DEGREE REQUIREMENTS

Bachelor of Science Degree

Biology, Biochemistry, Chemistry, Geology, Mathematics, Physics

Core Curriculum Requirements (42-48 hours)

A. Communication (12-14 hours)

(1) Six hours from: ENG 131, 132, 133H

(2) Six to eight hours from: BCM 247; COM 111, 170; ENG 273; FRE 131, 132; GER 131, 132; GRK 131, 132; ILA 111, 112; LAT 131, 132; SPA 131, 132; SPH 172, 272

B. Mathematics (4 hours)

MTH 233

C. Natural Sciences (6-8 hours) (Lab required)

Six to eight hours from: AST 105; BIO 131, 133, 225, 238; CHE 133, 134; GOL 131, 132; PHY 110, 131, 132, 241, 242

D. Humanities and Visual & Performing Arts (6 hours)

(1) Three hours from: ART 280, 281, 282; DAN 140, 341; MUS 140; MHL 245; THR 161, 370

(2) Three hours from: ENG 200 - 233H, 300; HIS 151, 152; PHI 153, 223

E. Social and Behavioral Sciences (15 hours)

(1) Six hours from: U.S. history (w/Texas option): HIS 133, 134

(2) Six hours from: PSC 141, 142

(3) Three hours from: ANT 231; ECO 231, 232; EPS 380; GEO 131, 230; PSY 133, 153; SOC 137, 139

College Requirements

A. Three or four hours from: MTH 220, 234, depending on requirements of major.

B. Six to eight hours from: BIO 131, 133, 225, 238; *CHE 133, *134; GOL 131, 132; *PHY 110, *131, *132, *241, *242; *AST 105. The natural science courses used to satisfy 1-C above and this requirement must have at least two different sciences represented.

C. Three hours from: CSC 101, 102, 121, 201

**An asterisk before a course number indicates that the appropriate laboratory course must be taken in conjunction with the lecture course.*

Additional Requirements

- Each discipline may restrict course selections from the core in order to satisfy degree requirements in that discipline. These restricted choices will be found in the degree plan for each discipline.
- An academic major in the range of 30 to 45 specified semester hours is required for all departments. At least 12 of the 15 advanced semester hours must be in residence at SFA.
- An academic minor of at least 18 semester hours and not more than 24 semester hours, with at least six hours in advanced SFA work.
- A minimum of 42 semester hours of work in residence at SFA, at least 36 hours of which must be advanced (courses numbered 300-499 inclusive).
- Enough additional hours to make a total of at least 120 semester hours.
- A grade of at least C in each freshman English course; a C average at SFA; and a C average in all specified work completed in the major and minor fields, considered separately, at SFA. These required averages are based on those courses in each category that are included in the student's official degree plan.

DEPARTMENT OF CHEMISTRY OF BIOCHEMISTRY

Comment [maj1]: Please be sure to update other sections of the bulletin where the department's name is displayed; i.e. index, back cover of book, etc.

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AREAS OF STUDY & DEGREES

B.S. Biochemistry
Pre-Professional Programs:
- Dentistry
- Medicine
- Optometry
- Pharmacy
- Veterinary Medicine

B.S. Chemistry
~~Degree~~ Major Tracks:
- ~~Biochemical~~Biochemistry/Pre-medical
- ~~Biotechnology~~
- ~~Computer Science~~
- ~~Environmental Chemistry~~
- ~~Forensic~~
- ~~General Chemist~~
- ~~Mathematics~~
- ~~Physics~~
- Professional Chemist
- Secondary Education
- ~~Statistics~~

Minor:
- Chemistry

FACULTY

Regents Professor
John T. Moore (2008 – 2009)

Professors
Anthony J. Duben, Michele R. Harris, Michael A. Janusa, Richard H. Langley

Associate Professor
Alyx S. Frantzen

Assistant Professors
Russell J. Franks, Darrell R. Fry, Arlen L. Jeffrey, Odutayo O. Odunuga, Kefa K. Onchoke

OBJECTIVES

The objectives of the Department of Chemistry and Biochemistry are:

(1) to prepare students for graduate and/or professional schools (e.g., medical);

(2) to prepare students for positions in industry, government service and teaching;

(3) to allow science students with non-chemistry majors to relate chemistry to their major science; and

(4) to acquaint non-science students with the methods, concepts and achievements of the science of chemistry.

The chemistry curriculum has the full approval of the American Chemical Society for training professional chemists. ~~The chemistry program is designed to be flexible, which allows students to choose electives best suited for their future career goals. Students completing the Bachelor of Science for professional chemists (American Chemical Society certified degree) can pursue opportunities in various industrial labs across the country or can continue their education in graduate school. Students interested in professional schools, chemistry associated industries, secondary education or other options may pursue the Bachelor of Science non-certified degree. This degree is designed to prepare students interested in careers combining the knowledge of chemistry with other areas.~~

- **Biochemistry** – curriculum designed for students interested in Biochemistry related careers or life/health sciences (i.e. medical) which includes pre-medical and other pre-professional students. The Biochemistry option combines the fundamentals of the B.S. degree in Chemistry with the advanced courses in Biochemistry and the life sciences. Biochemistry students are required to minor in Biology (24 hours).
- **Professional Chemist** – curriculum designed for students to pursue opportunities in various industrial labs across the country or continue their education in graduate school.
- **Secondary Education** – curriculum designed for students whose career goals are in the education field. Secondary Education students are required to minor in Secondary Education (24 hours + EPS 380 as the Social/Behavioral Science core elective).

STUDENT ORGANIZATION

Chemistry Club

DEFINITION OF MAJOR AND MINOR

A minimum of **120 semester hours** of course work is required for a B.S. degree ~~in biochemistry or chemistry~~. Of these hours, 35 ~~33~~ core chemistry hours are required including: CHE 133, 134, 231, 275, 331, 332, 337, 443, 452/452L and 470, 475. Each ~~degree~~ major track has additional hours of required courses; these hours are classified as major (15 hrs) or minor (18 hrs) under the **Suggested Curriculum Sequence** section. General education courses, PHY 241 and 242, and mathematics courses through MTH 234 also are required. A maximum of four hours of CHE 475/476 may be counted toward the major.

A minor in chemistry consists of a minimum of 18 hours of chemistry course work. The hours for a minor must include: CHE 133, 134, 231, 331 and two advanced hours in chemistry. A maximum of two semester hours of CHE 475/476 can be counted for a minor.

CHE 111, 112, 125, 302, 320 and 330 cannot be counted as hours of chemistry for a major or minor in chemistry.

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AMERICAN CHEMICAL SOCIETY-CERTIFIED B.S. DEGREE

An **American Chemical Society-certified B.S. degree** in chemistry consists of completing ~~one of the chemistry tracks~~ the professional chemist track and completion of a satisfactory supervised research project (CHE 475 or 476). ~~Biochemistry degree and secondary education track in the chemistry degree require one or two additional courses beyond their curricula for certified degrees~~. To obtain a certified degree, additional courses beyond their curricula are required for the biochemistry and secondary education tracks.

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CERTIFICATION FOR CHEMISTRY OR PHYSICAL SCIENCE TEACHING (Grades 8-12)

Students who wish to qualify for teaching certificates should consult the **Teacher Certification** section of this bulletin.

GRADUATE STUDY IN CHEMISTRY

The Overlap Graduate Degree Program permits qualified undergraduates to pursue a limited amount of graduate study (usually 12 credit hours or less) concurrently with undergraduate study. The Department of Chemistry and Biochemistry offers a thesis and non-thesis Natural Science ~~master's~~ Master's degree (thesis option highly recommended). Thesis master's degree requires a minimum ~~21~~ 24 of the required 30 semester hours in chemistry (including CHE 589 and 590). The non-thesis master's degree requires a minimum ~~27~~ 18 of the required 36 semester hours in chemistry. The department also offers an **Overlap Graduate Degree Program** that permits qualified undergraduates to pursue a limited amount of graduate study (usually 12 credit hours or less) concurrently with their undergraduate study giving a student the opportunity to obtain a BS and MS degree in only 5 years of study. For more information and eligibility requirements, consult the Graduate Bulletin or the **Overlap Program** in the **Academic Programs & Policies** section of this bulletin.

SUGGESTED CURRICULUM SEQUENCE FOR ~~BIOCHEMISTRY/CHEMISTRY MAJORS~~ BACHELOR OF SCIENCE DEGREE

~~**(Suggested Sequence)**~~

The department offers a Bachelor of Science degree ~~in biochemistry or chemistry~~ that requires ~~All~~ all students ~~must~~ to complete a major track and minor (or second major), take the appropriate core curriculum requirements and have the required semester hours for graduation.

~~The biochemistry degree combines the fundamentals of the B.S. degree in chemistry with advanced courses in biochemistry and the life sciences. The biochemistry degree is designed for students interested in biochemistry related careers or life health sciences (e.g., medical). Biochemistry majors are required to minor in biology (24 hours).~~

~~Chemistry majors may design an interdisciplinary educational experience by selecting one of the suggested areas of interest, or they may design their own with the approval of an adviser: biochemistry/pre-medical, biotechnology, computer science, environmental chemistry,~~

forensic, general chemist, mathematics, physics, professional chemist, secondary education, statistics. Note that courses listed in suggested areas are recommended and may be substituted with adviser approval. The chemistry degree is designed to be flexible, allowing you to design a degree program that is appropriate for your career goals. The chemistry degree has 22 hours of electives, which gives you the opportunity to select courses best suited for your career.

Each interdisciplinary experience has minor/electives in any area of interest leading to a minor (or second major), of which 11 hours must be approved advanced hours. (Six advanced hours in minor is required.)

Degree Tracks:

Biochemical/Pre-medical: CHE 453, 454 (six hours) and biology minor required courses (suggested electives: BIO 309, 327, 341, 342, 402, 431)

Biotechnology: CHE 453, 454, Bioinformatics I (Graduate) (select five hours) and biology minor required courses (suggested electives: BIO 309, 341, 402, 410)

Computer Science: CHE 400-level electives (two hours) and computer science minor required courses (21 hours)

Environmental Chemistry: CHE 420 (four hours), CHE 400-level chemistry electives (one hour) and environmental science or geology minor required courses

Forensic: CHE 453, advanced electives (two hours) and criminal justice minor required courses (DNA analysis: recommend BIO 130, 131, 133, 341, 431 and MTH 220)

General Chemist: Advanced electives (five hours) and minor required courses

Mathematics: CHE 400-level electives (two hours) and mathematics minor required courses (21 hours)

Physics: CHE 400-level electives (five hours) and physics minor required courses

Professional Chemist: CHE 400-level electives (five hours) and minor required courses

Secondary Education: Secondary education minor required courses: EPS 380, SED 370, 371, 372, 442 (six hours), 443, 450/450L, 460

Statistics: CHE 400-level electives (five hours) and applied statistics minor required courses

Freshman Year (32 hours)

CHE 133/133L	4	CHE 134/134L	4
CSC 101 or 201	3	Core Elective*	3
ENG 131 or 133	3	ENG 132	3
HIS 133 or 134	3	HIS 133 or 134	3
Minor***	3	Minor***	3
TOTALS	16		16

Sophomore Year (30 hours)

CHE 275	1		
Major***	3	CHE 231	4
CHE 331/331L	4	CHE 332/332L	4
ENG 273	3	Eng. Literature	3
MTH 233**	4	MTH 234	4
TOTALS	15		15

Junior Year (32 hours)

CHE 475	1		
CHE 337/337L	4	Major***	3
CHE 452/452L	4	Core elective*	6
PHY 241/241L	4	PHY 242/242L	4

Minor***	3	Minor***	3
TOTALS	16		16

Senior Year (26 hours)

Advanced Minor***	3	Advanced Minor***	3
PSC 141	3	PSC 142	3
CHE 443/443L	4	CHE 470	1
Major***	3	Major***	6
TOTALS	13		13

***Biochemistry** - Major: BIO electives (6 hours); CHE 453, 454, advanced ~~CHE~~ electives (three hours).

Minor: BIO minor (18 hours). Required biology courses: Bio 130 (3), 131 (4), 133 (4); recommend remaining biology courses from the following: 309 (4), 327 (3), 341 (4), 342 (4), 402 (3), 431 (3).

~~Chemistry~~ **Professional Chemist** - Major: CHE 241, 338, 441/442L, ~~degree track~~ advanced electives (four hours).

Minor: ~~degree track~~ any minor (18 hours). ~~[Note: Chemistry Secondary Education requires CHE 241, 321, 481, required education courses, and EPS 380 as the social/behavioral science core elective.]~~

Secondary Education – Major: SED required courses (6), CHE 241 (3), 321 (3), 481 (3).

Minor: Secondary Education minor (18). Required Secondary Education courses: SED 370 (3), 371 (3), 372 (3), 442 (6), 443 (3), 450 (3), 460 (3) and EPS 380 as the social/behavioral science core elective.

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**MTH 233 is the entry-level course for this major. All prerequisites for MTH 233 must be met.

*Core Requirements

Communication Skills: BCM 247; COM 111, 170; FRE 131, 132; GER 131, 132; ILA 111, 112; SPA 131, 132; SPH 172, 272; LAT 131, 132; GRK 131, 132 (three hours)

Visual and Performing Arts: ART 280, 281, 282; MUS 140; THR 161, 370; DAN 140, 341 (three hours)

Social/Behavioral Science: ANT 231; ECO 231, 232; EPS 380 (Sec Ed majors); GEO 131, 230; PSY 133, 153; SOC 137, 139 (three hours)

CO-REQUISITE COURSES

Courses that are co-requisites must be taken together during the same semester. Separate grades will be awarded for these courses. Withdrawal from one co-requisite course requires the dropping of the other course. A student is not required to repeat a co-requisite course for which the student has received a passing grade of C.

COURSE CREDIT

A minimum grade of C is required in all courses that are prerequisites to a chemistry course. Unless otherwise indicated, courses are three-semester hours credit, three hours lecture per week.

COURSES IN CHEMISTRY (CHE)

100. **Preparation for General Chemistry** - Designed for the students whose marginal background in chemistry would not allow them to succeed in CHE 133. Review of basic math and chemistry principles for students deficient or insecure in these areas. Topics covered will include, but will not be limited to, scientific calculations, atomic structure and the periodic table, gas laws, and reaction stoichiometry. Recommended for all students who wish to enroll in CHE 133, but who do not meet the prerequisites or did not have high school chemistry. Note this course does not meet any requirements for any degree.

111. **Introductory Chemistry I (CHEM 1305)** - Introduction to the principles and concepts of chemical thought. Co-requisite: CHE 111L. Prerequisite: eligibility for MTH 138.

111L. **Introductory Laboratory I (CHEM 1105)** - One semester hour, two hours lab per week. Introductory laboratory experiments. Co-requisite: CHE 111. Lab fee required.

112. **Introductory Chemistry II (CHEM 1307)** - Elementary organic and biochemical systems. Prerequisites: CHE 111 and 111L. Co-requisite: CHE 112L.

112L. **Introductory Laboratory II (CHEM 1107)** - One semester hour, two hours lab per week. Introductory organic laboratory experiments. Prerequisites: CHE 111 and 111L. Co-requisite: CHE 112. Lab fee required.

125. **Introductory Physical Science** - Four semester hours, three hours lecture, two hours lab per week. Presents introductory concepts in physics and chemistry. Seamless combination of content and interactive lectures with hands-on laboratory exercises

to give both conceptual and kinetic understanding of physical science principles. Not open to students who have received credit in PHY 125. This course is designed for education majors only and will not satisfy graduation requirements for any other major. Co-requisite: CHE 125L.

133. **General Chemistry I (CHEM 1311)** - Atomic and molecular structures, stoichiometry, gas laws and thermodynamics. Co-requisite: CHE 133L. Prerequisite: MTH 138 or concurrent enrollment.

133L. **General Laboratory I (CHEM 1111)** - One semester hour, three hours laboratory per week. Spectroscopy, quantitative experiments. Co-requisite: CHE 133. Lab fee required.

134. **General Chemistry II (CHEM 1312)** - Equilibrium, kinetics, redox, descriptive chemistry and radiochemistry. Prerequisites: CHE 133, 133L and MTH 138. Co-requisite: CHE 134L.

134L. **General Laboratory II (CHEM 1112)** - One semester hour, three hours laboratory per week. Kinetics, spectrophotometry, quantitative/qualitative experiments. Prerequisites: CHE 133 and 133L. Co-requisite: CHE 134. Lab fee required.

231. **Quantitative Analysis** - Four semester hours, three hours lecture, three hours lab per week. Analytical applications of solution chemistry. Prerequisites: CHE 134 and 134L. Lab fee required.

241. **Inorganic Chemistry** - Fundamental concepts of the descriptive inorganic chemistry of the elements. Prerequisites: CHE 134 and 134L.

271. **Special Topics in Chemistry** - Special studies in chemistry. May be repeated once on a different topic. Prerequisite: permission of the instructor.

271L. **Special Topics Lab** - One semester hour, three hours laboratory per week. Special studies in chemistry laboratory techniques. May be repeated once on a different topic. Prerequisite: permission of the instructor. Required lab fee.

275. **Supervised Problems** - One to four semester hours. Individual study and/or laboratory research. Prerequisite: permission of instructor. Pass or fail grading.

276. **Supervised Problems** - One to four semester hours. Continuation of CHE 275. Individual study and/or laboratory research. Prerequisite: permission of instructor. Pass or fail grading.

302. **Fundamental Applications of Chemistry** - Four semester hours, three hours lecture, two hours lab per week. Presentation of the applications of chemistry and chemical principles to everyday life with an emphasis on hands-on investigations. May not be used to meet graduation requirements by a student majoring/minoring in the College of Science and Mathematics. ~~Prerequisites: CHE 111, CHE 125 or PHY 125 or consent of instructor.~~ Required lab fee.

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320. **Chemical Concepts** - Review of fundamentals of chemistry as related to teaching. Does not count toward a major or minor in chemistry. Prerequisite: eight hours of chemistry.

321. **Applied Chemical Concepts** - Fundamentals of laboratory safety and stockroom management/design. Prerequisite: CHE 231.

330. **Fundamentals of Organic Chemistry** - Comprehensive one semester course for students requiring only one semester of organic. Prerequisites: CHE 134 and 134L. Co-requisite: CHE 330L.

330L. **Fundamentals of Organic Lab** - One semester hour, three hours of lab per week. Synthesis and characterization of organic compounds. Prerequisites: CHE 134 and 134L. Co-requisite: CHE 330. Required lab fee.

331. **Organic Chemistry I** - Development of organic chemistry for chemistry majors, minors and pre-health professionals. Prerequisites: CHE 134 and 134L. Co-requisite: CHE 331L.

331L. **Organic Laboratory I** - One semester hour, four hours of lab per week. Synthesis and characterization of organic compounds. Prerequisites: CHE 134 and 134L. Co-requisite: CHE 331. Required lab fee.

332. **Organic Chemistry II** - Continuation of CHE 331. Prerequisites: CHE 331 and 331L. Co-requisite: CHE 332L.

332L. **Organic Laboratory II** - One semester hour, four hours lab per week. Continuation of 331L. Prerequisites: CHE 331 and 331L. Co-requisite: CHE 332. Required lab fee.

337. **Physical Chemistry I** - Four semester hours, three hours lecture, three hours lab per week. Laws, principles and theories concerning the structure of matter as related to properties. Prerequisites: CHE 231 and MTH 234. Required lab fee.

338. **Physical Chemistry II** - Four semester hours, three hours lecture, three hours lab per week. Continuation of CHE 337. Prerequisite: CHE 337. Required lab fee.

420. **Environmental Chemistry** - Four semester hours, three hours lecture, three hours lab per week. Chemical processes involved in the environment. Prerequisites: CHE 231 and 330 or 331. Required lab fee.

441. **Advanced Inorganic Chemistry** - Reactions and structures of inorganic molecules and ions are studied. Prerequisite: CHE 337.

442L. **Advanced Inorganic Chemistry Laboratory** - One semester hour, three hours laboratory per week. The preparation and characterization of inorganic compounds. Prerequisite: CHE 441 or concurrent enrollment. Lab fee required.

443. **Instrumental Analysis** - Four semester hours, three hours lecture, three hours lab per week. Spectrochemical and electrochemical methods of analysis. Prerequisites: 231 and 337. Required lab fee.

452. **Comprehensive Biochemistry I** - Structure, function and chemical aspects of proteins, nucleic acids and carbohydrates; enzyme kinetics, mechanism/regulation of enzymes; introduction to metabolism; carbohydrate metabolism. Prerequisites: CHE 330 or 331.

452L. **Comprehensive Biochemistry I Laboratory** - One semester hour, three hours of lab per week. Purification and

characterization of biomolecules. Prerequisites: CHE 330L or 331L and CHE 452 or concurrent enrollment. Required lab fee.

453. **Comprehensive Biochemistry II** - Continuation of Comprehensive Biochemistry I; study of the structure, function, chemistry and metabolism of lipids, proteins and nucleic acids; control of metabolic pathways, interrelationships of metabolic pathways; bioenergetics; current issues relating metabolism to medicine and health. Prerequisite: CHE 452.

454. **Biochemical Techniques** - Three semester hours, one hour lecture, six hours lab per week. A capstone course for the biochemistry major that allows the student to obtain practice in biochemical techniques. Prerequisites: CHE 452L and CHE 453 (or concurrent enrollment). Lab fee required.

455. **Advanced Organic Chemistry** - Continuation of CHE 331-332, emphasizing spectroscopic methods and advanced topics. Prerequisite: CHE 332.

470. **Seminar** - One semester hour. Written and oral reports. Individual instruction. May be repeated for a total of four credit hours. Prerequisite: CHE 337.

471. **Advanced Special Topics** - One to four semester hours. Special studies in chemistry. May be repeated once on a different topic. Prerequisite: permission of the instructor.

471L. **Advanced Special Topics Lab** - One semester hour, three hours laboratory per week. Special studies in chemistry laboratory techniques. May be repeated once on a different topic. Prerequisite: permission of the instructor. Lab fee required.

475. **Advanced Supervised Problems** - One to four semester hours. May be repeated for a total of four hours credit. Undergraduate only. Individual study and/or laboratory research. Prerequisite: consent of the instructor. Pass or fail grading.

476. **Advanced Supervised Problems** - One to four semester hours. May be repeated for a total of four hours credit. Undergraduates only. Individual study and/or laboratory research. Prerequisite: consent of the instructor. Pass or fail grading.

480. **Industrial Internship** - Practical work in an industrial setting for a minimum of eight weeks under the joint guidance of a practicing chemist and SFA faculty member. May be repeated for credit if content differs. Prerequisite: permission of the department chair and instructor. Pass or fail grading.

481. **Laboratory Internship** - Three semester hours, one hour lecture, four hours lab per week. Teaching experience in undergraduate chemistry laboratory, including maintenance, laboratory preparation, grading and assistance of students in laboratory experience under the direct supervision of faculty mentor. May be repeated for credit if content differs. Prerequisite: permission of the department chair and instructor. Pass or fail grading.