATH 157 with a minimum grade of C- and MATH 258 with a minimum grade of C- and (PHYS 111 with a minimum grade of C- or PHYS 121 with a minimum grade of C-) and (PHYS 112 with a minimum grade of C- or PHYS 122 with a minimum grade of C-)
Corequisites: CHEM 356L

CHEM 356L. Thermodynamics & Kinetics Lab. (1 Credit)
Experimental work to introduce physical chemistry principles related to thermodynamics and kinetics. Emphasis on statistical analysis and interpretation of instrument-derived data. Taken concurrently with CHEM 356. One laboratory per week. Spring.
Prerequisites: CHEM 310L with a minimum grade of C-
Corequisites: CHEM 356
Course Fee: 150

CHEM 357. Quantum Chemistry. (3 Credits)
Postulates of quantum mechanics, solution of the Schrodinger equation for simples model systems, atomic and molecular structure and spectra, and symmetry. Taken concurrently with CHEM 357L. Fall.
Prerequisites: CHEM 310 with a minimum grade of C- and MATH 157 with a minimum grade of C- and MATH 258 with a minimum grade of C- and PHYS 121 with a minimum grade of C- and PHYS 122 with a minimum grade of C- and PHYS 201 with a minimum grade of C-
Corequisites: CHEM 357L

CHEM 357L. Quantum Chemistry Lab. (1 Credit)
Experimental work to introduce physical chemistry principles related to molecular structure and spectroscopy. Emphasis on statistical analysis and interpretation of instrument-derived data. Introduction to the use of molecular modeling software and software for solving complex mathematical problems. Taken concurrently with CHEM 357. One laboratory per week. Spring.
Prerequisites: CHEM 310L with a minimum grade of C-
Corequisites: CHEM 357
Course Fee: 150

CHEM 358L. Advanced Chemistry Lab. (2 Credits)
In-depth laboratory course featuring projects integrating inorganic, organic, and analytical chemistry, and projects with discipline specific content for skill and background development. Literature engagement and scientific writing are emphasized. Projects are more open-ended than in the foundational laboratory courses and require increased student independence and proficiency in experimental design, execution, and data evaluation. Two laboratory periods per week. Spring.
Prerequisites: CHEM 305 (may be taken concurrently) with a minimum grade of C- and CHEM 310L with a minimum grade of C- and CHEM 356L (may be taken concurrently) with a minimum grade of C-
Course Fee: 150

CHEM 370. Career Development II. (1 Credit)
This course will focus on scientific oral presentations and scientific writing and prepare students for their senior project. This course also includes outside speakers from graduate schools and the chemistry and biochemistry industry to further provide educational opportunities about continued study and employment in the field. One lecture per week. Spring.
Enrollment is limited to students with a program in Biochemistry, Chemistry or Chemistry.

CHEM 385L. Advanced Chemistry Lab. (3 Credits)
In-depth laboratory course featuring projects, often interdisciplinary, within the analytical, inorganic, physical, and organic sub-disciplines of chemistry. Literature engagement and scientific writing are emphasized. Two laboratory periods per week. Spring.
Prerequisites: CHEM 355 with a minimum grade of C- and CHEM 355L with a minimum grade of C-
Course Fee: 150

CHEM 390. Directed Research. (0-3 Credits)
May be repeated for credit.
Topic to be determined by instructor.

CHEM 395. Research Assistantship. (0 Credits)
May be repeated for credit.
Undergraduate research assistantships are opportunities for student to earn a stipend while performing independent research in the laboratory of a Biology or Chemistry & Biochemistry faculty member.

CHEM 399. Advanced Topics:. (2 Credits)
May be repeated for credit.
Courses focus on reading the primary literature in a particular content area, and will emphasize in-class discussion, writing, and/or presentations. Topics determined by instructor. Two lectures per week. Fall and Spring. Pre-requisites vary depending on topic.

CHEM 405. Special Topics in Chemistry. (2 Credits)
May be repeated for credit.
Topic determined by instructor. Two lectures per week. Fall and Spring. Pre-requisites vary depending on topic.

CHEM 407. Special Topics in Biochemistry. (2 Credits)
May be repeated for credit.
Topic determined by instructor. Two lectures per week. Fall and Spring. Pre-requisites vary depending on topic.

CHEM 408. RNA Chemistry and Biology. (2 Credits)
This course builds upon foundational topics introduced in CHEM 245 Biochemistry and CHEM 231 Organic Chemistry II to explore the biology, chemistry, and therapeutic uses of RNA. Emphasis placed on the determination of RNA structures, noncoding RNAs classes and their functions to relate gene expression in bacteria and eukaryotes, and the use of nucleic acid technology in therapeutics. The course involves the reading of primary and secondary literature and incorporates literature discussions. Two lectures per week.
Prerequisites: CHEM 245 with a minimum grade of C- and CHEM 231 with a minimum grade of C-

CHEM 415. Organometallic Chemistry. (2 Credits)
This course builds on foundational topics introduced in CHEM 205 Inorganic Chemistry and CHEM 230 Organic Chemistry I to explore the synthesis, structure, bonding, and reactivity of organometallic complexes, compounds that contain at least one bond between a carbon atom and a metal. Emphasis placed on d-block organometallic compounds and how they are used as homogeneous catalysts for current industrially important organic transformations including hydrogenations, carbonylations, hydroformylations, metathesis, and alkene polymerizations. Two lectures per week.
Prerequisites: CHEM 205 with a minimum grade of C- and CHEM 230 with a minimum grade of C-

CHEM 424. DNA Damage and Repair. (2 Credits)
This course builds upon foundational topics introduced in CHEM 245 Biochemistry and CHEM 231 Organic Chemistry II to explore the environmental and biological causes of DNA damage, the repercussions this has on disease development, and the enzymes that have evolved to maintain DNA integrity. Primary focus on the chemical mechanisms of DNA repair and intermolecular forces that imbue repair enzymes with remarkable specificity. The course will culminate in discussions on the development of drug therapies targeting DNA repair pathways for the treatment of numerous diseases. Two lectures per week.
Prerequisites: CHEM 231 with a minimum grade of C- and CHEM 245 with a minimum grade of C-

CHEM 432. CIS:. (3 Credits)
The Core Integration Seminar (CIS) engages the Year Four Question: "Imagining the possible: What is our role in the world?" by offering students a culminating seminar experience in which students integrate the principles of Jesuit education, prior components of the Core, and their disciplinary expertise. Each section of the course will focus on a problem or issue raised by the contemporary world that encourages integration, collaboration, and problem solving. The topic for each section of the course will be proposed and developed by each faculty member in a way that clearly connects to the Jesuit Mission, to multiple disciplinary perspectives, and to our students' future role in the world.
Prerequisites: Prerequisites exist. Refer to Zagweb.

CHEM 455. Special Topic in Chemistry or Biochemistry. (2 Credits)
May be repeated for credit.
Topic determined by instructor. Fall and Spring. Additional pre-requisites may be required depending on topic.
Prerequisites: CHEM 355 with a minimum grade of C-

CHEM 464. Group Theory and Spectroscopy. (2 Credits)
Introduction to foundations of group theory including symmetry operations and elements, point groups, character tables, reducible and irreducible representations. Formal development of standard models to describe electronic structure of atoms, chemical bonding, as well as rotational and vibrational motion. Quantum mechanical treatment of selection rules and their application to electronic, vibrational, and rotational transitions. Application of group theory and standard quantum mechanical models to the interpretation of atomic and molecular spectra. Two lectures per week.
Prerequisites: CHEM 355 with a minimum grade of C-

CHEM 485. Seminar. (1 Credit)
Required of all Chemistry and Biochemistry majors. Fall.
Enrollment limited to students with a semester level of Fourth Year (96+ credits) or Third Year (60-95.99 credits).

CHEM 488. Senior Literature Review. (1 Credit)
Literature review of special chemical problem or topic under the direction of a faculty member. Fall or Spring. By Department Chair permission only.
Prerequisites: CHEM 370 (may be taken concurrently) with a minimum grade of D
Enrollment limited to students with a semester level of Fourth Year (96+ credits).

CHEM 490. Directed Reading. (0-3 Credits)
May be repeated for credit.
Material and credit to be arranged by instructor.

CHEM 497. Internship. (0-6 Credits)
May be repeated for credit.
Professional work experience in a chemistry-related field.
Enrollment is limited to students with a program in Biochemistry, Chemistry, Chemistry or Chemistry.

CHEM 498A. Thesis I. (1 Credit)
Investigation of special chemical problems and topics under the direction of a faculty member. Required for ACS approved B.S. degrees. Fall.
Prerequisites: CHEM 370 (may be taken concurrently) with a minimum grade of D
Course Fee: 150
Enrollment limited to students with a semester level of Fourth Year (96+ credits) or Third Year (60-95.99 credits).

CHEM 498B. Thesis II. (1 Credit)
Required for ACS approved B.S. degrees. Continuation of CHEM 498A. Spring.
Prerequisites: CHEM 498A with a minimum grade of D
Course Fee: 150
Enrollment limited to students with a semester level of Fourth Year (96+ credits).