

General Information

Why Major in Chemistry?

Chemistry is often called the central science that is playing a key role in growing fields such as biotechnology, nanotechnology, and alternative energy, areas poised for growth in the 21st century.

Chemists are employed in many established profitable industries including those related to pharmaceuticals, foods and beverages, cosmetic and personal care products, and materials for high technology products. Chemists can also work in state and government labs in areas such as environmental chemistry, food safety, and forensics.

Saint Louis is an active center of the chemical and life science industries, and is a major location for a number of major companies including Pfizer, Monsanto, Covidien, Steris, Solutia, KV Pharmaceuticals, and Sigma-Aldrich. Numerous smaller companies and labs also provide employment opportunities for chemists. Placement of B.A. and B.S. chemistry graduates from UM-St. Louis into jobs in local industry has been excellent.

A degree in chemistry is an excellent pre-professional degree for those considering medicine, optometry, law, business, or other areas of graduate study in addition to chemistry.

Degrees and Areas Concentration.

The Department of Chemistry and Biochemistry offers courses leading to the following degrees:

B.A. in Chemistry

B.S. in Chemistry

B.S. in Chemistry with an emphasis in Biochemistry

B.S. in Biochemistry and Biotechnology (jointly with the Department of Biology)

B.S. in Education with emphasis in Chemistry (in cooperation with the School of Education)

B.A. in Chemistry with a Biochemistry certificate

B.A. in Chemistry with teacher certification (in cooperation with the School of Education)

The Department of Chemistry and Biochemistry is accredited by the American Chemical Society. Students completing the B.S. degree in chemistry are certified by the American Chemical Society and are well prepared for graduate study in chemistry or a career in the chemical industry.

The Department also offers work leading to the M.S. degree in chemistry, with or without a thesis. The Ph.D. degree in chemistry is offered in the emphasis areas: inorganic, organic, physical chemistry, and biochemistry.

In addition to a balanced program of basic graduate courses, the Department offers special topics courses and seminars in current research areas. Research is being carried out in inorganic chemistry, organic chemistry, physical chemistry, and biochemistry by postdoctoral associates, faculty members, and graduate and undergraduate students.

The Department provides students with opportunities for strong interaction with faculty representing the various areas. Students and faculty working in one area consult freely with members in other areas. In addition, there are joint research projects involving faculty and students from two or more areas.

The Department has graduated over 800 B.A. and B.S. graduates since it was founded in 1966.

Undergraduate Studies

General Education Requirements

Students must satisfy the University and College General Education requirements. Courses in chemistry may be used to meet some of these requirements as specified in the list of courses that may be counted as general education requirements in the various knowledge and skill areas (see course descriptions). The College's foreign language requirement fulfills the departmental requirements for B.A. candidates. It is recommended that candidates for the B.S. degree fulfill the language requirement in German or French, but any language that meets the College requirement for the B.A. degree is acceptable. For those students entering UM-St. Louis for the first time in fall 2005 and later and seeking a B.S. degree, the study of a foreign language is optional.

Satisfactory/Unsatisfactory Restrictions

Chemistry majors may not take required chemistry, mathematics, or physics courses on a satisfactory/unsatisfactory basis, nor may B.S. degree candidates apply this option to the six elective hours in science.

Degree Requirements

Bachelor of Arts in Chemistry

This degree is suitable for preprofessional students in the health sciences and related areas, as well as prelaw students interested in patent law. The degree is also suitable for students seeking employment in the chemical industry or graduate work, although additional coursework may be required. Candidates must complete the following chemistry courses:

1111, Introductory Chemistry I
1121, Introductory Chemistry II
2223, Quantitative Analysis
3022, Introduction to Chemical Literature
3312, Physical Chemistry I
3322, Physical Chemistry II
3333, Physical Chemistry Laboratory I
3412, Basic Inorganic Chemistry
2612, Organic Chemistry I
2622, Organic Chemistry II
2633, Organic Chemistry Laboratory
4897, Seminar (1 credit hour)

In addition, candidates must complete one laboratory course chosen from Chemistry 4343, 4233, 4433, 3643, and 4733.

No more than 45 hours in chemistry may be applied toward the degree. Chemistry majors must present a seminar and take the major field achievement test (MFAT), a comprehensive examination during the senior year.

After fulfilling the general education and specific major degree requirements, students are to take the remaining hours required to complete the B.A. degree from courses, which the appropriate department has evaluated as being of university-level quality, from one or more of the following areas or their university-quality equivalents at other institutions: anthropology/ archaeology, art (appreciation, history, studio), biology, chemistry, communication, criminology and criminal justice, economics, English, foreign languages/ literatures, history, mathematics/ computer science, music (appreciation, history, performance), philosophy, physics, political science, psychology, social work, sociology, business, education, engineering, and interdisciplinary. The chemistry department may require students to pass a tracking test in order to enroll in the next level course, provided this or an equivalent test is administered to all students seeking to enroll in that course.

Bachelor of Science in Chemistry

This is the first professional degree in chemistry. It may be taken as a terminal degree by students intending to become professional chemists or for preparation for graduate work in chemistry or biochemistry. Candidates must complete the requirements for the B.A. degree in chemistry. In addition, the following chemistry courses are required:

4343, Physical Chemistry Laboratory II
3643, Advanced Organic Chemistry Laboratory

4212, Instrumental Analysis
4233, Laboratory in Instrumental Analysis
4412, Inorganic Chemistry
4433, Inorganic Chemistry Laboratory
4712, same as **Bio 4712**, Biochemistry

Students must also take two elective hours of advanced work in Chemistry at the 3000 level or above. Students are encouraged to take Chemistry 3905, Chemical Research, to fulfill the advanced elective requirement. Participation in research requires the submission of a final report on the project.

Not more than 51 hours of chemistry courses may be applied toward the degree. Each candidate must present a seminar and take a comprehensive examination during their senior year.

Biochemistry Option

Candidates must complete the requirements for the B.A. degree in chemistry. The following chemistry and biology courses are also required:

Biology

1811, Introductory Biology I
3622, Cell Biology **or**
2012, Genetics

Chemistry

4212, Instrumental Analysis
4233, Laboratory in Instrumental Analysis
4412, Inorganic Chemistry
4712, same as **Bio 4712**, Biochemistry
4722, Advanced Biochemistry
4733, Biochemistry Laboratory
4764, Interdisciplinary Topics in Biochemistry, **or**
4772, Physical Biochemistry **or** 3 credits of Chemistry 3905,
Chemical Research (which must be a project in biochemistry and for which a final report must be submitted)

Bachelor of Arts in Chemistry with a Biochemistry Certificate

The university offers a certificate program for science majors who are interested in careers in biochemistry. This is an interdisciplinary program that involves additional courses in biochemistry and biology. In addition to the usual requirements for the B.A. degree in chemistry, the student must take the following courses:

Chemistry

4712, same as Bio 4712, Biochemistry

4722, Advanced Biochemistry

4733, Biochemistry Laboratory

4764, Interdisciplinary Topics in Biochemistry or

4772, Physical Biochemistry

Biology

1811, Introductory Biology I

3622, Cell Biology

2012, Genetics

4614, Biotechnology Laboratory I or

4602, Molecular Biology

Related Area Requirements

Bachelor of Arts and Bachelor of Science in Chemistry Degrees

Candidates for both degrees must also complete:

Mathematics 1800, Analytic Geometry and Calculus I

Mathematics 1900, Analytic Geometry and Calculus II

Mathematics 2000, Analytic Geometry and Calculus III

*Physics 2111, Physics: Mechanics and Heat

*Physics 2112, Physics: Electricity, Magnetism, and Optics

*If neither of these courses included a laboratory, a separate laboratory course is required.

Undergraduate Research Opportunities in the Department

The Department of Chemistry and Biochemistry welcomes the involvement of undergraduates in research. Involvement in research can provide unique and valuable training, enhance the prospects for employment or admittance to graduate school, and aid in the development of a student's intellectual ability and background. In many cases, a student will have opportunities to present their project at local or regional scientific meetings and to become coauthor of a publication derived from the work. Undergraduates have the opportunity to pursue a research project under the guidance of a faculty member during the regular academic year and/ or during the summer sessions. Students choosing to engage in research can expect access to all of the departmental facilities and support staff on a regular basis. In order to take part in research, a student typically consults with a number of faculty members to find a project suitable to their interests and background. Students engaged in research must enroll in Chemistry 3905, Research. Students seeking either the B.S. degree or the B.S. with an Emphasis in Biochemistry may use Chemistry 3905 to meet

their advanced elective requirements. Students interested in research are encouraged to read the descriptions of research areas on the department webpage and then arrange to talk to individual faculty.

Advising

All chemistry majors are assigned permanent advisors and are expected to meet with them each semester prior to enrolling in courses for the subsequent semester. It must be emphasized that not every chemistry course, and especially those at the upper levels, is offered every semester. Meeting with your advisor is intended to help you schedule appropriately in order to complete your degree in a timely manner. Projected course offerings for upcoming semesters may also be found on the departmental webpage.

Requirements for the Minor in Chemistry

Students may complete a minor in chemistry as described below:

The following five required courses are:

Chemistry 1111, Introductory Chemistry I
Chemistry 1121, Introductory Chemistry II
Chemistry 2223, Quantitative Analysis
Chemistry 2612, Organic Chemistry I
Chemistry 2633, Organic Chemistry Laboratory

One course must be completed from the following list:

Chemistry 3312, Physical Chemistry I
Chemistry 3412, Basic Inorganic Chemistry
Chemistry 2622, Organic Chemistry II
Chemistry (or Biology) 4712, Biochemistry

Courses that are prerequisites to subsequent courses in the minor may not be taken on a satisfactory/ unsatisfactory basis. A GPA of at least 2.0 is required for the courses presented for the minor. At least three courses towards the Chemistry minor must be completed at UM-St. Louis.

Bachelor of Science in Biochemistry and Biotechnology

This degree is intended for students seeking training encompassing the basic principles of biochemistry and the basic background and methods of biotechnology. The degree would be highly suitable for students seeking a career in the life sciences industry or those intending to pursue graduate studies in the life sciences. It is also suitable as a pre-professional degree. This degree program is a cooperative effort between the Department of Chemistry and Biochemistry and the Department of Biology.

Candidates must complete the following courses in chemistry and biology:

Biology Core

Biology 1811, Introductory Biology I
Biology 2482, Microbiology
Biology 2483, Microbiology Lab
Biology 2012, Genetics
Biology 2013, Genetics Lab
Biology 3622, Cell Biology
Biology 4602, Molecular Biology

Chemistry Core

Chemistry 1111, Introductory Chemistry I
Chemistry 1121, Introductory Chemistry II
Chemistry 2223, Quantitative Analysis
Chemistry 2612, Organic Chemistry I
Chemistry 2612, Organic Chemistry II
Chemistry 2633, Organic Chemistry Laboratory

Biochemistry/Biotechnology Core

Chemistry (or Biology) 4712, Biochemistry
Chemistry 4733 or Biology 4713, Biochemistry Laboratory
Chemistry 3302, Physical Chemistry for the Life Sciences
Biology 4614, Biotechnology Laboratory I

Biochemistry/Biotechnology Electives (minimum of 9 credits required):

Chemistry 4722, Advanced Biochemistry
Chemistry 4772, Physical Biochemistry
Biology 4615, Biotechnology Laboratory II
Biology 4632, Nucleic Acid and Structure
Biology 4612, Molecular Genetics of Bacteria
Biology 4642, Plant Molecular Biology and Genetic Engineering
Biology 4652, Virology
Biology 4622, Molecular Cell Biology
Biology 4842, Immunobiology
Biology 5712, Topics in Biochemistry
Chemistry 3905, Research or Biology 4905, up to 3 credits may be taken as an elective.

Related Area Requirements

Math 1030, College Algebra
Math 1035, Trigonometry
Math 1100, Basic Calculus
Or Math 1800, Analytical Geometry and Calculus I

Physics 1011, Basic Physics I
Physics 1012, Basic Physics II

Recommendations for free elective credits include basic statistics (Math 1310 or Math 1320), computer science, public speaking (communications 1040), foreign language, ethics, and undergraduate research (Biology 4905 or Chemistry 3905).

Goals of our Undergraduate Programs

Competencies that all students must demonstrate to complete the program successfully:

1. Knowledge and comprehension in areas of chemistry - Graduates should have a foundation of knowledge in chemistry suitable for the pursuit of further study in the discipline. In order to achieve the goals of any one of our chemistry degrees, knowledge is required from the related areas of introductory physics and calculus. *Students earning a B.S. degree as opposed to a B.A. degree are expected to distinguish themselves both in terms of superior grasp of the fundamental areas and by displaying knowledge from the advanced lecture courses taken only by B.S. degree students.*
2. Scientific problem-solving skills - Graduates should understand valid scientific approaches to problem solving and be able to design experiments to test a hypothesis. *Students earning a B.S. degree are expected to be able to design experiments drawing upon a wider range of methods including those they uniquely gain experience with in advanced laboratory courses that B.S degree majors complete.*
3. Data analysis/quantitative skills - Graduates should be able to draw valid conclusions from experimental data and observations. Graduates should be able to carry out statistical and linear regression analysis of data. Graduates should be able to identify the main possible sources of error in laboratory measurements.
4. Laboratory skills - Graduates should be able to carry out the basic techniques of preparative and analytical chemistry. An appreciation some aspects of chemical spectroscopy should be achieved. Graduates should be able to keep accurate records of experiments. Graduates should be able to work effectively in the laboratory individually or as a part of a small team. Graduates should have an awareness of the basic aspects of safe laboratory practices. *Students earning a B.S. degree are expected to be display more advanced skills in preparative and analytical chemistry.*
5. Communication skills - Graduates should be able to communicate scientific ideas clearly both orally and in written form. This includes the effective presentation of quantitative data and of scientific concepts or procedures using diagrams and/or figures.
6. Library/Information skills - Graduates should be able to search for and retrieve information from scientific journals, databases, and handbooks, especially those widely used by professional chemists.
7. Computer/software skills - Graduates should be proficient in the use of software widely used by practicing scientists, including word processors, scientific plotting and analysis software, and spreadsheets. *Students earning a B.S. degree are expected to be display more sophisticated skills in the use of the aforementioned software.*

Descriptions of Chemistry and Biochemistry Courses for Majors

General education requirement areas met by a course are noted after the course description (C = Communicating Skills, M = Managing Information Skills, S = Mathematical and Life/ Natural Sciences Knowledge)

Chemistry 1111. *Introductory Chemistry I (5)*

Prerequisites: Mathematics through college algebra and trigonometry (may be taken concurrently). Presents an introduction to the fundamental laws and theories of chemistry. Laboratory experiments are designed to demonstrate some aspects of qualitative and quantitative analysis and to develop skills in laboratory procedures. [S]

Chemistry 1121. *Introductory Chemistry II. (5)*

Prerequisite: Chem 1111 or advanced placement. Lecture and laboratory are a continuation of Chemistry 11. [M, S]

Chemistry 2223. *Quantitative Analysis (2)*

Prerequisite: Chem 1121. Principles and practice of elementary quantitative chemistry. The lecture treats descriptive statistics with emphasis on small samples; various types of competing equilibria pertaining to acid-base, buffer, and polyprotic acid systems; quantitative explanations of acid-base, complexometric, and potentiometric titrations; and an introduction to spectrophotometric processes. The laboratory provides exercises in titrimetric, gravimetric and spectrophotometric techniques. [C, M, S]

Chemistry 2412 (same as 3412, renumbered to 3412 in 2004, see below)

Chemistry 2612. *Organic Chemistry I (3)*

Prerequisite: Chem 1121. An Introduction to the structure, properties, synthesis, and reactions of aliphatic and aromatic carbon compounds. [M, S]

Chemistry 2622. *Organic Chemistry II (3)*

Prerequisite: Chem 2612. A systematic study of organic reactions and their mechanisms; organic synthetic methods. [M, S]

Chemistry 2633. *Organic Chemistry Laboratory (2)*

Prerequisite: Chem 2612. An introduction to laboratory techniques and procedures of synthetic organic chemistry. [C, M, S]

Chemistry 3022. *Introduction to Chemical Literature (1)*

Prerequisite: Chem 2622 (may be taken concurrently) and Chem 3412 (previous number 2412). The course will familiarize the student with the literature of chemistry and its use.

Chemistry 3312. *Physical Chemistry I (3)*

Prerequisite: Chem 1121, Math 2000 (may be taken concurrently), and Physics 2111 (or equivalent). Principles of physical chemistry including thermodynamics, theory of gases, phase equilibria, kinetics, crystal structure, spectroscopy and quantum mechanics.

Chemistry 3322 *Physical Chemistry II (3)*

Prerequisite: Chem 3312. Continuation of Chemistry 3312.

Chemistry 3333 *Physical Laboratory Chemistry I (2)*

Prerequisite: Chem 3312 and Chem 2223. Experiments designed to illustrate principles introduced in Chemistry 3312.

Chemistry 3412 *Basic Inorganic Chemistry (2). Prerequisite: Chem 1121. Review of principles of atomic structure, covalent and ionic bonding. Properties of the elements and synthesis, reactions and bonding aspects of important compounds of main group and transition metal compounds. [M, S]*

Chemistry 3643. *Advanced Organic Chemistry Laboratory (2) Prerequisites: Chem 2223, 3022 (may be taken concurrently), 2622, and 2633. Identification of organic compounds by classical and spectroscopic methods; advanced techniques in synthesis and separation of organic compounds.*

Chemistry 4212. *Instrumental Analysis (2)*

Prerequisite: Chem 3322. Principles and applications of modern methods of instrumental analysis for analytical chemistry measurements. Topics will be selected from the areas of electrochemistry, absorption and emission spectroscopy, chromatography, mass spectrometry, surface analysis, and nuclear magnetic resonance.

Chemistry 4233. *Laboratory in Instrumental Analysis (2)*

Prerequisite: Chem 4212 and Chem 3333. Experiments designed to illustrate the principles and practices of instrumental analysis, involving the use of modern instrumentation in analytical chemistry applications.

Chemistry 4343. *Physical Laboratory Chemistry II (2)*

Prerequisites: Chem 3322 (may be taken concurrently) and Chem 3333. Experiments designed to illustrate principles introduced in Chemistry 4322.

Chemistry 4412. *Inorganic Chemistry (3)*

Prerequisite: Chem 3322 (may be taken concurrently), 3412, and 2622. An introduction to the chemistry of the elements, including atomic and molecular structure, acids and bases, the chemistry of the solid state, and main group and transition metal chemistry.

Chemistry 4433. *Inorganic Chemistry Laboratory (2)*

Prerequisite: Chem 3333, 4412, and 3643 (may be taken concurrently). The more sophisticated techniques of physical and analytical chemistry will be used to study inorganic compounds and their reactions.

Chemistry 4712. *Biochemistry (3)*

(Same as Biology 371) Prerequisite: Chem 2612 and either Biology 1811 or Chem 2622. The chemistry and function of cell constituents, and the interaction and conversions of intracellular substances.

Chemistry 4722. *Advanced Biochemistry (3)*

Prerequisite: Chem 4712. Selected advanced topics in the chemistry of life processes.

Chemistry 4733. *Biochemistry Laboratory (2)*

Prerequisite: Chem 4712 (may be taken concurrently) and Chem 2223. Laboratory study of biochemical processes in cellular and subcellular systems with emphasis on the isolation and subcellular systems with emphasis on the isolation and purification of proteins (enzyme) and the characterization of catalytic properties.

Chemistry 4764. Interdisciplinary Topics in Biochemistry

Prerequisites: Chem 4712; Chem 4722 strongly recommended. Includes advanced studies of enzyme mechanisms, the role of metal ions in enzymatic and non-enzymatic process, and the application of computational chemistry to biological systems.

Chemistry 4772: Physical Biochemistry (3)

Prerequisite: Chem 4712 or Chem 3312. Designed to acquaint students with concepts and methods in biophysical chemistry. Topics that will be discussed include protein and DNA structures, forces involved in protein folding and conformational stability, protein-DNA interactions, methods for characterization and separation of macromolecules, electron transfer, and biological spectroscopy.

Chemistry 4897. Seminar (1)

Prerequisites: Chem 3022 and Senior standing. Presentation of papers by students, faculty, and invited speakers. Chemistry majors must enroll during the Fall or Winter semester of the year in which they graduate. Completion of a comprehensive examination is a course requirement. One hour of lecture and one hour of discussion per week.

Hypothetical Four-Year Schedule

B.A. in Chemistry

Year	Fall	Winter	Year	Fall	Winter
Freshman	Chem 1111 (5) Math 1030 (3) ^a Math 1035 (2) ^a English 1100(3) *Elective (3) 16	Chem 1121 (5) Math 1800 (5) *Electives (6) 16	Sophomore	Chem 2223 (3) Math 1900 (5) Physics 2111(5) *Elective (3) 16	Chem 3412 (2) Math 2000 (5) Physics 2112(5) *Elective (3) 15
Junior	Chem 2612 (3) Lang. 1 (5) English31xx(3) ^b *Elective (3) 14	Chem 2622 (3) Chem 2633 (2) Lang. 2 (5) *Electives (6) 16	Senior	Chem 3312 (3) Chem 3022 (1) Adv. Lab (2) ^c Lang. 3 (3) *Electives (6) 15	Chem 3322 (3) Chem 3333 (2) Chem 4897 (1) *Electives (6) 12 Total = 120

- a. If student passes the math placement exam, Math 1030 and Math 1035 would be replaced by Math 1800.
- b. English 3160 or 3100 are recommended.
- c. With this schedule the advanced laboratory would be Chem. 3643.

Hypothetical Four-Year Schedule

B.A. Degree in Chemistry with Biochemistry Certificate

Year	Fall	Winter	Year	Fall	Winter
Freshman	Chem 1111 (5)	Chem 1121 (5)	Sophomore	Chem 2612 (3)	Chem 2622 (3)
	Math 1030 (3) ^a	Math 1800 (5)		Chem 2223 (3)	Chem 2633 (2)
	Math 1035 (2) ^a	Biol. 1811 (5)		Math 1900 (5)	Math 2000 (5)
	English 1100(3)	16		Biol. 2012 (3)	Physics 2112(5)
	*Elective (3) ^b			Physics 2111(5)	15
	16			16	
Junior	Chem 3312 (3)	Chem 3322 (3)	Senior	Chem 4772 (3)	Chem 4897 (1)
	Chem 4712 (3)	Chem 3333 (2)		Chem 3022 (1)	Biol. 4614 (4)
	Chem 4733 (2)	Chem 4722 (3)		Biol 3622 (3)	Lang 3 (3)
	Chem 3412 (2)	English31xx(3) ^c		Lang 2 (5)	*Electives (6) ^b
	Physics 2112(5)	Lang. 1 (5)		*Elective (3) ^b	14
	15	16		15	Total = 123

- a. If student passes the math placement exam, Math 1030 and Math 35 1035 would be replaced by Math 1800.
 - b. Only 15 hours of electives are included which means that the State Requirement and the Cultural Diversity requirement must overlap with another knowledge or skill area. NOTE that this also means that Lang 3 is included as a Humanities and Fine Arts requirement.
 - c. English 3160, 3130 or 3100 are recommended.
- * Electives include General Education courses.

Hypothetical Four-Year Schedule

B.S. Degree in Chemistry

Year	Fall	Winter	Year	Fall	Winter
Freshman	Chem 1111 (5) Math 1030 (3) ^a Math 1035 (2) ^a English 1100 (3) *Elective (3) 16	Chem 1121(5) Math 1800 (5) *Electives (6) 16	Sophomore	Chem 2612 (3) Chem 2223 (3) Math 1900 (5) Physics 2111(5) 16	Chem. 2622 (3) Chem. 2633 (2) Math 2000 (5) Physics 2112(5) 15
Junior	Chem 3312 (3) Chem 3643 (2) Chem 3412 (2) Chem 3022 (1) Lang. 1** (5) English 31xx (3) ^b 16	Chem.3322(3) Chem.3333(2) Chem.3905(n) Lang. 2 (5) Elective (3) 13 + n	Senior	Chem 4212 (2) ^c Chem 4343 (2) ^d Chem 4412 (3) Chem 4712 (3) Chem 3905 n Lang. 3 (3) ^e *Elective (3) 16 +n	Chem 4233 (2) Chem 4897 (1) Chem 4433 (2) Chem 4xx (3) ^e (or Chem3905) *Electives (6) 14 Total = 122

- a. If student passes math placement exam, Math 1030 and Math 1035 would be replaced by Math 1800.
 - b. English 3160, 3130 or 3100 are recommended.
 - c. Late afternoon class.
 - d. Currently not scheduled for this semester.
 - e. If a lecture course is selected, Chem. 3905 would be dropped.
- ** Foreign language optional for students entering in Fall 2005 and later.

Hypothetical Four-Year Schedule

B.S. Degree in Chemistry with an Emphasis in Biochemistry

Year	Fall	Winter	Year	Fall	Winter
Freshman	Chem 1111 (5) Math 1030 (3) ^a Math 1035 (2) ^a English 1100(3) *Elective <u>(3)</u> ^b 16	Chem 1121 (5) Math 1800 (5) Biol 1811 <u>(5)</u> 15	Sophomore	Chem 2612 (3) Chem 2223 (3) Math 1900 (5) *Electives <u>(3)</u> ^b 14	Chem 2622 (3) Chem 2633 (2) Math 2000 (5) Physics2111 <u>(5)</u> 15
Junior	Chem 3312 (3) Chem 4712 (3) Chem 4733 (2) Chem 3412 (2) Chem 3022 (1) Physics 212 <u>(5)</u> 16	Chem 3322 (3) Chem 3333 (2) Chem 4722 (3) Lang. 1** (5) English31xx <u>(3)</u> ^c 16	Senior	Chem 4212(2) ^d Chem 4412 (3) Chem 4772(3) ^e (orChem 3905) Lang. 2 (5) *Elective <u>(3)</u> ^b 16	Chem 4897 (1) Chem 4233 (2) Biol 3622 (3) Lang 3 (3) ^b *Electives <u>(6)</u> ^b 15 Total = 123

- a. If student passes math placement exam, Math 1030 and Math 1035 would be replaced by Math 1800.
 - b. Only 15 hours of electives are included which means that the State Requirement and the Cultural Diversity requirement must overlap with another knowledge or skill area. Note that this also means that Lang 3 is included as a Humanities and Fine Arts requirement.
 - c. English 3160, 3130 or 3100 are recommended.
 - d. Late afternoon class.
 - e. If lecture course is selected, Chem. 3905 would be dropped.
- * Electives include General Education courses.
- ** Foreign language optional for students entering in Fall 2005 and later.

Bachelor of Arts in Chemistry

University of Missouri-St. Louis

• General Education Requirements

Freshman Composition: _____

Advanced Expository Writing-Junior Level English Requirement (Eng 3100 or Eng 3160 preferred):

American History and Government Requirement: (1 course)

Cultural Diversity Requirement (1 course, see Bulletin for list):

Foreign Language (must fulfill College requirement):

1. _____

2. _____

3. _____

Communicating (2 courses or 6 hours):

Managing Information (1 course or 3 hours):

Valuing (1 course or 3 hours):

Social and Behavioral Sciences (3 course or 9 hours):

Humanities and Fine Arts (3 courses or 9 hours):

Mathematical and Life/ Natural Sciences (4 three-hour courses
or 12 hours):

• Core Curriculum

- Chemistry 1111 Introductory Chemistry I (5)

- Chemistry 1121 Introductory Chemistry II (5)

- Chemistry 2223 Quantitative Analysis (3)

- Chemistry 3022 Intro. to Chemical Literature (1)

- Chemistry 3312 Physical Chemistry I (3)

- Chemistry 3322 Physical Chemistry II (3)

- Chemistry 3333 Physical Chemistry Laboratory I (2)

- Chemistry 3412 Basic Inorganic Chemistry (2)

- Chemistry 2612 Organic Chemistry I (3)

- Chemistry 2622 Organic Chemistry II (3)

- Chemistry 2633 Organic Chemistry Laboratory (2)

- Chemistry 4897 Seminar (1)

• Advanced Laboratory Requirement

(One laboratory course chosen from: Chemistry 4343, 4433, 3643, 4233 or 4733; lecture prerequisites required for 4433 and 4233)

* _____

• Related Area Requirements:

- Math 1800 Analytical Geometry & Calculus I (5)

- Math 1900 Analytical Geometry & Calculus II (5)

- Math 2000 Analytical Geometry & Calculus III (5)

- Phys 2111 Physics: Mechanics and Heat (5)

- Phys 2112 Physics: Electricity, Magnetism & Optics (5)

• Major Field Achievement Test:

• Electives:

■ _____

■ _____

■ _____

■ _____

Bachelor of Science in Chemistry

University of Missouri-St. Louis

• General Education Requirements

Freshman Composition: _____

Advanced Expository Writing-Junior Level Writing Requirement (3100 or 3160 preferred):

American History and Government: (1 course):

Cultural Diversity (1 course, see Bulletin for listing):

Foreign Language - (optional for students entering F05 and later):

1. _____

2. _____

3. _____

Communicating (2 courses or 6 hours):

Managing Information (1 course or 3 hours):

Valuing (1 course or 3 hours):

Social and Behavioral Sciences (3 course or 9 hours):

Humanities and Fine Arts (3 courses or 9 hours):

Mathematical and Life/ Natural Sciences (4 three-hour courses or 12 hours):

• Core Curriculum

- Chemistry 1111 Introductory Chemistry I (5)

- Chemistry 1121 Introductory Chemistry II (5)

- Chemistry 2223 Quantitative Analysis (3)

- Chemistry 3022 Intro. to Chemical Literature (1)

- Chemistry 3312 Physical Chemistry I (3)

- Chemistry 3322 Physical Chemistry II (3)

- Chemistry 3333 Lab in Physical Chemistry I (2)

- Chemistry 4343 Lab in Physical Chemistry II (2)

- Chemistry 3412 Basic Inorganic Chemistry (2)

- Chemistry 2612 Organic Chemistry I (3)

- Chemistry 2622 Organic Chemistry II (3)

- Chemistry 2633 Organic Chemistry Laboratory (2)

- Chemistry 4897 Seminar (1)

- Chemistry 4212 Instrumental Analysis (2)

- Chemistry 4233 Laboratory in Instrumental Analysis (2)

- Chemistry 4412 Inorganic Chemistry (3)

- Chemistry 4433 Inorganic Chemistry Laboratory (2)

- Chemistry 3643 Advanced Organic Chemistry Laboratory (2)

- Chemistry 4712 Biochemistry (3)

- Two elective credits of advanced work in chemistry at the 3000 level or above. Students are encouraged to take Chemistry 3905.

• Related Area Requirements:

- Math 1800 Analytical Geometry & Calculus I (5)

- Math 1900 Analytical Geometry & Calculus II (5)

- Math 2000 Analytical Geometry & Calculus III (5)

- Phys 2111 Physics: Mechanics and Heat (5)

- Phys 2112 Physics: Electricity, Magnetism & Optics (5)

• Major Field Achievement Test:

• Electives:

■ _____
■ _____

Bachelor of Science in Chemistry with an Emphasis in Biochemistry

University of Missouri-St. Louis

- **General Education Requirements**

Freshman Composition: _____

Advanced Expository Writing-Junior Level Writing Requirement (3100 or 3160 preferred):

American History and Government (1 course)

Cultural Diversity (1 course, see Bulletin for listing):

Foreign Language - (optional for students entering F05 and later):

1. _____ 2. _____

3. _____

Communicating (2 courses or 6 hours):

Managing Information (1 course or 3 hours):

Valuing (1 course or 3 hours):

Social and Behavioral Sciences (3 course or 9 hours):

Humanities and Fine Arts (3 courses or 9 hours):

Mathematical and Life/ Natural Sciences (4 three-hour courses or 12 hours):

- **Core Curriculum**

-Chemistry 1111 Introductory Chemistry I (5)

-Chemistry 1121 Introductory Chemistry II (5)

-Chemistry 2223 Quantitative Analysis (3)

-Chemistry 3022 Intro. To Chemical Literature (1)

-Chemistry 3312 Physical Chemistry I (3)

-Chemistry 3322 Physical Chemistry II (3)

-Chemistry 3333 Physical Chemistry Laboratory I (2)

-Chemistry 3412 Basic Inorganic Chemistry (2)

-Chemistry 2612 Organic Chemistry I (3)

-Chemistry 2622 Organic Chemistry II (3)

-Chemistry 2633 Organic Chemistry Laboratory (2)

-Chemistry 4897 Seminar (1)

-Chemistry 4212 Instrumental Analysis (2)

-Chemistry 4233 Laboratory in Instrumental Analysis (2)

-Chemistry 4412 Inorganic Chemistry (3)

-Chemistry 4712 Biochemistry (3)

-Chemistry 4722 Advanced Biochemistry (3)

-Chemistry 4733 Biochemistry Laboratory (2)

-Advanced Elective (3 credits) must be from Chemistry 3905 Research in Chemistry, Chemistry 4764 Special Topics in Biochemistry (3) or Chemistry 4772 Physical Biochemistry (3). Research must be an approved biochemistry project.

- **Related Area Requirements:**

-Math 1800 Analytical Geometry & Calculus I (5)

-Math 1900 Analytical Geometry & Calculus II (5)

-Math 2000 Analytical Geometry & Calculus III (5)

-Phys 2111 Physics: Mechanics and Heat (5)

-Phys 2112 Physics: Electricity, Magnetism & Optics (5)

-Biology 1811 Introductory Biology (5)

-Biology 3622 Biology (3) or Biology 2012 Genetics (3)

- **Major Field Achievement Test:**

Bachelor of Arts in Chemistry with Biochemistry Certificate

University of Missouri-St. Louis

- **General Education Requirements**

Freshman Composition: _____

Advanced Expository Writing-Junior Level Writing Requirement (3100 or 3160 preferred):

American History and Government: (1 course):

Cultural Diversity Requirement (1 course): _____

Foreign Language - (must fulfill College requirement):

1. _____ 2. _____

3. _____

Communicating (2 courses or 6 hours):

Managing Information (1 course or 3 hours):

Valuing (1 course or 3 hours):

Social and Behavioral Sciences (3 course or 9 hours):

Humanities and Fine Arts (3 courses or 9 hours):

Mathematical and Life/ Natural Sciences (4 three-hour courses
or 12 hours):

- **Core Curriculum**

-Chemistry 1111 Introductory Chemistry I (5)

-Chemistry 1121 Introductory Chemistry II (5)

-Chemistry 2223 Quantitative Analysis (3)

-Chemistry 3022 Intro. To Chemical Literature (1)

-Chemistry 3312 Physical Chemistry I (3)

-Chemistry 3322 Physical Chemistry II (3)

-Chemistry 3333 Physical Chemistry Laboratory I (2)

-Chemistry 3412 Basic Inorganic Chemistry (2)

-Chemistry 2612 Organic Chemistry I (3)

-Chemistry 2622 Organic Chemistry II (3)

-Chemistry 2633 Organic Chemistry Laboratory (2)

-Chemistry 4897 Seminar (1)

-Chemistry 4712 Biochemistry (3)

-Chemistry 4722 Advanced Biochemistry (3)

-Chemistry 4733 Biochemistry Laboratory (2)

-Chemistry 4764 Interdisciplinary Topics in Biochemistry (3)
or Chemistry 4772 Physical Biochemistry (3)

- **Related Area Requirements:**

-Math 1800 Analytical Geometry & Calculus I (5)

-Math 1900 Analytical Geometry & Calculus II (5)

-Math 2000 Analytical Geometry & Calculus III (5)

-Phys 2111 Physics: Mechanics and Heat (5)

-Phys 2112 Physics: Electricity, Magnetism & Optics (5)

-Biology 1811 Introductory Biology (5)

-Biology 3622 Cell Biology (3)

-Biology 2012 Genetics (3)

-Biology 4614 Biotechnology Laboratory I (4) or
Biology 4602 Molecular Biology (3)

- **Major Field Achievement Test:**

Bachelor of Science in Biochemistry and Biotechnology

University of Missouri-St. Louis

• General Education Requirements

English Proficiency: _____

Advanced Expository Writing-Junior Level Writing Requirement (3100 or 3160 preferred):

American History and Government Requirement: (1 course)

Cultural Diversity Requirement (1 course):

Foreign Language (must fulfill College requirement):
{French or German preferred }

Communicating (2 courses or 6 hours):

Managing Information (1 course or 3 hours):

Valuing (1 course or 3 hours):

Social and Behavioral Sciences (3 course or 9 hours):

• Chemistry Core Curriculum

- Chemistry 1111 Introductory Chemistry I (5)
- Chemistry 1121 Introductory Chemistry II (5)
- Chemistry 2223 Quantitative Analysis (3)
- Chemistry 2612 Organic Chemistry I (3)
- Chemistry 2622 Organic Chemistry II (3)
- Chemistry 2633 Organic Chemistry Laboratory (2)

• Biology Core Curriculum

- Biology 1811, Introductory Biology I
- Biology 2482, Microbiology
- Biology 2483, Microbiology Lab
- Biology 2012, Genetics
- Biology 2013, Genetics Lab

- Biology 3622, Cell Biology

- Biology 4602, Molecular Biology

• Biochemistry/Biotechnology Core

- Chemistry (or Biology) 4712, Biochemistry

- Chemistry 4733 or Biology 4713, Biochemistry Laboratory

- Chemistry 3302, Physical Chemistry for the Life Sciences

- Biology 4614, Biotechnology Laboratory I

- Chemistry 4897 or Biology 4889, Capstone seminar

• Biochemistry/Biotechnology Electives

A minimum of 9 credits from the following courses:

Chemistry 4722, Advanced Biochemistry
Chemistry 4772, Physical Biochemistry
Biology 4615, Biotechnology Laboratory II
Biology 4632, Nucleic Acid and Structure
Biology 4642, Plant Molecular Biology and Genetic Engineering
Biology 4652, Virology
Biology 4612, Molecular Genetics of Bacteria
Biology 4622, Molecular Cell Biology
Biology 4842, Immunobiology
Biology 5712, Topics in Biochemistry
Chemistry 3905 or Biology 3905 (up to 3 credits)

• Related Area Requirements:

- Math 1030 College Algebra

- Math 1035 Trigonometry

- Math 1800 Analytical Geometry & Calculus II (5)
or Math 1100, Basic Calculus (5)

- Phys 1011 Basic Physics I (5)

- Phys 1012 Basic Physics II (5)

• Comprehensive Examination

TEACHING & RESEARCH INTERESTS

LAWRENCE BARTON, Professor Emeritus - Office: M302, 516-5334, lbarton@umsl.edu.

B.Sc., 1960, B.Sc.(Hons), 1961, Ph.D., 1964, Liverpool University Research Associate, 1964-66, Cornell University; Senior Research Fellow, 1970-71, Explosives Research and Development Establishment, Waltham Abbey, UK.

Teaching: Inorganic Chemistry I, Inorganic Chemistry II, Inorganic Reactions, Undergraduate Chemical Research, and Senior Seminar.

Research Interest: Inorganic Chemistry. Synthesis, structure and chemistry of borane and metalborane cage compounds, transition metallaborane complexes, boron oxygen ring systems, organometallic chemistry.

EIKE BAUER, Assistant Professor – Office B315i, 516-5340, bauere@umsl.edu.

Vordiplom (B.S. degree) 1995, University of Erlangen-Nuremberg (Germany); Hauptdiplom (Thesis M.S. degree) 1999, University of Erlangen-Nuremberg; Ph.D., 2003, University of Erlangen-Nuremberg; Postdoctoral Fellow, 2004-2005, University of California – Riverside; Visiting Assistant Professor, 2005-2006, Illinois Wesleyan University.

Teaching: Organic Chemistry I and II, Advanced Organic Chemistry, Organometallic Chemistry.

Research Interests: Organometallic and Organic Chemistry. Organometallic complexes as catalysts in organic syntheses; water-compatible organometallic catalysts systems, application of ring-closing metathesis in the syntheses of novel organometallic architectures.

ALICIA M. BEATTY, Associate Professor, Office: M207, 516-4383, beatty@umsl.edu

B.S. Chemistry, 1989, University of Missouri - St. Louis. Ph.D. Chemistry, 1994, Washington University in St. Louis.

Teaching: General Chemistry, Basic Inorganic Chemistry, Advanced Inorganic Chemistry, Inorganic Chemistry Laboratory.

Research Interests: Crystal engineering, organic and inorganic solid state chemistry, organic synthesis, coordination chemistry, solid state characterization (X-ray diffraction, thermal methods, electron microscopy).

JAMES S. CHICKOS, Professor - Office: B435, 516-5377, jsc@umsl.edu.

B.S. 1963, S.U.N.Y., Buffalo; Ph.D., 1966, Cornell University. NIH Fellow, 1966-67, Princeton University; NIH Fellow, 1967-69, University of Wisconsin.

Teaching: Introductory Chemistry I, Chemistry for the Health Professions, General Chemistry Laboratory, Introduction to Chemical Literature, Techniques of Organic Chemistry, Advanced Organic Chemistry, and Undergraduate Chemical Research, Physical Organic Chemistry.

Research Interest: Organic Chemistry. Synthesis of chiral organo-deuterium compounds, thermal reactions of hydrocarbons, stereochemistry, heats of sublimation, isotope effects.

JOYCE Y. COREY, Professor Emeritus - Office: B318, 516-5360, corey@umsl.edu.

B.S., 1960, M.S., 1961, University of North Dakota; Ph.D., 1964, University of Wisconsin.

Teaching Introductory Chemistry II, Inorganic Chemistry I, Inorganic Chemistry II, Inorganic Reactions, and Undergraduate Chemical Research.

Research Interest: Inorganic Chemistry. Synthesis and characterization of organometallic compounds containing elements from groups III and IV with emphasis on group IV analogs of pharmaceutically active derivatives.

ALEXEI V. DEMCHENKO, Associate Professor and Director of Graduate Studies – Office B434, 516-7995, demchenkoa@msx.umsl.edu.

M.Sc., 1988, Mendeleev University of Chemical Technology of Russia, Moscow; Ph.D., 1993, Zelinsky Institute of Organic Chemistry (IOC), Russia; Research Associate, 1993-1995, IOC; BBSRC Postdoctoral Research Fellow, 1995-1998, University of Birmingham, UK; Research Associate, 1998-2001, Complex Carbohydrate Research Center, GA.

Teaching: Organic Chemistry I and II, Structural Organic Chemistry, Modern Carbohydrate Chemistry.

Research Interest: Carbohydrate chemistry, novel synthetic strategies and approaches, drug discovery, synthetic vaccines, medicinal chemistry, polymer-supported synthesis. IV analogs of pharmaceutically active derivatives.

VALERIAN T. D'SOUZA, Associate Professor - Office: B221, 516-5324, vally@umsl.edu.

B.Sc., 1976, M.Sc., 1979, Bombay University; Ph.D., 1983, University of Detroit. Postdoctoral Fellow, 1983-87, Northwestern University.

Teaching: General Organic Chemistry, Introduction to Chemical Literature, Techniques of Organic Chemistry, Undergraduate Chemical Research, and Biochemistry.

Research Interest: Bioorganic Chemistry. Bioorganic chemistry, kinetics, mechanisms and structure-function relationships of organic reactions particularly of biological processes; enzyme mechanisms, mimics and catalysis; cyclodextrin and modified cyclodextrin chemistry.

CYNTHIA M. DUPUREUR, Associate Professor – Office: M307, 516-4392, cdup@umsl.edu.

B.S., 1987, Southwest Missouri State University, Ph.D., 1992, Ohio State University. Postdoctoral Fellow, 1992-1995, California Institute of Technology.

Teaching: Physical Biochemistry, Advanced Biochemistry, and Biochemical Techniques.

Research Interest: Biochemistry. Metallo- and nucleic acid enzyme structure-function relationships; biophysical chemistry; biological applications of fluorescence and NMR spectroscopy.

GEORGE W. GOKEL, Distinguished Professor of Science, Associate Director, Center for Molecular Electronics - Office: B428, 516-5321, gokelg@umsl.edu.

B.S. 1968, Tulane University, New Orleans. Ph.D. 1971, University of Southern California, Los Angeles; Post doctoral Fellow, U.C.L.A. 1972-1974.

Teaching: Organic Chemistry.

Research Interests: Bioorganic chemistry, chemical biology, supramolecular chemistry. Design, synthesis, and characterization of model systems that mimic biological function. Development and study of models that probe supramolecular interactions.

HAROLD H. HARRIS, Associate Professor - Office: B315f, 516-5344, hharris@umsl.edu.

B.S., 1962, Harvey Mudd College; Ph.D. 1966, Michigan State University. Postdoctoral Fellow, 1966-67, University of California-Irvine.

Teaching: General Chemistry, 1, General Chemistry Laboratory, Quantitative Analysis, Physical Chemistry I & II, Laboratory in Physical Chemistry I & II, Methods of Teaching Physical Sciences, Chemistry Seminar, Undergraduate Chemical Research, Intermediate Physical Chemistry, Advanced Physical Chemistry.

Research Interest: Physical Chemistry. Self-organizing systems; combustion chemistry; chemical education.

WESLEY R. HARRIS, Professor - Office: B320, 516-5331, wharris@umsl.edu.

B.S., 1974, Ph.D., 1977, Texas A&M University. Postdoctoral Associate, 1977, University of California-Berkeley.

Teaching: Inorganic Chemistry I, Inorganic Chemistry II, Inorganic Reactions, and Undergraduate Chemical Research and The Teaching and Practices of Chemistry in Colleges and Universities.

Research Interest: Inorganic Chemistry. Complexation equilibrium with proteins and low molecular weight ligands. Metal ion exchange kinetics with serum transferrin. Linear free-energy relationships in coordination chemistry.

STEPHEN M. HOLMES, Associate Professor - Office: B418, 516-4382, holmesst@umsl.edu.

B.S., 1992, Southwest Texas State University (now Texas State University); Ph.D. 1999, University of Illinois at Urbana-Champaign. Postdoctoral Associate, 1999-2001, Cornell University.

Teaching: Introductory Chemistry, General Chemistry, Inorganic Chemistry, Laboratory in Inorganic Chemistry, Spectroscopy and Methods in Chemistry, and Undergraduate Chemical Research.

Research Interests: Inorganic and Materials Chemistry. Magnetic and optically responsive materials, coordination and organometallic chemistry, catalysis, and electronic materials and devices.

JINGYUE (JIMMY) LIU, Professor – Office: M303, 516-5345, liuj@msx.umsl.edu.

B.Sc. (Hons), 1982, Beijing University of Science & Technology; Ph.D., 1990, Arizona State University; Research Associate, 1990-92, Research Scientist, 1993-94, Arizona State University; Senior Research Scientist, Science Fellow, Senior Fellow, 1994-2006, Monsanto Company. Director of the Center for Molecular Electronics, UM-St. Louis.

Teaching: Microscopy, Spectroscopy and Diffraction, Nanocharacterization and Nanotechnology

Research Interests: nanotechnology and nanobiotechnology; nanoparticles and nanoparticle systems; nanocatalysis and nanostructured catalysts; surfaces, thin films and catalytic sensors; atomic resolution imaging, nanodiffraction and nanospectroscopy; biological imaging and nanobioanalytics.

RENSHENG LUO, Research Assistant Professor – Office: B433, 516-6748, luor@umsl.edu.

M.S., 1982, Wuhan University, Ph.D., 1999, Chinese Academy of Sciences, Postdoctoral Associate, University of Illinois at Urbana-Champaign, 1999-2001, St. Judes Children Hospital, 2001-2004.

Research Interests: Dr. Luo is the Director of the Nuclear Magnetic Resonance Laboratory, providing nuclear magnetic resonance services to the department. He is responsible for handling lab administration, maintaining the spectrometers, assisting users with the setup of NMR experiments, and training new users to operate the spectrometers. In addition, he is implementing new NMR experiments and advising and collaborating with members of the department in the solution of chemical and biochemical problems using NMR spectroscopy. Dr. Luo's areas of personal interest are the study of 3D structure, conformational dynamics and mobility of biomacromolecules and organometallic complexes, and ligand binding and molecular interactions in solution using multidimensional NMR methods.

MICHAEL R. NICHOLS, Assistant Professor – Office B319, 516-7345, nicholsmic@umsl.edu.

B.S., 1993, Lindenwood College; Ph.D., 1999, Purdue University; Postdoctoral Fellow, Associate Consultant/ Asst. Professor, 1999-2004, Mayo Clinic Jacksonville

Teaching: Biochemistry and Biochemistry Laboratory, Undergraduate Chemical Research

Research Interests: Biochemistry, Biophysical Chemistry. Mechanisms of protein assembly. Structural characterization of macromolecules. Signaling mechanisms in inflammatory cells.

JAMES J. O'BRIEN, Professor - Office: B414, 516-5717, obrienjja@umsl.edu.

B.Sc. Honors (1st class), 1975, James Cook University of Queensland, Australia; 1981, Australian National University, Canberra, Australia. CSIRO (Australia) Fellowship, 1981-82, University of California-Berkeley; NRC Associateship, 1982-84, National Research Council of Canada, Ottawa, Canada; Postdoctoral Associate, 1985-88, University of Arizona, Tucson.

Teaching: Instrumental Analysis, Laboratory in Instrumental Analysis, Physical Chemistry I & II, and Undergraduate Chemical Research.

Research Interests Physical Chemistry. Gaseous species important in pyrolytic and plasma assisted chemical vapor deposition processes studied laser spectroscopy; laboratory spectra of species important in planetary atmospheres.

**NIGAM P. RATH, Research Professor - Office: M304, 516-5333,
nigam_rath@umsl.edu.**

B.Sc. (Hons), M.Sc., Berhampur University in India; Ph.D. from Oklahoma State University. Postdoc Fellow and Assistant Faculty Fellow at the University of Notre Dame. He is the department's X-ray Diffraction specialist.

Teaching: General Chemistry, X-Ray Crystallography.

Research Interests: Dr. Rath's research interests are in the field of chemical crystallography and inorganic chemistry. His research involves single crystal x-ray diffraction structure determination of novel organic and organometallic compounds. Also, he is interested in developing techniques for high-resolution data collection.

**CHRISTOPHER D. SPILLING, Professor and Chair - Office: B315, 516-5437,
cspill@umsl.edu.**

B.Sc. (Hons), 1983, Ph.D., 1986, University of Technology, Loughborough. Postdoctoral fellow, 1986, Northwestern University.

Teaching: Structural Organic Chemistry, Techniques of Organic Chemistry, Advanced Organic Chemistry, and Undergraduate Chemical Research.

Research Interests Organic Chemistry. Organic synthesis; new synthetic methods; chiral phosphonate and phosphonamides in asymmetric synthesis; carbohydrate chemistry and synthesis of natural products.

KEITH J. STINE, Professor - Office: M204, 516-5346, kstine@umsl.edu.

B.S., 1984, Fairleigh Dickinson University; Ph.D. 1988, Massachusetts Institute of Technology. Postdoctoral Associate, 1988-90, University of California, Los Angeles.

Teaching: Introductory Chemistry, General Chemistry, Physical Chemistry, Laboratory in Physical Chemistry, Surface Chemistry, and Undergraduate Chemical Research.

Research Interests: Physical and Biophysical Chemistry. Monolayers at the water-air interface as biomembrane models and as supramolecular systems, lipid microstructures, nanostructures, biosensors.

**JANET BRADDOCK-WILKING, Assistant Professor - Office: M306, 516-6436,
wilkingj@umsl.edu.**

B.A., 1985, UM-St. Louis; M.A., 1987, Washington University; Ph.D., 1990, Washington University; Postdoctoral Fellow, 1990-91, Harvard University; Postdoctoral Fellow, 1992-93, Mallinckrodt Medical, Inc.

Teaching Interests: Introductory Chemistry II, Inorganic Chemistry I, Inorganic Chemistry II, Inorganic Reactions, Undergraduate Chemical Research

Research Interests: Inorganic and Organometallic Chemistry. Synthesis, properties, and reaction chemistry of complexes containing bonds between transition-metals and heavier group 14 elements (Si, Ge, Sn, Pb). NMR spectroscopy.

**CHUNG F. WONG, Assistant Professor – Office: M203, 516-5318,
wongch@msx.umsl.edu.**

B.Sc.(Hons.), 1980, Chinese University of Hong Kong; Ph.D., 1984, University of Chicago; Postdoctoral fellow, 1985-1988, University of Houston.

Teaching: Biochemistry, Physical Chemistry for Life Sciences, Biological and Chemical Informatics, Special Topics in Biochemistry.

Research Interests: Develop and apply computational methods to study biomolecular structure, dynamics, and function and to aid the design of bioactive molecules. Protein kinases and phosphatases. Computer-aided drug design.

ZHI XU, Associate Professor - Office: M206, 516-5328, zhixu@umsl.edu.

B.S., 1982, Tsinghua University, Beijing; M.S., 1985, Tsinghua University, Beijing; Ph.D., 1991, University of Pittsburgh. Postdoctoral Fellow, 1991-94, University of Illinois.

Teaching: Intermediate Physical Chemistry, Advanced Physical Chemistry, Physical Chemistry Lab, Instrumental Analysis, and Undergraduate Chemical Research.

Research Interests: Physical Chemistry. Surface chemistry, molecular electronics and non-linear laser spectroscopy, development of molecular devices with picosecond optical response.

Fellowships and Scholarships

The Brunngraber Undergraduate Research Fellowship is given annually to a chemistry major based on GPA, research interests, and performance in course work.

The William and Erma Cook Chemistry Fellowship is given annually to an outstanding full-time chemistry major who is at least a sophomore and has financial need.

Aid to Education Scholarships are given to approximately 10 junior or senior chemistry majors annually. Awardees are selected on the basis of merit, and the scholarships consist of a stipend for books, educational materials, and Student Affiliate membership dues to the American Chemical Society.

The Lawrence Barton Scholarship is awarded annually to a junior Chemistry major, with preference given to first generation college students.

The Barbara Willis Brown Scholarship for Women in Chemistry is awarded annually to an outstanding female chemistry major over the age of 25 who will be encouraged to participate in undergraduate research.

A series of undergraduate awards are given each year to the outstanding students. The **Chemical Rubber Company Freshman Chemistry Award** is given to the outstanding student in Freshman chemistry, the **American Chemical Society Division of Analytical Chemistry Award** is given to the outstanding student in analytical chemistry, the **American Chemical Society - St. Louis Section, Outstanding Junior Chemistry Major Award** is given to the outstanding junior chemistry major, and the outstanding senior receives the **Alan F. Berndt Award** and the **American Institute of Chemists Certificate**.

Career Outlook

The B.S. degree in chemistry is the usual foundation for graduate study in chemistry, while any bachelor's degree in chemistry provides students with professional competence to enter the chemical industry. The St. Louis Metropolitan Area is a major center for industrial chemistry, and the demand for graduates consistently exceeds the supply.

A major in chemistry provides students excellent preprofessional training in the health sciences. A double major in chemistry and biology is often chosen by premedical and pre dental students, and by those interested in graduate work in biochemistry or biology. A minor in chemistry provides the minimum qualifications and training for a position as laboratory technician in industry, hospital laboratories, etc.

For further information, contact:

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Email inquiries to:

Keith J. Stine
kstine@umsl.edu, Director of Undergraduate Studies

or

Christopher D. Spilling
SpillingC@msx.umsl.edu, Chair of Department

or

Pre-medical Advisor: Professor James J. O'Brien
(314) 516-5717, email: obrienjja@umsl.edu