CHEMISTRY

The Bachelor of Science in Chemistry program guides students in the study of the properties, composition, and structure of substances, the transformations they undergo, and the energy changes that occur during these processes. Students gain a strong foundation of knowledge in chemistry and develop their scientific skills needed to succeed in careers or post-graduate study. Our chemistry program is housed in a state-of-the-art science facility with modern instrumentation including FT-NMR, FTIR, GCMS, LCMS, HPLC, flame AAS, ICP, DSC, and SEM. Guided by expert faculty, students can choose from a variety of authentic hands-on learning experiences including undergraduate research, service learning, and internships. Students can also practice leadership skills and engage in professional development through involvement in the Chemist Honor Society or other registered student clubs. Students in this program select one of four concentrations: General Chemistry, Environmental Chemistry, Pre-Health Sciences, and Industrial Chemistry as described further below.

General Chemistry Concentration: This concentration provides students the opportunity to study a broad range of chemical sciences and is designed to allow flexibility in preparing students for a multitude of chemistry roles. Students can design a course of study that will prepare them for work in private sectors, government agencies, or for continued graduate education.

Environmental Chemistry Concentration: This concentration integrates the chemical, biological, and physical sciences providing students with a strong foundation in the study of chemical processes occurring in the environment which are impacted by human activities. Many environmental chemists work for local, state, or federal governments conducting research or monitoring and advising on policy, non-governmental organizations, or academia.

Pre-Health Sciences Concentration: This concentration provides students with a strong foundation in a variety of the laboratory sciences required for entry into and success in post-graduate professional programs and degrees including medicine, dentistry, pharmacy, veterinary medicine, and advanced research degrees in these fields.

Industrial Chemistry Concentration: This concentration provides students with a strong foundation in chemistry that can be applied to industrial applications such as processes in manufacturing and commercial production of chemicals. Many of our students obtain internships and careers within the local industries.

Recommended minors: Biology, Mathematics, or Sustainability

This degree prepares students for a variety of career opportunities ranging from applied or basic laboratory research in state and federal organizations and industry to education in public and private school systems. Furthermore, the degree provides the ideal preparation for entry into professional school and graduate programs including medical school, dental school, and veterinary school or advanced studies in chemistry.

Bachelor of Science

Area A: Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1113	Precalculus Mathematics	3
Area B: Institutional Options		
COMM 1110	Fundamentals of Speech	3
One of the following electives:		1
COMM 1120	Argumentation and Advocacy	
ENGL 1105	Intro to Greek Mythology	
ENGL 1110	Creative Writing	
GEOL 1000	Natural Hazards	
HIST 1050	Appalachian Hist-Special Topic	
HIST 1051	Sports Hist & Amer Character	
HLTH 1030	Health and Wellness Concepts	
HUMN 1000	Mystery Fiction in Pop Culture	
HUMN 1100	Political and Social Rhetoric	
HUMN 1300	Christian Fiction/Pop Culture	
SOCI 1000	Race and Ethnicity in America	
PRSP Elective (See advisor)		
Area C: Humanities/Fine Arts		
Choose one to two ENGL course(s):		3-6
ENGL 2000	Topics in Literature & Culture	
ENGL 2111	World Literature I	
ENGL 2112	World Literature II	
ENGL 2120	British Literature I	
ENGL 2121	British Literature II	
ENGL 2130	American Literature I	
ENGL 2131	American Literature II	
ENGL 2201	Intro to Film as Literature	
If only one ENGL course chosen, add one of the following:		0-3
ARTS 1100	Art Appreciation	
HUMN 1201	Expressions of Culture I	
HUMN 1202	Expressions of Culture II	
MUSC 1100	Music Appreciation	
MUSC 1110	World Music	
MUSC 1120	American Music	
THEA 1100	Theatre Appreciation	
Area D: Science/Mathematics/Technology		
One of the following Laboratory Science Sequences:		8
PHYS 1111K & PHYS 1112K	Introductory Physics I and Introductory Physics II	
PHYS 2211K & PHYS 2212K	Principles of Physics I and Principles of Physics II	
MATH 2253	Calculus and Analytic Geom I *	4
Area E: Social Sciences		
HIST 2111	United States History to 1877	3
or HIST 2112	United States Hist since 1877	
POLS 1101	American Government	3
Two of the following electives:		6
ANTH 1103	Intro to Cultural Anthropology	
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
GEOG 1100	Introduction to Geography	
GEOG 1101	Intro to Human Geography	
GEOG 1111	Intro to Physical Geography	
HIST 1111	World Civilization to 1500 CE	
HIST 1112	World Civilization since 1500	

HIST 2111	United States History to 1877	
HIST 2112	United States Hist since 1877	
PHIL 1103	Intro to World Religions	
PHIL 2010	Intro to Philosophical Issues	
PHIL 2020	Logic and Critical Thinking	
POLS 2101	Intro to Political Science	
POLS 2201	State and Local Government	
POLS 2301	Comparative Politics	
POLS 2401	International Relations	
PSYC 1101	Introduction to Psychology	
PSYC 2101	Psychology of Adjustment	
PSYC 2103	Human Development	
SOCI 1101	Introduction to Sociology	
SOCI 1160	Social Problems	
Area F: Major-Related		
BIOL 1107K	Principles of Biology I	4
CHEM 2000	Scientific Communication	2
CHEM 1211K	Principles of Chemistry I	4
CHEM 1212K	Principles of Chemistry II	4
MATH 2254	Calculus and Analytic Geom II	4
Required Chemistry Courses		
CHEM 3211K	Organic Chemistry I	4
CHEM 3212K	Organic Chemistry II	4
CHEM 3311K	Quantitative Analysis	4
CHEM 3312K	Instrumental Methods of Analys	4
CHEM 3411K	Physical Chemistry I	4
CHEM 3412K	Physical Chemistry II	4
CHEM 4000	Senior Seminar	2
CHEM 4110K	Advanced Inorganic Chemistry	4
MATH 2255	Calculus and Analytic Geom III	4
Choose one Concentration: **/***/****		
NOTE: Concentration must be declared through the Registrar's Office.		
General Chemistry Concentration:		
Upper Level Chemistry Electives		9
CHEM 3500	Biochemistry	
CHEM 3700K	Environmental Chemistry	
CHEM 4420	Adv Organic Spectroscopy	
CHEM 4430	Advanced Organic Chemistry	
CHEM 4860	Internship in Chemistry **	
CHEM 4900	Special Topics in Chemistry ***	
CHEM 4960	Research in Chemistry **	
STM Electives		13-14
BIOL 1105K	Environmental Studies	
BIOL 1108K	Principles of Biology II	
BIOL 1203K	Principles of Botany ****	
BIOL 1224K	Entomology	
BIOL 2212K	Anatomy and Physiology I	
BIOL 2213K	Anatomy and Physiology II	
BIOL 2215K	Microbiology ****	
CMPS 1301	Principles of Programming I	
CMPS 1371	Computing for Scien & Engineer	
MATH 1401	Elementary Statistics	
MATH 2256	Introduction to Linear Algebra	
MATH 2403	Differential Equations	
MATH 2770	Statistics and Applications	
SUST 2000	Intro Envir Sustainability	
Any 3000 or 4000 level BIOL course EXCEPT BIOL 4000. **/***/****		
Any 3000 or 4000 level CHEM course including CHEM 3900 and CHEM 4800. **/***		
Any 3000 or 4000 level MATH course EXCEPT MATH 3703, MATH 3803, and MATH 4713.		
Any 3000 or 4000 level SUST course EXCEPT SUST 4000.		
Free Electives		3
Select 3 hours from any transfer credit courses in the College curriculum other than PHED courses.		
Environmental Chemistry Concentration:		
Upper Level Chemistry Electives		9
CHEM 3700K	Environmental Chemistry	
CHEM 4420	Adv Organic Spectroscopy	
CHEM 4430	Advanced Organic Chemistry	
CHEM 4900	Special Topics in Chemistry ***	
Environmental Chemistry STM Electives		13-14
BIOL 1105K	Environmental Studies	
BIOL 1108K	Principles of Biology II	
BIOL 1203K	Principles of Botany ****	
BIOL 1224K	Entomology	
BIOL 3000	Research Methods in Biology	
BIOL 3500K	Ecology	
BIOL 3510K	Plant Biology ****	
BIOL 3520K	Invertebrate Zoology	
BIOL 3550	Conservation Biology	
BIOL 3600K	Ornithology	
BIOL 3700	Field Biology Techniques	
BIOL 4275	Bioremediation/Phytoremediatio	
CHEM 3900	Readings in Chemistry **	
CHEM 4860	Internship in Chemistry **	
CHEM 4960	Research in Chemistry **	
CMPS 1301	Principles of Programming I	
CMPS 1371	Computing for Scien & Engineer	
MATH 1401	Elementary Statistics	
MATH 2256	Introduction to Linear Algebra	
MATH 2403	Differential Equations	
MATH 3050	Biological Statistics	
SUST 2000	Intro Envir Sustainability	
Any 3000 or 4000 level SUST course EXCEPT SUST 4000.		
Free Electives		3
Select 3 hours from any transfer credit courses in the College curriculum other than PHED courses.		
Industrial Chemistry Concentration:		
Upper Level Chemistry Electives		9
CHEM 3700K	Environmental Chemistry	
CHEM 4420	Adv Organic Spectroscopy	
CHEM 4430	Advanced Organic Chemistry	
CHEM 4860	Internship in Chemistry **	

CHEM 4900	Special Topics in Chemistry ***	
Industrial Chemistry STM Electives		13-14
BIOL 1108K	Principles of Biology II	
CHEM 3900	Readings in Chemistry **	
CHEM 4960	Research in Chemistry **	
CMPS 1301	Principles of Programming I	
CMPS 1371	Computing for Scien & Engineer	
MATH 1401	Elementary Statistics	
MATH 2256	Introduction to Linear Algebra	
MATH 2403	Differential Equations	
MATH 2770	Statistics and Applications	
MATH 3050	Biological Statistics	
SUST 2000	Intro Envir Sustainability	
Any 3000 or 4000 level SUST course EXCEPT SUST 4000.		
Free Electives		3
Select 3 hours from any transfer credit courses in the College curriculum other than PHED courses.		
Pre-Health Sciences Concentration:		
Upper Level Pre-Health Chemistry Electives		9
CHEM 3500	Biochemistry	
CHEM 4420	Adv Organic Spectroscopy	
CHEM 4430	Advanced Organic Chemistry	
CHEM 4900	Special Topics in Chemistry ***	
Pre-Health Chemistry Professional Track		13-14
BIOL 1108K	Principles of Biology II	
BIOL 2212K	Anatomy and Physiology I	
BIOL 2213K	Anatomy and Physiology II	
BIOL 2215K	Microbiology ****	
BIOL 3000	Research Methods in Biology	
BIOL 3200K	Cellular Biology	
BIOL 3300K	Developmental Biology	
BIOL 3340K	General Microbiology ****	
BIOL 3400K	Genetics	
BIOL 3850	Neuroscience	
BIOL 3900	Readings in Biology	
BIOL 4100	Immunology	
BIOL 4250	Evolution	
BIOL 4360K	Comparative Vertebrate A & P	
BIOL 4410K	Molecular Biology	
BIOL 4500K	Biotechnology	
BIOL 4800	Service Learning in Biology **	
BIOL 4900	Special Topics in Biology ***	
BIOL 4960	Research in Biology	
CHEM 3900	Readings in Chemistry **	
CHEM 4860	Internship in Chemistry **	
CHEM 4960	Research in Chemistry **	
MATH 1401	Elementary Statistics	
MATH 3050	Biological Statistics	
Free Electives		3
Select 3 hours from any transfer credit courses in the College curriculum other than PHED courses.		
Physical Education		
PHED Activity Elective		1
Total Hours		**121-122**

* One hour from MATH 2253 may be used toward the upper-level curriculum.

** Students are limited to a maximum of eight credit hours in applied learning courses (BIOL 3900, CHEM 3900, BIOL 4800, CHEM 4800, BIOL 4860, CHEM 4860, BIOL 4960, and CHEM 4960). Students are limited to a maximum of four credit hours in any one of the four applied learning categories; readings (BIOL 3900 and CHEM 3900), service learning (BIOL 4800 and CHEM 4800), internships (BIOL 4860 and CHEM 4860), and research (BIOL 4960 and CHEM 4960).

*** CHEM 4900 (Special Topics in Chemistry) and BIOL 4900 (Special Topics in Biology) can be taken multiple times when topic has changed.

**** Students will not be able to count both BIOL 1203K & BIOL 3510K or BIOL 2215K & BIOL 3340K in Upper Level or General Elective areas. A student may take both classes in these pairs, but only one course will count in the Upper Level or General electives. The other course may count as a free elective.

Courses

CHEM 1151K. Survey of Chemistry. 3-3-4 Units.
Introduces the fundamentals of chemistry including general principles of atomic structures, bonding, reactions, gases, water, solutions, pH and elementary organic chemistry and biochemistry.(S)
Prerequisites: MATH 1001, 1101, or 1111 and ENGL 0999 unless exempt.

CHEM 1211K. Principles of Chemistry I. 3-3-4 Units.
Explores the discipline of chemistry through an understanding of the basic laws and properties of matter, stoichiometry, atomic structure, chemical bonding, gas laws, solutions and the physical states of matter. Requires laboratory experimentation which illustrates applications of concepts studied in lecture.(F,S,M)
Prerequisites: MATH 1111 with a grade of "C" or better, ENGL 0999 unless exempt.

CHEM 1212K. Principles of Chemistry II. 3-3-4 Units.
Continues the exploration of the discipline of chemistry begun in CHEM 1211. Focuses on the more quantitative aspects of chemistry including chemical equilibria, kinetics, acid-base, solubility product, electrochemistry and coordination compounds. Requires laboratory development of techniques necessary to identify common metallic and non-metallic ions.(F,S,M)
Prerequisites: CHEM 1211K.

CHEM 2000. Scientific Communication. 2-0-2 Units.
An introduction to the principles of ethics in the chemical sciences. Also, the infrastructure of scientific scholarship is introduced with an emphasis on interaction with the scientific community, responsible conduct in research, and communication of scientific findings.(F)
Prerequisites: CHEM 1211K Corequisites: CHEM 1212K.

CHEM 3211K. Organic Chemistry I. 3-3-4 Units.
Introduces the chemistry of organic compounds including aliphatic and aromatic hydrocarbons, stereochemistry, monofunctional compounds and some polyfunctional compounds. Requires the illustration of techniques for synthesis, separation, purification and identification of organic compounds in the laboratory.(F,S,M)
Prerequisites: CHEM 1212K.

CHEM 3212K. Organic Chemistry II. 3-3-4 Units.
Continues the exploration of the chemistry of organic compounds with an emphasis on the characteristics and reactions of a variety of functional groups. Requires the illustration of techniques for synthesis, separation, purification and identification of organic compounds in the laboratory. (F,S,M)
Prerequisites: CHEM 3211K.

CHEM 3311K. Quantitative Analysis. 3-4-4 Units.
Introduction to statistics. The use of spreadsheets. Principles and techniques of volumetric analysis. Concepts of chemical equilibria as applied to acid-base, precipitation, and complex ion reactions. Electrochemistry and potentiometry. Introduction to spectroscopy and chromatography.(F,S)
Prerequisites: CHEM 1212K and MATH 1113.

CHEM 3312K. Instrumental Methods of Analys. 3-3-4 Units.
Theoretical principles and uses of modern instrumental methods covering: measurement theory, atomic spectroscopy, molecular spectroscopy, mass spectrometry, electrometry, electroanalysis and chromatographic separations.(S)
Prerequisites: CHEM 3311K.

CHEM 3411K. Physical Chemistry I. 3-3-4 Units.
A study of macromolecular phenomena in terms of micro molecular concepts including the gas state and thermodynamic.(F)
Prerequisites: CHEM 1212K, MATH 2254, PHYS 1112K or PHYS 2212K.

CHEM 3412K. Physical Chemistry II. 3-3-4 Units.
A continuation of CHEM 3411K including liquid and solid state, kinetics, and equilibria.(S)
Prerequisites: CHEM 1212K,MATH 2254, and PHYS 1112K or PHYS 2212K.

CHEM 3500. Biochemistry. 3-0-3 Units.
The chemical aspects of protein, carbohydrate, lipid, and nucleic acid, and enzyme function, bioenergetics, metabolism, photosynthesis, nuclei acid function, and protein biosynthesis.(F,S,M)
Prerequisites: BIOL 1107K and CHEM 3211K.

CHEM 3700K. Environmental Chemistry. 3-3-4 Units.
This course will cover the environmental chemistry involving the transport, distribution, reactions, and speciation of inorganic, organometallic and organic chemicals occurring in the air, soil and water environments at the local, national and global scale. Environmental transformations and degradation processes, toxicology, pollution and hazardous substances will be discussed(F)
Corequisites: CHEM 3211K.

CHEM 3900. Readings in Chemistry. 0-0-2 Units.
Independent in-depth study of the literature within a topic of current research in Chemistry. Approval of a faculty supervisor required before registration.(F,S, M)
Prerequisites: 12 hours of Chemistry and permission of the instructor.

CHEM 4000. Senior Seminar. 2-0-2 Units.
Survey of various topics, especially highlighting the interdisciplinary nature of chemistry.(S)
Prerequisites: 12 hours of upper level chemistry.

CHEM 4110K. Advanced Inorganic Chemistry. 3-3-4 Units.
Advanced theories of bonding and structure in inorganic chemistry with emphasis on ligand field theory, bioinorganic chemistry, and organometallic chemistry(S)
Prerequisites: CHEM 3212K, CHEM 3311K.

CHEM 4120. Drug Action and Drug Design. 3-0-3 Units.
This course is intended to introduce chemistry and biology students the key concepts in medicinal chemistry that overlaps the disciplines of a variety of science fields extended from chemistry and biology. This course will primarily consist of molecular mechanisms of drug target interactions in the body and drug design strategies for improving drug action. Some discussion will be devoted to specific drug classes, but the primary focus of the course will be acquiring the chemistry and theory of general drug action and drug design. This course will include limited hands-on experience using available computer programs in medicinal chemistry. Prerequisite(s): CHEM 3212K or permission of instructor.

CHEM 4420. Adv Organic Spectroscopy. 3-0-3 Units.
This course is intended to introduce the spectroscopic methods used in the modern determination of organic structures. This will primarily consist of the study of mass spectrometry (MS), infrared (IR) spectroscopy, and nuclear magnetic resonance (NMR) spectrometry. Some discussion will be devoted to instrumental methods, but the primary focus of the course will be acquiring skill in the interpretation of this spectral data. This course will include hands-on experience using instrumentation. (F even-numbered years) Prerequisites: CHEM 3212K

CHEM 4430. Advanced Organic Chemistry. 3-0-3 Units.
Advanced topics in organic chemistry. Such topics include biomolecules, stereochemistry, physical organic chemistry, and heterocycles(F)
Prerequisites: CHEM 3212K.

CHEM 4800. Service Learning in Chemistry. 0-0-1-4 Unit.
A lecture assistantship or laboratory assistantship within a chemistry course here at Dalton State. Repeatable for a maximum of 4 credit hours. (F,S,M)
Prerequisites: Approval of both a faculty supervisor and department chair.

CHEM 4860. Internship in Chemistry. 0-0-1-4 Unit.
A supervised, credit-earning work experience of one academic semester with a previously approved business firm, private agency or government agency. Repeatable for a maximum of 4 credit hours. (F,S,M).
Prerequisites: Permission of department chair.

CHEM 4900. Special Topics in Chemistry. 0-0-1-4 Unit.
Advanced concepts in chemistry will be presented, the detailed content varying from year to year. Course may be repeated for credit when topic differs.(Offered as Needed)
Prerequisites: CHEM 3212K and additional 3 upper level Chemistry courses.

CHEM 4960. Research in Chemistry. 0-0-1-4 Unit.
Research project conducted by a student under guidance of a faculty member. Approval of a faculty supervisor required before registration. Variable 1-4 hours. Repeatable for a maximum of 4 hours.(F,S,M)
Prerequisites: 16 hours of Chemistry and permission of the instructor.