MASTER OF SCIENCE (M.S.), MAJOR IN BIOCHEMISTRY

Major Program
This program is designed for students who have undergraduate degrees in biology, biochemistry, or chemistry and wish to pursue advanced studies in biochemistry.

Admission Policy
For information regarding admission application requirements and deadlines, please visit The Graduate College website at http://www.gradcollege.txstate.edu/bioch.html.

Degree Requirements
The master of science (M.S.) degree with a major in biochemistry requires 30 semester hours of course work, the completion of a graduate research thesis, and the successful completion of a comprehensive exam.

Course Work Requirements

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Total Hours: 30

If a student elects to follow the thesis option for the degree, a committee to direct the written thesis will be established. The thesis must demonstrate the student’s capability for research and independent thought. Preparation of the thesis must be in conformity with the Graduate College Guide to Preparing and Submitting a Thesis or Dissertation. The thesis handbook may be accessed at http://www.gradcollege.txstate.edu/docs/Thesis_Diss_Guide.pdf.

Thesis Proposal
The student must submit an official Master’s Thesis Proposal form to their thesis committee. The required thesis proposal form may be obtained from The Graduate College at http://www.gradcollege.txstate.edu/gcforms.html. After signing the form and obtaining committee members’ signatures, graduate advisor’s signature (if required by the program), and the department chair’s signature, the student must submit the thesis proposal form with one copy of the proposal attached to the dean of The Graduate College for approval before proceeding with research on the thesis. If the thesis research involves human subjects, the student must obtain exemption or approval from the Texas State Institutional Review Board prior to submitting the proposal for the thesis research to The Graduate College. If the thesis research involves vertebrate animals, the proposal form must include the Texas State IACUC approval code. It is recommended the thesis proposal form be submitted to the dean of The Graduate College by the end of the student’s enrollment in 5399A.

Thesis Committee
The thesis committee must be composed of a minimum of three approved graduate faculty members.

Thesis Enrollment and Credit
The completion of a minimum of six hours of thesis enrollment is required. Enrollment for the thesis will be in course number 5399A for a student’s initial thesis enrollment and a thesis B course for each subsequent thesis enrollment in the field in which the subject matter of the thesis falls, e.g., ENG 5399A, ENG 5199B, ENG 5299B, ENG 5399B, ENG 5599B, and ENG 5999B. Preliminary discussions regarding the selection of a topic and assignment to a research supervisor will not require enrollment for the thesis course.

A student will be required to enroll in and pay the fee for at least one hour of the thesis course during any term in which the student will receive thesis supervision or guidance and/or in which the student is using university resources. Failure to register for the thesis course during a term in which supervision is received may result in postponement of graduation. After initial enrollment in 5399A, the student will continue to enroll in a thesis B course as long as it takes to complete the thesis. In the rare case when a student has not previously enrolled in thesis and plans to work on and complete the thesis in one term, the student will enroll in both 5399A and 5399B. The only grades assigned for thesis courses are PR (progress), CR (credit), W (withdraw), and F (failing). If acceptable progress is not being made in a thesis course, the instructor may issue a grade of F. If the student is making acceptable progress, a grade of PR is assigned until the thesis is completed. The minimum number of hours of thesis credit (“CR”) will be awarded only after the thesis is filed in the Alkek Library and the librarian has electronically returned the thesis card to the office of The Graduate College.

A student who has selected the thesis option must be registered for the thesis course during the term or Summer I (during summer the thesis course runs ten weeks for both sessions) in which the degree will be conferred.

Fee Reduction
A master’s degree candidate for graduation may be eligible for a one-time fee reduction under V.T.C.A. Education Code, Section 54.054. Please refer
to the section titled Fee Reduction in the Additional Fees and Expenses chapter of this catalog for more information.

**Thesis Deadlines and Approval Process**

Thesis deadlines are posted at the following web page: http://www.gradcollege.txstate.edu/Thes-Diss_Info/T_D_Deadlines.html. The completed thesis must be submitted to the chair of the thesis committee no later than 41 days before the date of the commencement at which the degree is to be conferred.

The following must be submitted to the office of The Graduate College no later than 24 days, not counting weekends or holidays, before the date of commencement at which the degree is to be conferred (see The Graduate College webpage for specific deadlines):

1. The Thesis/Dissertation Committee Approval form bearing original signatures of the student and all committee members.
2. One (1) copy of the thesis in final form, approved by all committee members, on standard paper (Hard-copy Submission Option) or PDF of the thesis in final form, approved by all committee members, uploaded in the on-line Vireo submission system (Vireo On-line Submission Option).

After the dean of The Graduate College approves the thesis, the process is as follows:

1. For the Vireo On-line Submission Option:
   a. No copies are required to be submitted to the Alkek Library. However, Alkek will bind copies submitted that the student wants bound for personal use. Personal copies are not required to be printed on archival quality paper. The student will take the personal copies to the Alkek Library and pay the binding fee for personal copies.

Master's level courses in Chemistry and Biochemistry: CHEM

**Courses Offered**

**Chemistry (CHEM)**

**CHEM 5110. Seminar in Chemistry.**
A course designed to acquaint the graduate student with current research areas in chemistry. May be repeated twice for total of 3 semester hour credit.
about Seminar in Chemistry
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Seminar in Chemistry

**CHEM 5195. Professional Development of Graduate Assistants.**
This course is designed to develop and enhance graduate assistants' laboratory instruction abilities. Topics covered in the course include effective lecture techniques, laboratory safety, theory and practical knowledge on laboratory experiments and laboratory section management. This course does not earn graduate credit. Graded on a credit (CR), no-credit (F) basis.
about Professional Development of Graduate Assistants
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships
about Professional Development of Graduate Assistants

**CHEM 5285. Laboratory Development Practice.**
This course develops the laboratory instructional abilities of post-baccalaureate students seeking either 8-12 Chemistry or 8-12 Physical Science Teaching Certification. Topics include both traditional laboratory techniques and guided inquiry techniques, safety, laboratory management, pedagogical theory and practical knowledge of laboratory experiments.
about Laboratory Development Practice
2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Laboratory Development Practice

**CHEM 5295. Professional Development of Graduate Assistants.**
This course is designed to develop and enhance graduate assistants’ laboratory instruction abilities. Topics covered in the course include effective lecture techniques, laboratory safety, theory and practical knowledge on laboratory experiments and laboratory section management. This course does not earn graduate credit. Graded on a credit (CR), no-credit (F) basis.
about Professional Development of Graduate Assistants
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships
about Professional Development of Graduate Assistants

**CHEM 5299B. Thesis.**
This course represents a student’s continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.
about Thesis
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

**CHEM 5312. Organometallic Chemistry.**
This course will survey the structure, bonding, and reactivity of organometallic complexes. Homogeneous catalysis of the transition metals as well as the main group elements along with specialized “seminal research papers” in the field of organometallic chemistry will also be presented. Prerequisites: CHEM 2342 and CHEM 3341 with a grade of “C” or higher.
about Organometallic Chemistry
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Organometallic Chemistry
CHEM 5320. Modern Molecular Modeling.
The application of computational techniques to molecular modeling.
Topics covered include quantum mechanical modeling, force field based molecular modeling, energy minimization, molecular dynamics, vibrational spectra, solution of crystalline structures, diffraction patterns, molecular blends, phase equilibria, crystal morphology, physical property prediction, and mesoscale modeling. Prerequisites: CHEM 3340 or consent of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

Study of the relation of the following topics to structure and reactions of organic compounds: bonding, stereochemistry, acid-base concepts, physical organic chemistry, reactive species, and mechanisms. Prerequisites: Advanced Organic Chemistry

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5330. Physical Chemistry.
Fundamentals of physical chemistry are surveyed, emphasizing application in the other chemical sub-disciplines. Topics include classical thermodynamics, kinetics, atomic structure, and molecular spectroscopy. Prerequisites: CHEM 2342 and CHEM 2142. Students who have completed CHEM 4333 or its equivalent may not take this course for master's credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5333. Spectroscopy.
Study of various spectrometric techniques in qualitative and structural analysis of chemical substances. Prerequisites: CHEM 2342 and CHEM 2142. Students who have completed CHEM 4333 or its equivalent may not take this course for master's credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5341. Advanced Inorganic Chemistry.
Chemical bonding, symmetry, and group theory, coordination chemistry, spectroscopy, magnetism, and organometallic compounds along with some descriptive chemistry. This course does not earn graduate degree credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships

CHEM 5351. Introduction to Polymers and Polymer Synthesis.
This course is designed to develop the student's general understanding of polymer history and importance as well as terminology, structure, and synthesis. The overall scope of the course will be to develop the student's general knowledge of polymer synthesis and structure. Students who have completed CHEM 4351 or its equivalent may not take this course for master's credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5353. Polymer Processing and Characterization.
This course is designed to explore the areas of polymer processing and characterization. Students will be introduced to extrusion, injection molding, film formation, thermoforming, thermal-mechanical measurements, classical mechanical testing, thermal-optical measurements, and methods for determination of polymer molecular weight. Prerequisites: CHEM 2342 and CHEM 5351.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5355. Physical Chemistry of Polymers.
A study of the physical chemistry of polymers. Subjects covered include thermodynamics, kinetic polymerization, phase relationships, molecular geometry, spectroscopy of polymers, polymer physics and mechanical behavior, polymer blends, rheology, and polymer composites.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5356. Separation Methods in Chemical Analysis.
The principles of gas chromatography, capillary electrophoresis, and mass spectrometry are discussed with a balance among theory, practice, and application.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5370. Problems in Chemistry.
Open to graduate students on an individual basis by arrangement with the faculty member concerned. May be repeated once with different emphasis for additional credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CHEM 5375. Biochemistry.
A course devoted to a study of the chemistry of carbohydrates, lipids, proteins, enzymes, and nucleic acids. A study of enzyme kinetics and thermodynamics of coupled reactions is included.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
**CHEM 5381. Physical Biochemistry.**
An introduction to the physical techniques of biochemistry with emphasis on the interpretation of experimental data obtained from electrophoresis, chromatography, immunological methods, ultracentrifugation, spectroscopy and emerging techniques.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5382. Enzymology.**
A study of the chemical and physical properties of enzymes. Topics will include structure-function relationships, elucidation of chemical and kinetic mechanisms, and the role of enzymes in metabolism.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5383. Molecular Biology & Molecular Genetics.**
This course addresses the basic genetic mechanisms of bacteria and eukaryotes and introduces some examples of the biochemical and genetic techniques employed to study cells, tissues, and organisms.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5384. Current Topics in Biochemistry and Molecular Biology.**
Course provides students with advanced knowledge in the areas of biochemistry and molecular biology. Topics include signal transduction and the molecular biology of cancer, as well as emerging topics in Genomics, Proteomics, and other new developments in biochemistry. May be repeated once for credit. Prerequisites CHEM 4360 or CHEM 5383.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5385. MPMetabolism.**
A study of biodegradation and biosynthesis of carbohydrates, lipids, amino acids, proteins, and nucleic acids. Students who have completed CHEM 4385 or its equivalent may not take this course for master’s credit.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5386. Proteins.**
This course will cover advanced biochemistry topics related to proteins. Topics will include protein structure, structure-function relationships, and current methodologies for examining proteins in addition to current findings in primary literature. Prerequisite: CHEM 5375.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5387. Nucleic Acids Chemistry.**
This course will cover advanced biochemistry topics related to nucleic acids. Topics will include nucleic acid structures and properties, catalytic nucleic acids, protein-nucleic acid interactions, higher order complexes of protein-nucleic acids, and current methodologies for examining nucleic acids in addition to current findings in primary literature. Prerequisite: CHEM 5383 or equivalent.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5389. Supramolecular Chemistry.**
This course is designed to be a survey of the nature of non-covalent interactions between host and guest species. Emphasis will be focused on the rational design of hosts, thermodynamic and kinetic parameters involved in binding and the applications of various binding/recognition phenomena.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5395. Fundamentals of Research.**
Course is designed to acquaint the beginning graduate student with materials and methods of chemical research.

*Grade Mode:* Standard Letter
*Credit Hours:* 3
*Lecture Contact Hours:* 2
*Lab Contact Hours:* 3

**CHEM 5399A. Thesis.**
This course represents a student’s initial thesis enrollment. No thesis credit is awarded until student has completed the thesis in CHEM 5399B. Graded on a credit (CR), progress (PR), no-credit (F) basis.

*Grade Mode:* Credit/No Credit
*Credit Hours:* 3
*Lecture Contact Hours:* 3
*Lab Contact Hours:* 0

**CHEM 5399B. Thesis.**
This course represents a student’s continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

*Grade Mode:* Credit/No Credit
*Credit Hours:* 5
*Lecture Contact Hours:* 5
*Lab Contact Hours:* 0
CHEM 5999B. Thesis.
This course represents a student’s continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit