

School of Mathematics and Physical Sciences

Contact Information

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The School of Mathematics and Physical Sciences offers graduate programs and supporting coursework across the disciplines of Chemistry, Geosciences, Mathematics, and Physics. Graduate programs include the Master of Science in Chemistry and the Master of Science in Petrophysics. Graduate-level academic certificates and supporting graduate coursework is also available in Geology, Mathematics, Physics, and Statistics.

The Master of science in Chemistry offers two concentrations: the General Chemistry Concentration and the Biochemistry Concentration. The General Chemistry Concentration encompasses all major areas of chemistry, while the Biochemistry Concentration emphasizes biochemistry and related subjects. Within each concentration, students may select from three degree options: thesis, research, or course only.

The Master of Science in Petrophysics is a multidisciplinary program that addresses the physical and chemical properties of reservoirs, including rocks and fluids, with applications to the petroleum exploration and productivity industry. The program integrates coursework and graduate research in Geology, Physics, and Natural Gas Engineering. It is the first program of its kind in North America.

Admission to the M.S. Petrophysics requires a bachelor's degree in Geoscience, Mathematics, Physics, Chemistry, or a related field. Students lacking sufficient background preparation may be required to complete additional undergraduate coursework.

Graduate-level certificates are offered in Nano Materials Science and Engineering, Forensic Science, Clinical Biochemistry, Pharmaceutical Analysis and Quality Control, Data Science for Chemical Applications, and Geographic Information Systems.

In addition to degree and certificate programs, graduate-level courses in Mathematics, Physics, and Geology provide valuable supporting fields for students pursuing advanced study in science, mathematics, engineering, and related disciplines.

Chemistry (CHEM)

CHEM 5300 Chemistry Graduate Practice **0 SCH (0-0)**

The beginning graduate student must complete a one-semester course Chemistry Graduate Practice. The course provides a general orientation and resources for incoming graduate students related to the Chemistry Graduate Program. Students are explained the different degree plan options and concentration areas. The course offers workshops for thesis writing, group discussion, and meetings with the the course instructor for individual guidance.

CHEM 5301 Advanced Chemistry Instruments **3 SCH (2-4)**

Principles and practices in design of instruments for research, analysis and process control. Prerequisite: CHEM 4401.
 Fee: \$5.00

CHEM 5303 Advanced Analytical Chem **3 SCH (3-0)**

An advanced survey of principles of chemical analysis with emphasis on newer developments in the field of analytical chemistry. Prerequisite: CHEM 4401.

CHEM 5305 Project Research **3 SCH (3)**

Designed for students on a project research degree plan. Requires completion of a research project within one semester of research activity. Prerequisite: Departmental approval.

CHEM 5306 Thesis Research **3 SCH (3)**

Designed for students on a thesis research degree plan. Requires completion of a thesis project in two semesters of research activity. May be repeated for a maximum of 6 semester hours. Prerequisite: Departmental approval.

CHEM 5308 Chem/Biochem Analysis **3 SCH (3-0)**

The use of advanced synchronous x-ray, Raman and mass spectrometry for surface-profiling and depth-profiling of chemical and biochemical materials, material-air/solution interface. Prerequisite: CHEM 4401 or equivalent measurement, spectroscopy or analytical course.

CHEM 5311 Advanced Inorganic Chemistry **3 SCH (3-0)**

In depth study of d- and f-block elements, their acid-base properties, standard reduction potentials, periodic trends of properties of the elements and their compounds, ligand field theory, coordination compounds, bonding and structure, optical and magnetic properties, and reaction mechanism of coordination compounds. Recovery of d- and f-block elements and industrial applications as well as metal ions in biomolecules will be discussed. Prerequisite: CHEM 4311.

CHEM 5313 Chemistry and Nanoscience 3 SCH (3-0)

Chemical concepts related to nanoscience. Selected topics include chemical, optical, electronic, and magnetic interactions produced by nanomaterials, the relationship between microstructural scale and its influence on physical mechanism, and appropriate applications such as solar devices, fuel cells or biomedical agents. Prerequisite: Departmental Approval.

CHEM 5323 Advanced Organic Chemistry 3 SCH (3-0)

An advanced treatment of organic chemistry including a study of both cyclic and acyclic compounds. Prerequisites: CHEM 3323/3123 and CHEM 3325/3125.

CHEM 5327 Advanced Organic Synthesis 3 SCH (3-0)

An in-depth survey of modern synthetic reactions in the areas of carbon-carbon single and double bond formations and cycloaddition reactions. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5328 Physical Organic Chemistry 3 SCH (3-0)

A one-semester course that provides an in-depth survey of molecular orbital theory in a thorough and rigorous manner and emphasizes the molecular orbital interpretation of various types of concerted pericyclic reactions. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5329 Asymmetric Synthesis 3 SCH (3)

An in-depth survey of practical methods for the synthesis of enantiomerically pure organic compounds in agrochemical and pharmaceutical industries and in university research laboratories. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5332 Molecular Modeling 3 SCH (3-0)

As an introduction to Quantum Mechanics-Molecular Modeling, this course serves two purposes: (1) Use computational tools to help increase student understanding of material already covered in various chemistry courses (2) Teach students about computational chemistry (molecular modeling) itself, with the goal to enable them to apply these computational tools in research projects. Prerequisite: CHEM 3332 or approval by instructor.

CHEM 5333 Bioinformatics 3 SCH (3-0)

Computational models of biological systems and mechanisms. Models may use tools and web applications to solve diverse problems, such as protein or nucleic acid structure, function, stability, or evolutionary relationship. Prerequisite: CHEM 3181 or equivalent literature or research methods course.

CHEM 5341 Biochem Analysis of Proteins 3 SCH (3-0)

Biochemical study of proteins (methods of protein purification, principles of protein structure and the study of proteins as enzymes). Prerequisite: CHEM 4341.

CHEM 5342 Biochem Analysis of Gene Ex 3 SCH (3-0)

Biochemical study of nucleic acids and the expression of genetic information (nucleic acid structures and manipulation, transcription and translation). Prerequisite: CHEM 4341.

CHEM 5343 Forensic Chemistry 3 SCH (3-0)

Understanding the theory, concepts and application of forensic chemistry to complex problem solving related to crime detection and solving of crime via chemical means, such as use of mass spectrometry, chromatography, and spectroscopy. Prerequisite: CHEM 4401 or equivalent analytical or bioanalytical course.

CHEM 5345 Medical Biochemistry 3 SCH (0-3-0-0-1)

The course examines fundamental aspects of biochemistry critical to understanding the chemical and cellular mechanisms relevant to health and disease including metabolism, enzymology, and genetics. Counts as an elective for the Health Science Post-baccalaureate Certificate

CHEM 5351 Environmental Chemistry 3 SCH (3-0)

The advanced study of chemistry as the basis of the environmental regulations for air pollution, water pollution, solid/hazardous wastes, toxic commercial chemical products and employee safety. Prerequisite: CHEM 1311/CHEM 1111 and CHEM 1312/CHEM 1112 or equivalent.

CHEM 5365 Graduate Research 3 SCH (3-0)

Individual research problems defined and supervised by a Department of Chemistry graduate faculty member with permission of the department chair. Provides experiences in individual design, execution and reporting of small units of research of professional caliber. May be repeated; no more than 6 hours may be counted toward one degree. Prerequisite: Departmental approval and completion of appropriate safety courses, as defined by the research mentor.

CHEM 5412 Special Topics in Chemistry 1-4 SCH (1-4-0)

A detailed study of special areas of chemistry featuring current advances and trends. Course may be repeated for credit when topics are different. A laboratory may or may not be offered.

Fee: \$5.00

Geology (GEOL)

GEOL 5101 Research Problems I 1 SCH (0-1)

Individual problems assigned, defined and supervised by a graduate faculty member in the department. Provides experience in individual project design, execution and reporting of research of professional caliber. The Research Problems I, II, and III courses may be repeated in any combination for a total maximum of 9 semester credit hours applied toward the graduate degree.

GEOL 5201 Research Problems II 2 SCH (0-2)

Individual problems assigned, defined and supervised by a graduate faculty member in the department. Provides experience in individual project design, execution and reporting of research of professional caliber. The Research Problems I, II and III courses may be repeated in any combination for a total maximum of 9 semester credit hours applied towards the graduate degree.

GEOL 5303 Research Problems III 3 SCH (0-3)

Individual problems assigned, defined and supervised by a graduate faculty member in the department. Provides experience in individual project design, execution and reporting of research of professional caliber. The Research Problems I, II and III courses may be repeated in any combination for a total maximum of 9 semester credit hours applied towards the graduate degree

GEOL 5305 Graduate Research Project 3 SCH (0-0-3)

Designed for project option students and requires completion of a research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semesters hours.

GEOL 5306 Thesis 3 SCH (3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

GEOL 5310 Advanced Topics in Geology 1-3 SCH (1-3)

Intensive study at a graduate level of selected advanced topics. May be repeated for credit under different topics.

GEOL 5312 Geographic Info Systems 3 SCH (3-0)

Principles and practice of geographic information systems (GIS) using vector-based GIS as the primary software package. Students will demonstrate the use of GIS through individual class projects oriented toward their area of interest.

GEOL 5313 Advanced GIS 3 SCH (2-3)

Research applications of advanced techniques of Geographic Information Systems. Vector-and raster-based GIS modeling: terrain modeling, hydrological modeling, 3-D modeling: hands-on research topics. GIS programming for problem solving in students research applications. Prerequisite: GEOL 5312 or permission of instructor.

GEOL 5352 Remote Sensing 3 SCH (2-3)

Principles and practice of remote sensing involving analysis and interpretation of aerial photos and digital images. Students will demonstrate the use of remote-sensed through individual class projects oriented toward their area of interest.

Mathematics (MATH)

MATH 5305 Graduate Research Project 3 SCH (3)

A Graduate Research Project must be completed and submitted to the Graduate Office for a grade to be assigned, otherwise IP notations are recorded. This course is specifically designed for Plan II and Plan III students. Prerequisite: departmental approval.

MATH 5306 Thesis 3 SCH (3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

MATH 5321 Real Analysis 3 SCH (3-0)

Lebesgue integration and Lebesgue measure. LP spaces. Differentiability properties of monotone functions.

MATH 5325 Advanced Linear Algebra 3 SCH (3-0)

Vector spaces and linear transformations, orthogonality, eigenvalues, and numerical methods. Prerequisite: consent of the instructor.

MATH 5340 Matrix Methods Linear Models 3 SCH (3-0)

Common matrix methods in statistical applications, including eigenvalues and eigenvectors; the Moore-Penrose inverse; matrix differentiation; the distribution of quadratics forms. Prerequisite: STAT 4303 and MATH 3340 or equivalents.

MATH 5341 Abstract Algebraic Theories 3 SCH (3-0)

Groups and their generalizations. Homomorphism and isomorphism theorem. Direct sums and products. Linear spaces and representations. Field extensions and Galois groups. Prerequisite: MATH 4340 or its equivalent.

MATH 5360 Analytic Decision Theory 3 SCH (3-0)

Introduction to mathematical decision theory and game theoretic analysis. Classification of games, definitions in game theory, sequential-/simultaneous-move games, pure and mixed strategies, equilibrium concepts and matrix games. Prerequisite: MATH 3340 or equivalent.

MATH 5374 Numerical Analysis 3 SCH (3-0)

Underlying principles of numerical analysis. Topics include: finite differences and interpolation, numerical differentiation and integration, solving algebraic and transcendental equations, computations with matrices, the method of least squares, and numerical solutions of differential equations. Attention is given to the solutions of problems using computer. Prerequisite: MATH 4341 or equivalent.

MATH 5390 Advanced Topics in Math 1-3 SCH (1-3)

Different areas of advanced mathematics with emphasis on rigor, critical reasoning and the concept of proof. May be repeated as topic changes.

Physics (PHYS)

PHYS 5382 Exploration Geophysics **3 SCH (3)**

Application of classical physics to the study of the Earth and the solution of problems in Earth sciences, including gravity, magnetic, seismic, heatflow, electrical, electromagnetic, and well log methods, instruments, data acquisition, processing and interpretation. Applications to petroleum exploration. Prerequisites: GEOL 3370 or permission of the instructor.

PHYS 5385 Seismology **3 SCH (3-0)**

Basics of seismology: wave propagation, seismic reflection and refraction. Application of physics in the seismic velocity and anisotropy structure of the Earth. Earthquake generation, post-seismic deformation and creep events, relation to faulting and plate tectonics. Prerequisites: GEOL 3370 or permission of the instructor.

PHYS 5388 Borehole Geophysics **3 SCH (3-0)**

Basic rock properties concepts; evaluating formations from geophysical well logging. Instrumentation, the physics of logging, and well log interpretation. Rock physics tools and well logs for petroleum and geothermal exploration, as well as water prospecting. Prerequisites: GEOL 1303/ GEOL 1103 and PHYS 2325/ PHYS 2125, PHYS 2326/ PHYS 2126.

Statistics (STAT)

STAT 5305 Graduate Research Project **3 SCH (0-3)**

Designed for project option students. A Graduate Research Project must be completed and submitted to the Graduate Office for a grade to be assigned, otherwise S/U (Satisfactory/Unsatisfactory) notations are recorded. Prerequisite: departmental approval.

STAT 5306 Thesis **3 SCH (0-0-3)**

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. Maximum credit applicable towards the degree is 6 semester hours.

STAT 5332 Big Data and Computing **3 SCH (3-0)**

Introduction to use of SAS (and R)/PC statistical software, including data entry, data summaries, descriptive statistics, and interpretation of SAS (and R) output for some standard statistical procedures. Prerequisites: graduate standing and approval of instructor.

STAT 5344 Predictive Analytics **3 SCH (3-0)**

Correlation, simple linear and multiple regression, one and two way ANOVA, various multiple comparison procedures, randomized block designs, applications, use of statistical software. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5346 Design of Experiments **3 SCH (3-0)**

Hypothesis testing, principles of design of an experiment, t-test, completely randomized design, randomized block design, multiple comparison techniques, factorial designs, random effect models, fixed effect models, BIBD, nested designs, analysis of covariance and split plot design. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5350 Probability for Analytics **3 SCH (3-0)**

Mathematical treatment of probability distributions, probability concepts and laws; sample spaces, combinations and permutations, Bayes' theorem, discrete/continuous random variables, expected value, distribution of functions of random variable, two-dimensional variables, central limit theorem; t, F, and chi-square distributions. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5351 Inferential Analytics **3 SCH (3-0)**

Theory of estimation and hypothesis testing, maximum likelihood, method of moments, likelihood ratio tests, consistency, bias, efficiency and sufficiency. Prerequisite: STAT 5350 or equivalent.

STAT 5361 Multivariate Statistics **3 SCH (3-0)**

An applied approach to multivariate data analysis and linear statistical models in research. Prerequisite: MATH 4341 and STAT 5344 or equivalents.

STAT 5370 Survey Sampling Analytics **3 SCH (3-0)**

Survey sampling from initial planning phases through collection and storage of the data; simple random sampling, stratified random sampling, auxiliary information, estimators, chi-square contingency table analysis for two and three way tables, handling of small expected frequencies, matched pairs, measures of association; use of statistical software on big survey data. Prerequisite: STAT 4301 or STAT 4303 or equivalent.

STAT 5374 Survey Models Social Science **3 SCH (3-0)**

Sensitive data and privacy issues in survey sampling. Randomized response models and variations. Estimation of prevalence of two or more sensitive characteristics. Use of Cramer-Rao lower bound of variance. Measures of protection of respondents. Models using complex designs. Prerequisite: PSYC/SOCI 3381.

STAT 5375 Operations Research **3 SCH (3-0)**

Geometric linear programming, the Simplex method, duality theory, sensitivity analysis, project planning and integer programming. Optional topics include, but are not limited to: the transportation problem, the upper bounding technique, the dual Simplex method, parametric linear programming, queuing theory, decision analysis, and simulation. Prerequisite: Any introductory course in linear algebra.

STAT 5390 Advanced Topic in Statistics **3 SCH (3-0)**

Different areas of advanced statistics will be covered at separate offerings of this course. Topics include sampling techniques, multivariate analysis, quality control techniques. May be repeated once. Prerequisite: 6 semester hours of advanced statistics or the equivalent.

Fee: \$15.00

Graduate Programs

- Chemistry - Biochemistry, M.S.
- Chemistry, M.S.
- Petrophysics, M.S.

Graduate Certificates

- Clinical Biochemistry, Academic Certificate
- Data Science for Chemical Applications, Academic Certificate
- Forensic Science, Academic Certificate
- Geographic Information Systems, Academic Certificate
- Nano Materials Science and Engineering, Academic Certificate
- Pharmaceutical Analysis and Quality Control, Academic Certificate

Planned Course Offerings

This section provides a comprehensive list of graduate courses offered by the School of Mathematics and Physical Sciences, along with a two-year schedule indicating when each course is expected to be available. Please note that course offerings and scheduling are subject to change based on faculty availability and student demand. To ensure steady progress toward degree completion, students are strongly encouraged to work closely with their advisor to develop a personalized academic plan.

Chemistry (CHEM)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
CHEM 5300	X		X	
CHEM 5301 ¹				
CHEM 5303 ¹				
CHEM 5305	X	X	X	X
CHEM 5306	X	X	X	X
CHEM 5308	X			
CHEM 5311		X		
CHEM 5313	X			
CHEM 5323		X	X	
CHEM 5327	X			
CHEM 5328		X		X
CHEM 5329				
CHEM 5332 ¹				
CHEM 5333		X		
CHEM 5341	X			
CHEM 5342			X	
CHEM 5343			X	
CHEM 5345		X		X
CHEM 5351		X		
CHEM 5365	X	X	X	X
CHEM 5412	X	X	X	X

¹ This course is available during the summer term only.

Geology (GEOL)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
GEOL 5305		X		X
GEOL 5306	X	X	X	X
GEOL 5310	X			
GEOL 5312	X		X	
GEOL 5313		X		X
GEOL 5352	X		X	

Mathematics (MATH)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
MATH 5305	X	X	X	X
MATH 5306	X	X	X	X
MATH 5321		X		X
MATH 5325	X	X	X	X
MATH 5340	X	X	X	X
MATH 5341		X		X
MATH 5360		X		X
MATH 5374				X
MATH 5390	X	X	X	X

Physics (PHYS)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
PHYS 5382	X		X	
PHYS 5385		X		X
PHYS 5388		X		X

Statistics (STAT)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
STAT 5305	X	X	X	X
STAT 5306	X	X	X	X
STAT 5332	X	X	X	X
STAT 5344		X		X
STAT 5346	X		X	
STAT 5350		X		X
STAT 5351		X		X
STAT 5361		X		X
STAT 5370	X		X	
STAT 5375				X
STAT 5390	X	X	X	X

Marketable Skills

Texas A&M University-Kingsville is dedicated to equipping graduate and doctoral students with the advanced marketable skills necessary for professional and academic excellence beyond the university setting. These skills encompass a range of high-level interpersonal, analytical, and applied competencies that are sought after in today's competitive workforce.

Our graduate programs are structured to cultivate these capabilities through rigorous academic inquiry, experiential learning, faculty-mentored research, professional internships, and opportunities for scholarly and community engagement.

Below are the marketable skills cultivated through the school's graduate academic program.

Chemistry, M.S.

- Effective communication
- Critical thinking
- Empirical and quantitative skills
- Personal and social responsibility
- Teamwork and leadership skills
- Technical skills
- Problem-solving and decision-making skills

Petrophysics, M.S.

- Effective communication
- Critical thinking
- Empirical and quantitative skills
- Teamwork