

CHEMISTRY, BIOCHEMISTRY, And ENVIRONMENTAL CHEMISTRY

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Chemistry is a central science that provides a basic understanding needed to deal with many of society's needs. It is a critical field for man's attempt to feed and clothe the world population, to tap new sources of energy, to improve health, and to protect our environment. All life processes are manifestations of chemical change. Understanding chemical reactivity is necessary for our understanding of life and the world around us. Modern chemical instrumental techniques furnish a crucial dimension. They account for the recent acceleration of progress that now promises especially high return from the investment of additional resources in the field of chemistry. The chemical industry of the U.S. employs over a million people. There is no basic science that offers greater security for investment in the future than chemistry.

The Chemistry program leading to the Bachelor of Science degree at U. T. Permian Basin follows the guidelines of the American Chemical Society for a Bachelor of Science in Chemistry. This degree is appropriate for a student who wishes to pursue a professional career in any field of chemistry. The B.S. in Chemistry (Biochemistry Track) is designed for students pursuing a career in a health profession and who desire a strong background in this central science as preparation for medical, dental, veterinary and pharmacy schools, as well as teaching. The B.S. in Chemistry (Environmental Chemistry Track) is designed for Chemistry students pursuing a career related to the environment.

Degree Requirements

The total semester credit hours required for a B. S. in Chemistry is 120.

General Education

49 semester credit hours

Complete the requirements shown in the General Education Requirements section in this catalog, including the following specific courses. Although not required, it is most desirable that students also take Calculus II (MATH 2414) and the University Physics sequence.

Mathematics	MATH 2412, 2413,	8 sch
Physics	PHYS 1301/1101, 1302/1102 or PHYS 2425, 2426	8 sch
Computers	COSC 1335	3 sch

Students pursuing the Environmental Chemistry Track must also take the following GEOL & BIOL courses:

Geology	GEOL 1301/1101, 1302/1102	8 sch
Biology	BIOL 1306/1106	4 sch

Chemistry Major and Minor Requirements

Students may complete the requirements for a B.S. degree in Chemistry through either of two pathways. The B.S. degree in Chemistry (≥ 26 upper level sch) is designed for chemical professionals and requires a minor. Organic Chemistry may also be taken at the lower level at a community college and will transfer for the typical 8 sch and is one example of how students might have fewer UL sch for the degree. A minimum of 48 UL sch is required for any degree at UTPB. However, students that transfer Org CHEM may be required to take the Org CHEM II lab at UTPB to assure the expertise in instrumental analysis if they do not receive hands-on use and experience elsewhere.

The B.S. degree in Chemistry with a Biochemistry Track (≥ 26 CHEM upper level sch) requires a preselected list (12 upper level sch) of Biology courses and therefore does not require a minor. The pre-pharmacy track may be based on either of these degree plans but is shown in the 2 yr and 3 yr time frames where certain requirements must be achieved to gain early acceptance into the Pharmacy programs at other institutions.

The following requirements are listed for each degree track. Since each degree plan is customized to each student and depends upon their level of preparation for college level coursework, transfer courses, and choices of electives, minor, etc., only sample degree plans are included after the course descriptions.

B.S. in Chemistry

		LL	UL
CHEM 1311/1111, 1312/1112	General CHEM	8	
CHEM 3311/3113, 3312/3114	Organic CHEM		8 (example)
CHEM 3324/3225	Analytical CHEM		5
CHEM 3695	CHEM Research		2
CHEM 4301/4103,	Physical CHEM I		4
CHEM 4321/4223	Biochemistry (or BIOL equivalent)		4
CHEM 4374/4174	Adv. Inorganic CHEM		4
CHEM Electives (≥ 7 sch)			
CHEM 4302/4102	Physical CHEM II		4 (example)
CHEM 4330/4131	NMR Spectroscopy.		
CHEM 4340	Medicinal CHEM		
CHEM 4389	Modern Nuclear CHEM		3 (example)
Total:		42 total sch and	≥ 26 UL sch

A formal Minor in another discipline is required as part of this degree plan. Minor requirements are defined by each discipline but must be ≥ 18 total sch and ≥ 9 UL sch.

B.S. in Chemistry (Biochemistry Track)

The Biochemistry Track is a program designed for students interested in the application of chemical concepts to biological systems. This degree program will prepare students seeking to continue their education in a health field (medical, dental, pharmacy, etc.) or in a graduate program in which the research may focus on biochemical, medicinal, or forensic chemistry, or toxicology areas (to name a few).

In addition to the General Education courses, 64 sch (with ≥ 40 sch are UL) are required in Chemistry and BIOL courses. 1 This degree plan does not require a separate minor. Depending upon each student's level of readiness for college courses, pre-calculus can be counted within the total sch for the degree while another UL elective allows pre-med students to take another BIOL course to further their preparation for professional/graduate schools.

Required Chemistry Courses		LL	UL
CHEM 1311/1111, 1312/1112	General CHEM	8	
CHEM 3311/3113, 3312/3114	Organic CHEM		8 (example)
CHEM 3324/3225	Analytical CHEM		5
CHEM 3695	CHEM Research		2
CHEM 4301/4103	Physical CHEM I		4
CHEM 4321/4223	Biochemistry/lab (or BIOL equivalent)		4
CHEM 4374/4175	Advanced Inorganic CHEM		4
Chemistry Electives (≥ 7 UL sch) 1			
CHEM 4302/4104	Physical CHEM II		4 (example)
CHEM 4330/4131	NMR Spectroscopy		
CHEM 4340	Medicinal CHEM		3 (example)
CHEM 4389	Modern Nuclear Chemistry		
Total:		42 total sch and	≥ 26 UL sch

Required Biology Courses (22 total sch)		
BIOL 1306/1106, 1307/1107	General BIOL	8
Upper Level Biology Courses (≥14 UL sch)		
BIOL 3300, 3101	Microbiology	4 (example)
BIOL 4340/4141	Genetics	4
BIOL (select 2 of 3)		
BIOL 4303	Nutrition	3 (example)
BIOL 3324	Cell Biology	
BIOL 4322	Molecular Biology	3 (example)
Total:		22 total sch and ≥14 UL sch
Recommended Statistics Course (3 total sch)		
PSYC 3301		3

B.S. in Chemistry (Environmental Chemistry Track)

The Environmental Chemistry Track is a program designed for students interested in the application of chemical concepts to the environment. This degree program will prepare students for industrial positions for graduate programs in either field.

Since lower level courses in GEOL (Physical & Historical GEOL & labs, 8 sch) and BIOL (Gen. Biology I & lab, 4 sch) are additional pre-requisites for the ENSC courses, fewer total courses in Chemistry are required in this track. In addition to the General Education courses, there are 31 sch of common science (see example degree plan), 35 sch total CHEM (with 27 UL) and 21 total ENSC, all UL, requirements. This degree plan does not require a separate minor. Depending upon each student's level of readiness for college courses, pre-calculus can be counted within the total sch for the degree, but calculus II is highly recommended.

Required Chemistry Courses		LL	UL
CHEM 1311/1111, 1312/1112	General CHEM	8	
CHEM 3311/3113, 3312/3114	Organic CHEM		8 (example)
CHEM 3324/3225	Analytical CHEM		5
CHEM 3695	CHEM Research		2
CHEM 4301/4103	Physical CHEM I		4
CHEM 4374/4175	Advanced Inorganic CHEM		4
Chemistry Electives (4 UL sch)			
CHEM 4389	Modern Nuclear Chemistry		3
CHEM 3695	CHEM Research		1
Total:		35 total sch and 27 UL sch	

Required Environmental Science Courses (21 total sch)		
ENSC 3301 & 3302	Environmental Science I & II	6
ENSC 3310 & 3315	Water & Air Quality	6
ENSC 3320	Environmental Law	3
ENSC (select 2 of 3)		
ENSC 4303	GIS Applications	3 (example)
ENSC 3324	Adv. Environmental Science	
ENSC 4322	Environmental Research	3 (example)
Total:		21 total sch (all UL)

B.S. in Chemistry (Pre-Pharmacy Track)

A sample degree plan is included at the end of the Chemistry & Biochemistry section of this catalog to show the specific requirements that need to be met for 2-year and 3-year early acceptance into some Pharmacy programs.

Chemistry Minor

The Chemistry minor provides an appropriate supporting background particularly suited for students typically pursuing a major in another area of science, technology, engineering, or math. This plan furnishes some knowledge about various fields of chemistry (inorganic, organic, etc.) and provides the essential analytical tools for other areas of study.

Minor Requirements

The total semester credit hour requirement for a minor in Chemistry is **21** with at least **9** sch at the upper level. The Chemistry minor is specifically described by the following courses as taken at UTPB. Transfer students may be required to take the 1 sch upper level credit for Organic Chem II lab (CHEM 3114), particularly if they have not had access to modern analytical instrumentation during their previous experience. Research in chemistry may not be substituted for any lecture or lab without written consent of the Chemistry chair.

Required Courses		LL	UL
CHEM 1311/1111, 1312/1112	General CHEM	8	
CHEM 3311/3113, 3312/3114	Organic CHEM		8 (example)
CHEM 3324/3225	Analytical CHEM		5
	Total:	21 total sch and	≥9 UL sch

Chemistry as a Teaching Field Education Requirements

The current education course requirements for secondary teacher certification are:

PROFESSIONAL FOUNDATIONS (Pre-Candidacy)

- *PSYC 3341 Child and Adolescent Psychology
- *EDUC 3352 The Exceptional Child
- EDUC 4362 Foundations of Bilingualism and Multiculturalism

LITERACY AND PEDAGOGY (Requires application and admission to candidacy)

- EDUC 4322 Classroom Instruction and Management
- EDUC 4326 Reading in the Content Areas
- EDUC 4376 Teaching Science in Grades 8-12

CLINICAL PRACTICE (Requires application and admission)

- **EDUC 4099 Seminar: Student Teaching
- **EDUC 4685 Student Teaching

*Acceptable community college transfer courses for PSYC 3341 include PSYC 2308, PSYC 2314, and TECA 1354. Acceptable community college transfer courses for EDUC 3352 include EDUC 2301.

**Students seeking to do a paid internship in lieu of student teaching must pass their content area TExES exam and graduate in order to be eligible to be hired as an intern teacher. Candidates for the TExES test in 8-12 Chemistry must have completed the courses for the B.S. in Chemistry. Candidates for TExES tests in 8-12 Physical Science or 8-12 Science must have completed the courses listed for each area below or equivalent courses.

8-12 Physical Sciences: CHEM 1311/1111, 1312/1112, 3324/3225, 3311/3113, 3312/3114, 4301/4103; PHYS 2425, 2426 or PHYS 1301/1101 and 1302/1102; 6 hours of science electives.

8-12 Science: BIOL1306/1106, 1307/1107, 4340, 4342; BIOL 3372 or 3230/3231; BIOL 3300/3101 or 3324/3125; CHEM 1311/1111, 1312/1112, 3311/3113; GEOL 1301/1101, 1302/1102; PHYS 1301/1101 and 1302/1102 or PHYS 2425 and 2426; 6-7 hours of science electives.

Course Listing

CHEM 1301 Chemistry in Context (3)[†]

This course will introduce non-science majors to fundamental principles of chemistry using a topics approach. Chemistry concepts will be introduced and developed as needed for the understanding of contemporary societal-technological issues such as the ozone layer; global warming; energy; acid rain; nuclear fission; polymers; drugs; and nutrition. This course is designed to better prepare students to be well-informed citizens. Corequisite: CHEM 1103. FS

CHEM 1103 Chemistry in Context Lab (1)[†]

This course provides lab experiences that reflect the significant broad societal implications of the specific science and technology issues addressed in the lecture course. Hands on experiences are crucial to an understanding of scientific method and the role that Chemistry plays in addressing these issues. The focus is on exploration and data gathering rather than traditional lab techniques. Corequisite: CHEM 1301. FS

CHEM 1305 Introductory Chemistry (3)[†]

This course is a survey of the fundamentals of chemistry with applications to environmental science, allied health occupations, and food science. It will require critical thinking skills and problem solving ability, in addition to learning of factual material. Students with a weak background in Chemistry should take this course prior to enrolling in the General Chemistry sequence, i.e., CHEM 1311. FS

CHEM 1311 General Chemistry I (3)[†]

An introduction to chemistry, fundamentals of atomic structure and bonding, periodic chart, chemical nomenclature, equations and reactions. Prerequisite: high school chemistry. Corequisite: math at college algebra level or better. FS

CHEM 1111 General Chemistry Lab I (1)[†]

Experiments related to principles and topics covered in CHEM 1311. Corequisite: CHEM 1311. FS

CHEM 1312 General Chemistry II (3)[†]

Continuation of Chem 1311. Kinetics, equilibria, thermodynamics, electrochemistry, environmental chemistry, nuclear chemistry, and organic chemistry. Prerequisite: CHEM 1311 and 1111 both with C grade or higher. S, Sm

CHEM 1112 General Chemistry Lab II (1)[†]

Experiments related to principles and topics covered in CHEM 1312. Prerequisite: CHEM 1311 and 1111 both with C grade or higher. Corequisite: CHEM 1312. S, Sm

CHEM 3311 Organic Chemistry I (3)

Organic functional groups. Emphasizes synthesis and mechanisms. For chemistry, pre-professional and other science majors. Includes a noncredit recitation hour. Prerequisite: CHEM 1312-1112 with C grade or higher. Corequisite: CHEM 3113. F

CHEM 3113 Organic Chemistry Lab I (1)

Techniques of separation, purification and synthesis of organic compounds. F

CHEM 3312 Organic Chemistry II (3)

Continuation of CHEM 3311 including an introduction to naturally occurring and biologically important compounds. Includes a noncredit recitation hour. Prerequisite: CHEM 3311 and 3113 with C grade or higher. Corequisite: CHEM 3114. S,

CHEM 3114 Organic Chemistry Lab II (1)

Continuation of CHEM 3113; qualitative analysis, spectral interpretation (IR, NMR, MS), and instrument usage. Prerequisites: CHEM 3311 and 3113 with C grade or higher. Corequisite: CHEM 3312. S,

CHEM 3324 Analytical Chemistry I (3)

Analytical techniques and methods (emphasis on instrumentation) common to all areas of chemistry, medicine and the biological sciences. Prerequisite: CHEM 1312/1112 with C grade or higher. Corequisite: CHEM 3225. F

CHEM 3225 Analytical Chemistry Lab I (2)

Laboratory experience with instruments and methods presented in CHEM 3324. Corequisite: CHEM 3324. F

CHEM 3695 Intro to Research (Available for up to 6 credit hours)

Active participation in a research project conducted under the mentorship of a member of the Chemistry faculty. The choice of faculty member is selected by the student. Prerequisite: consultation with chemistry faculty and permission of research advisor. May be repeated for credit. F, S, Sm

CHEM 4301 Physical Chemistry I (3)

A physical chemistry course designed for all chemistry majors and minors. Topics include thermodynamics, kinetics, and electrochemistry and the subsequent application of these concepts to both chemical and biological systems. Prerequisites: CHEM 3312, one year of physics and Calculus I. Corequisite: CHEM 4103. F

CHEM 4103 Physical Chemistry Lab I (1)

Thermodynamic, kinetic and spectroscopic measurements. High-vacuum techniques and the use of sophisticated equipment in measuring molecular parameters. Corequisite: CHEM 4301. F

CHEM 4302 Physical Chemistry II (3)

Kinetics, quantum mechanics, bonding and molecular spectroscopy. Prerequisite: CHEM 4301, or with the permission of the instructor. S

CHEM 4104 Physical Chemistry Lab II (1)

Continuation of CHEM 4103. Prerequisite: CHEM 4103, or with the permission of the instructor. Corequisite or prerequisite: CHEM 4302. S

CHEM 4321 Biochemistry I (3)

Beyond Organic Chemistry, this course covers the structure and function of proteins and enzymes. Fundamental metabolic pathways of the chemical reactions of carbohydrates and basic thermodynamic principles that drive these chemical reactions of life processes are also covered. Prerequisite: CHEM 3312 and 3114, both with C or higher grade. F

CHEM 4322 Biochemistry II (3)

The second half of this sequence covers photosynthesis and carbon fixation, bases that are incorporated into nucleic acids, the polymers of nucleic acids, lipids and membranes. Prerequisites: CHEM 4321; Co-requisite: CHEM 4223. S

CHEM 4223 Biochemistry Techniques (2)

This course surveys the most common laboratory techniques and applications used to investigate bio-molecules and their structure, isolation, purification and activity. Many experiments have to be done on a timely basis and may take several lab periods. Co-requisite: CHEM 4321. S

CHEM 4330 NMR Spectroscopy (3)

The Nuclear Magnetic Resonance phenomenon is reviewed and basic concepts of modern pulsed multinuclear NMR methods are presented. Focus will be on 1-D and 2-D techniques that are most useful today. 2-D techniques will then be covered as to their most effective use. The latter part of the course uses multiple spectra problem sets to gain proficiency in structure determination by NMR. Prerequisites: CHEM 3312 and 3114. Corequisite 4131. F

CHEM 4131 NMR Spectroscopy Lab (1)

Basic NMR experiments with a modern superconducting magnet - pulsed multinuclear NMR is followed by more advanced 2-D NMR techniques currently used to determine chemical structure. Use of unknowns for most experiments is followed by more advanced special projects at the end of the semester. Prerequisites: CHEM 3312 and 3114. F

CHEM 4340 Medicinal Chemistry (3)

A brief historical development of medicinal chemistry and pharmacognosy is followed by a detailed look at most drug classes. Emphasis will be on relating chemical structure with bioactivity. Commonly used methods of drug design are interspersed. Prerequisite: CHEM 3312. S

CHEM 4374 Inorganic Chemistry (3)

Modern bonding theories at a level appropriate to understanding structure and chemical properties. Periodic relationships applied to families of elements. Prerequisite: CHEM 3324, 3225. S

CHEM 4175 Inorganic Chemistry Lab (1)

Experiments which illustrate the descriptive nature of chemistry as well as techniques in the synthesis and identification of inorganic compounds. Prerequisite: CHEM 3324, 3225. S

CHEM 4389 Selected Topics (3)

These are undergraduate courses which will be offered only once or will be offered infrequently or which are being developed before a regular listing in the catalog and may be acceptable for graduate credit. Topics may include, for example: advanced analytical methods, modern nuclear chemistry, and polymer chemistry. F, S

CHEM 4391 Contract Study (3)

Advanced independent study or research. These courses will not count for graduate credit.

† Course fulfills general education requirements.

DEGREE PLAN: BS IN CHEMISTRY

	Lower Level	Upper Level
<u>GENERAL EDUCATION REQUIREMENTS (30 sch):</u>		
___ English Composition: ENGL 1301 & 1302	6	
___ U.S. History: HIST 1301 & 1302	6	
___ U.S. & State Government: PLSC 2305 & 2306	6	
___ Literature: ENGL 2322, 2323, 2327, or 2328	3	
___ Social Science: PSYC, SOCI 1301, ECON 2301	3	
___ Communication: COMM 1315	3	
___ Fine Arts: ARTS 1301, MUSI 1306, DRAM 2301	3	
<u>COMMON SCIENCE REQUIREMENTS (19 sch):</u>		
___ MATH 2412 & MATH 2413 (pre-Calculus & Calculus I)	8	
___ PHYS 1301/1101, 1302/1102 or 2325/2125 & 2326/2126	8	
___ COSC 1335 (Computer Science)	3	
<u>CHEM CHEMISTRY COURSES (42 sch total, ≥28 sch UL)</u>		
___ CHEM 1311/1111 & 1312/1112, General Chemistry	8	
___ CHEM 3311/3113 & 3312/3114 Organic Chemistry		8
___ CHEM 3324/3225 Analytical Chemistry		5
___ CHEM 4301/4103 Physical Chemistry		4
___ CHEM 3695 Research		2
___ CHEM 4321/4223, Biochemistry (or equiv BIOL)		4
___ CHEM 4374/4175 Advanced Inorganic Chemistry		4
<u>ADVANCED CHEMISTRY ELECTIVES (select ≥7 sch):</u>		
___ CHEM 4340, Medicinal Chemistry		
___ CHEM 4330/4131 NMR Spectroscopy		
___ CHEM 4302/4104 Physical Chemistry II		4
___ CHEM 4389, Modern Nuclear Chemistry		3
MINOR: _____ (20 total, 12 upper level)		
In general, a minor consists of 18-24 sch of which 9-12 sch must be upper level. Please refer to the catalog for specific requirements for each individual minor.		
_____ / _____	8	
_____ / _____		12
_____ / _____		
_____ / _____		
TRANSFER or OTHER SCH Not Listed Above		
Lower level: _____		1
Upper level: _____		8
TOTAL SCH (PLAN: 120 SCH with 48-54 Upper Level)	66	54

DEGREE PLAN: BS IN CHEMISTRY

(Biochemistry Track)

	Lower Level	Upper Level
<u>GENERAL EDUCATION REQUIREMENTS (30 sch):</u>		
___ English Composition: ENGL 1301 & 1302	6	
___ U.S. History: HIST 1301 & 1302	6	
___ U.S. & State Government: PLSC 2305 & 2306	6	
___ Literature: ENGL 2322, 2323, 2327, or 2328	3	
___ Social Science: PSYC, SOCI 1301, ECON 2301	3	
___ Communication: COMM 1315	3	
___ Fine Arts: ARTS 1301, MUSI 1306, DRAM 2301	3	
 <u>COMMON SCIENCE REQUIREMENTS (22 sch):</u>		
___ MATH 2412, 2413 pre-Calculus & Calculus I	8	
___ PHYS 1301/1101, 1302/1102 OR 2325/2125 & 2326/2126	8	
___ COSC 1335 Computer Science	3	
___ PSYC 3301 Statistics		3
 <u>CHEM CHEMISTRY COURSES: (42 sch total, ≥28 sch UL)</u>		
___ CHEM 1311/1111 & 1312/1112, General Chemistry	8	
___ CHEM 3311/3113 & 3312/3114 Organic Chemistry		8
___ CHEM 3324/3225 Analytical Chemistry		5
___ CHEM 4301/4103 Physical Chemistry I		4
___ CHEM 3695 Research		2
___ CHEM 4321/4223, Biochemistry (or equiv BIOL)		4
___ CHEM 4374/4175 Advanced Inorganic Chemistry		4
 <u>ADVANCED CHEMISTRY ELECTIVES (select ≥7 sch):</u>		
___ CHEM 4340, Medicinal Chemistry		3
___ CHEM 4330/4131 NMR Spectroscopy		
___ CHEM 4302/4104 Physical Chemistry II		4
___ CHEM 4389, Modern Nuclear Chemistry		
 <u>Required Biology Courses (22 total sch, ≥14 UL)</u>		
_ BIOL 1306/1106 & 1307/1107, General Biology I&II	8	
_ BIOL 3300/3101 Microbiology _____, _____		4
_ BIOL 4340/4141 Genetics _____, _____		4
_ BIOL (select 2 of 3)		
BIOL 3324 Cell Biology _____, _____		3
BIOL 4303 Nutrition _____, _____		
BIOL 4322 Molecular Biology _____, _____		3
 TRANSFER or OTHER SCH Not Listed Above		
Lower level: _____		1
Upper level: _____		3
 TOTAL SCH (PLAN: 120 SCH with 48-54 Upper Level)	 66	 54

DEGREE PLAN: BS IN CHEMISTRY

(Environmental chemistry Track)

	Lower Level	Upper Level
<u>GENERAL EDUCATION REQUIREMENTS (30 sch):</u>		
___ English Composition: ENGL 1301 & 1302	6	
___ U.S. History: HIST 1301 & 1302	6	
___ U.S. & State Government: PLSC 2305 & 2306	6	
___ Literature: ENGL 2322, 2323, 2327, or 2328	3	
___ Social Science: PSYC, SOCI 1301, ECON 2301	3	
___ Communication: COMM 1315	3	
___ Fine Arts: ARTS 1301, MUSI 1306, DRAM 2301	3	
<u>COMMON SCIENCE REQUIREMENTS (31 sch):</u>		
___ MATH 2412, 2413 pre-Calculus & Calculus I	8	
___ PHYS 1301/1101, 1302/1102 OR 2325/2125 & 2326/2126	8	
___ COSC 1335 Computer Science	3	
___ GEOL 1301/1101, 1302/1102 Phys. & Hist. Geology	8	
___ BIOL 1306/1106 General Biology I	4	
<u>CHEM CHEMISTRY COURSES: (35 sch total, 27 sch UL)</u>		
___ CHEM 1311/1111 & 1312/1112, General Chemistry	8	
___ CHEM 3311/3113 & 3312/3114 Organic Chemistry		8
___ CHEM 3324/3225 Analytical Chemistry		5
___ CHEM 4301/4103 Physical Chemistry I		4
___ CHEM 3695 Research		2
___ CHEM 4374/4175 Advanced Inorganic Chemistry		4
<u>ADVANCED CHEMISTRY ELECTIVES (≥4 sch):</u>		
___ CHEM 4389 Nuclear Chemistry		4
___ CHEM 3695 Research		1
<u>Required Environmental Science Courses (21 total sch, 21 UL)</u>		
___ ENSC 3301, 3302 Environmental Science I&II		8
___ ENSC 3310, 3315 Water & Air Quality		6
___ ENSC 3320 Environmental Law		3
___ ENSC (select 2 of 3)		
ENSC 3324 GIS Applications		3 (example)
ENSC 4303 Adv. Environmental Science		
ENSC 4322 Environmental Research		3 (example)
TRANSFER or OTHER SCH Not Listed Above		
Lower level: _____		3
Upper level: _____		
TOTAL SCH (PLAN: 120 SCH with 48 Upper Level)	72	48

DEGREE PLAN: BS IN CHEMISTRY (PRE-PHARMACY)

First two full years:	Lower Level	Upper Level
<u>GENERAL EDUCATION REQUIREMENTS:</u>		
___ English Composition: ENGL 1301 & 1302	6	
___ U.S. History: HIST 1301 & 1302	6	
___ U.S. & State Government: PLSC 2305 & 2306	6	
___ Literature: ENGL 2322, 2323, 2327, or 2328	3	
___ Social Science: PSYC, SOCI 1301, ECON 2301	3	
___ Communication: COMM 1315	3	
___ Fine Arts: ARTS 1301, MUSI 1306, DRAM 2301	3	
<u>COMMON SCIENCE REQUIREMENTS (15 sch):</u>		
___ MATH 2412, 2413 pre-Calculus & Calculus I	8	
___ PHYS 1301/1101, OR 2325/2125	4	
___ PSYC 3301 Statistics		3
<u>CHEMISTRY COURSES: 42 sch total, ≥28 sch UL</u>		
___ CHEM 1311/1111 & 1312/1112, General Chemistry	8	
___ CHEM 3311/3113 & 3312/3114 Organic Chemistry		8
_ BIOL 1306/1106 & 1307/1107, General Biology I&II	8	
_ BIOL 3300/3101 Microbiology _____, _____		4
<u>Third year:</u>		
___ PHYS 1302/1102, OR 2326/2126	4	
___ COSC 1335 (Computer Science)	3	
___ CHEM 3324/3225 Analytical Chemistry		5
___ CHEM 4340, Medicinal Chemistry		3
___ CHEM 4321/4223, Biochemistry (or equiv BIOL)		4
BIOL 4340/4141 Genetics (or other BIOL below)		4
BIOL 3197 Pre-Professional Seminar		1
<u>Fourth Year:</u>		
___ CHEM 4301/4103 Physical Chemistry I		4
___ CHEM 4374/4175 Advanced Inorganic Chemistry		4
___ CHEM 3695 Research		2
<u>ADVANCED CHEMISTRY ELECTIVES (≥3 sch):</u>		
___ CHEM 4302/4104 Physical Chemistry II		...
___ CHEM 4330/4131 NMR Spectroscopy		...
___ CHEM 4389, Modern Nuclear Chemistry		3
_ BIOL (select 2 of 3)		
BIOL 3324 Cell Biology _____, _____		3
BIOL 4303 Nutrition _____, _____		
BIOL 4322 Molecular Biology _____, _____		3
TRANSFER or OTHER SCH Not Listed Above		
Lower level: _____		1
Upper level: _____		3
TOTAL SCH (PLAN: 120 SCH with 48-54 Upper Level)	66	54

DEGREE PLAN: BS IN CHEMISTRY and Teacher Certification

	Lower Level	Upper Level
<u>GENERAL EDUCATION REQUIREMENTS (30 sch):</u>		
___ English Composition: ENGL 1301 & 1302	6	
___ U.S. History: HIST 1301 & 1302	6	
___ U.S. & State Government: PLSC 2305 & 2306	6	
___ Literature: ENGL 2322, 2323, 2327, or 2328	3	
___ Social Science: PSYC 1301	3	
___ Communication: COMM 1315	3	
___ Fine Arts: ARTS 1301, MUSI 1306, DRAM 2301	3	
<u>COMMON SCIENCE REQUIREMENTS (19 sch):</u>		
___ MATH 2412 & MATH 2413 (pre-Calculus & Calculus I)	8	
___ PHYS 1301/1101, 1302/1102 or 2325/2125 & 2326/2126	8	
___ COSC 1335 (Computer Science)	3	
<u>CHEM CHEMISTRY COURSES (42 sch total, ≥28 sch UL)</u>		
___ CHEM 1311/1111 & 1312/1112, General Chemistry	8	
___ CHEM 3311/3113 & 3312/3114 Organic Chemistry		8
___ CHEM 3324/3225 Analytical Chemistry		5
___ CHEM 4301/4103 Physical Chemistry		4
___ CHEM 3695 Research		2
___ CHEM 4321/4223, Biochemistry (or equiv BIOL)		4
___ CHEM 4374/4175 Advanced Inorganic Chemistry		4
<u>ADVANCED CHEMISTRY ELECTIVES (select ≥7 sch):</u>		
___ CHEM 4340, Medicinal Chemistry		
___ CHEM 4330/4131 NMR Spectroscopy		
___ CHEM 4302/4104 Physical Chemistry II		4
___ CHEM 4389, Modern Nuclear Chemistry		3
<u>CERTIFICATION COURSES: _____ (18 total + 6 student teaching)</u>		
___ *PSYC 3341 Child & Adolescent Psychology (or equiv)		3
___ *EDUC 4352 The Exceptional Child (or equiv)		3
___ EDUC 4362 Foundations of Bilingualism & Multiculturalism		3
___ EDUC 4322 Classroom Instruction & Management		3
___ EDUC 4326 Reading in the Content Areas		3
___ EDUC 4376 Teaching Science in Grades 8-12		3
___ EDUC 4099 Seminar: Student Teaching		
___ EDUC 4685 Student Teaching		6
TRANSFER or OTHER SCH Not Listed Above		
Lower level: _____	5	
Upper level: _____		
TOTAL SCH (PLAN: 120 SCH with >48 Upper Level)	62	58