

College of Agriculture, Science and Engineering

Dr. James R. Clark, dean

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Graduate programs within the disciplines of agriculture, biology, chemistry, engineering technology, environmental science and mathematics offer students an opportunity to develop in-depth

knowledge of a particular academic area, each of which emphasizes obtainment of research skills appropriate to the discipline. The graduate faculty are actively involved in research and publication, thus, ample opportunities are available for graduate students to pursue the research necessary for writing a thesis or dissertation. Most of the graduate programs can be structured to meet individual needs within broad degree requirements. Library holdings and facilities, when coupled with the capacity for rapid interchange of materials from other area libraries, provide excellent support of student and faculty research programs.

Department of Agricultural Sciences

Dr. Dean Hawkins, department head

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Full Graduate Faculty: Almas, Baker, Brown, Clark, DeOtte, Hawkins, Kieth, Lawrence, Loneragan, Parker, Pendleton, Pipkin, Robinson, Stewart, Topliff.

Associate Graduate Faculty: Blaser, Lust.

The Department of Agricultural Sciences provides students the opportunity for personal development and preparation for careers in agriculture, academia and related industries. One out of five jobs in the United States is in the agricultural sector and involves the production, processing, distribution, or consumption of feed grains, food and fiber. Both master of science (M.S.) and doctor of philosophy (Ph.D.) degrees are offered. Students seeking a master's degree may choose from either a thesis or non-thesis option with a major in agriculture, agricultural business and economics, animal science, or plant, soil and environmental science. Students wishing to pursue the Ph.D. degree will undergo a rigorous course of multi-disciplinary study, research and leadership training with an emphasis on systems agriculture.

In addition to classrooms and laboratories, the Department of Agricultural Sciences utilizes the 2,500-acre Nance Ranch, Research Feedyard, Feedmill, Horse Center, Federally Inspected Meat Science Laboratory and Greenhouse Complex to provide research opportunities and "hands on" experience for students. Further, the relationship with other agricultural research entities in the area provides collaborative opportunities to be involved in cutting-edge research on the challenges and opportunities facing the dynamic agricultural industry.

Discipline	Course Prefix
Agriculture Business and Economics	AGBE
Agriculture	AGRI
Animal Science	ANSC
Plant, Soil and Environmental Science	PSES

NOTE: See the "Academic Courses and Abbreviations" and "Course Descriptions" sections of this catalog for a complete list of courses offered by the University.

Doctor of Philosophy (Ph.D.) Degree

Major in Agriculture (Major Code: 7500)

All students must be formally admitted to the program. Admission to the program is highly selective on a competitive basis and includes an application packet and personal interview (see graduate school admission policies for details). The Ph.D. program requires a minimum of a bachelor's degree plus a master of science degree (thesis preferred) with at least one degree in an agriculture discipline prior to admission to the Ph.D. program. The degree will require a minimum of 90 semester credit hours (sch) beyond the baccalaureate degree with the following requirements. (Students with a D.V.M. or other agriculture-related professional degree may be admitted and will be considered on a case-by-case basis with consideration by the potential adviser, program director, department head, and deans of the college and graduate school. Students with other backgrounds also may be considered but may be expected to develop expertise in agriculture either before or after admission to the program.)

A core of 24 semester credit hours, including 12 semester credit hours of formal core courses:

- AGRI 7375—Systems Agriculture I.
- AGRI 7381—Systems Methods.
- AGRI 8303—Systems Agriculture II.
- AGRI 8000—12 semester credit hours of dissertation
- AGRI 7101—One semester credit hour of graduate seminar in leadership—offered once per year and repeated three times for a total of three semester credit hours.

Department of Agricultural Sciences

Students entering the doctoral program will undergo assessment by their major adviser and graduate advisory committee to identify the student's strengths and weaknesses and to develop a plan of study most suited to reaching the educational objectives of the program.

The student's advisory committee will administer a qualifying examination for advancement to candidacy after completion of at least 34 semester credit hours of course work listed on the degree plan exclusive of all leveling courses, research and dissertation, and at least four months prior to the student's graduation. The examination will consist of a set of common written questions over the core courses, developed by faculty from each of the three discipline areas and questions developed by the student's committee. The committee will also administer an oral examination after completion of the written portion of the examination. A majority vote of the members of the student's advisory committee is required for advancement of the student to candidacy. Should a student fail the qualifying examination, a period of at least four months must elapse before the exam is administered a second time. Should the student fail to pass the examination the second time, the student will be automatically dismissed from the program.

Upon admission to the doctoral program, students must be continuously enrolled taking a minimum of three semester credit hours during each fall and spring semester. Full-time students must take a minimum of nine semester credit hours during the fall and spring semesters and six semester credit hours during the summer session(s). After advancement to candidacy, students in residence must continuously enroll in dissertation hours adequate to maintain full-time student status, complete a substantial multi-disciplinary research project and write a dissertation of appropriate length and rigor. Students not in residence must make appropriate arrangements with their advisers, which recognizes adequately the investment of resources and time made by the University and the faculty and subject to full administrative approval through the director the program, department head, dean of the college and dean of the Graduate School. A final defense of the dissertation and final examination of the candidate will be conducted by the student's advisory committee. Should the student fail the final examination, the advisory committee shall outline the deficiencies to be corrected for the student to re-defend the dissertation. A minimum of four months must elapse before a second defense may be attempted. Should the student fail to pass the second time, the student will be automatically dismissed from the program.

Work completed in the doctoral program of another recognized graduate school will be considered on the recommendation of the departments concerned, but no assurance can be given that such work will reduce the course or residence requirements at West Texas A&M University. In no case can transferred credit reduce the minimum residence requirement of 45 semester credit hours.

Multi-Disciplinary Breadth

A minimum of nine additional semester credit hours with a minimum of three hours each in at least two of three departmental disciplines (AGBE, ANSC, PSES) to insure multidisciplinary breadth. Courses are to be chosen from:

- AGRI 8070—Graduate Experiences in Systems Agriculture (1–3 sch for a total of 3 sch)—summers only with faculty outside focus area.
- AGRI 7302—Agricultural Perspectives on Environmental Risk.

- AGRI 7376—Biotechnology in Agriculture.
- AGBE 7301—Organization, Operation and Management of Agribusiness (previously 8301).
- AGBE 7302—Policy, Trade and the Agribusiness Firm (previously 8302).
- ANSC 7301—Integrated Animal and Resource Management (previously 8301).
- ANSC 7302—Case Studies in Integrated Animal Management (previously 8302).
- ANSC 7325—Forage Resource Utilization by Grazing Animals.
- PSES 7301—Advanced Plant and Soil Management (previously 8301).
- PSES 7302—Plant, Soil and Environmental Resource Management Perspectives (previously 8302).
- PSES 7325—Soil-Plant-Water Relationships.
- PSES 7344—Agricultural Waste Management.

Graduate Statistics

A minimum of six semester credit hours of graduate-level statistics equivalent to AGRI 7318 and 7301 (formerly 8301) or above must be completed in residence for the Ph.D. degree. If this requirement is satisfied during the M.S. degree, six semester credit hours of electives, including research, may be substituted at the discretion of the student's advisory committee and approval of the director of the Doctoral Program with concurrence of the department head, dean of the college and dean of the Graduate School.

Discipline Depth

A minimum of six semester credit hours of Ph.D.-level courses to be chosen from:

- AGBE 7301 or 7302, whichever was not taken to satisfy requirements for multi-disciplinary breadth, or other AGBE 7000-level or above course.
- AGRI 7302 (formerly 8302) or other AGRI 7000-level or above course.
- ANSC 7302 (formerly 8302) or other ANSC 7000-level or above course exclusive of ANSC 7301.
- PSES 7302 (formerly 8302) or other PSES 7000-level or above course exclusive of PSES 7301.

At the discretion of the committee, the six semester credit hours may be in a single discipline.

Additional Credit Hour Requirements

Forty-five semester credit hours of electives from 6000-level or above courses, including research credits. No more than nine semester credit hours may accrue from AGRI 8095, AGBE 8095, ANSC 8095, PSES 8095 or other independent or directed studies, and no more than six semester credit hours may accrue from directed studies in a single discipline.

Credit for Master of Science Degree

Up to six semester credit hours thesis, plus up to two semester credit hours seminar, plus up to 32 semester credit hours from lecture, laboratory or independent study courses may be applied to the 90 required semester credit hours beyond the baccalaureate degree upon request of the student's graduate advisory committee and approval of the program director, department head, dean of the college and dean of the Graduate School.

Department of Agricultural Sciences

Master of Science (M.S.) Degree

Majors in Agriculture

Students seeking the M.S. degree in agriculture will select one of the following areas of concentration:

- Agricultural Business and Economics (Major Code: 5522)
- Agriculture (Major Code: 5513)
- Animal Science (Major Code: 5523)
- Plant, Soil and Environmental Science (Major Code: 5524)

Thesis Option (30 credit hours)

- At least 18 hours credit from 6000-level and above courses.
- At least 18 hours credit in courses offered in the Department of Agricultural Sciences.
- At least one hour credit in graduate seminar (up to three hours credit can be used toward degree requirements).

- AGRI 6316 and 7318 or other courses with approval.
- Six hours credit of thesis (AGRI 6301 and 6302).
- No more than four hours credit from individual study courses.
- Successful completion of thesis and comprehensive exam.

Non-Thesis Option (36 credit hours)

- At least 18 hours credit from 6000-level and above courses.
- At least 18 hours credit in courses offered in the Department of Agricultural Sciences.
- One hour credit in graduate seminar.
- AGRI 6316 or other courses with approval.
- Six hours credit in a supplementary area (not from courses in agricultural business and economics, animal science, or plant, soil and environmental science).
- No more than six hours credit from individual study courses.
- Successful completion of comprehensive exam.

Department of Engineering and Computer Science

Dr. Freddie J. Davis, department head
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Full Graduate Faculty: Chen, Davis.

Associate Graduate Faculty: Alex, Chang, Issa, Murty.

The Department of Engineering and Computer Science combines the areas of engineering, engineering technology and computer science. At the graduate level, the department offers a master's degree in engineering technology. The program prepares students for a wide range of career opportunities from production, quality assurance, industrial safety, research and development to supervisory and managerial positions in industry.

Discipline	Course Prefix
Engineering Technology	ET

NOTE: See the "Academic Courses and Abbreviations" and "Course Descriptions" sections of this catalog for a complete list of courses offered by the University.

Master of Science (M.S.) Degree

Major in Engineering Technology

(Major Code: 5112)

Options

- Plan I (Thesis)
- Plan II (Non-Thesis)

General Requirements

Students with undergraduate degrees in a field other than engineering technology or related fields may be required to complete leveling courses chosen and approved by the adviser and the department head.

Requirements

Plan I (Thesis)

Thirty (30) semester hours of approved courses which must include six semester hours in ET 6301, 6302 (Thesis) and 24 hours in 6000-level courses in engineering technology, of which 21 hours must be in organized classes.

Plan II (Non-Thesis)

Thirty-six (36) semester hours of approved courses which must include at least 24 semester hours in organized 6000-level courses in engineering technology. Students with undergraduate degrees in engineering technology may take up to 12 semester hours of graduate work outside engineering technology upon approval of the adviser and the department head. Students with undergraduate degrees in non-technical fields will be required to complete all 36 semester hours in 6000-level courses in engineering technology in addition to leveling work.

Department of Life, Earth and Environmental Sciences

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Full Graduate Faculty: Bingham, Bouma, Cepeda, Ghosh, Kazmaier, Latman, Matlack, Rogers, Schultz, Sissom, Wright.

Associate Graduate Faculty: Gaasch, Lee, Ward.

Discipline	Course Prefix
Biology	BIOL
Environmental Science	ENVR

NOTE: See the "Academic Courses and Abbreviations" and "Course Descriptions" sections of this catalog for a complete list of courses offered by the University.

Master of Science (M.S.) Degree

Admission Requirements

In addition to University requirements for admission, the applicant must:

- Have a bachelor's degree in biology, in environmental science or in a related field from an accredited institution.
- Submit a satisfactory score from the Graduate Record Exam (GRE). (See the "Graduate School" section of this catalog.)
- Complete all requirements for admissions to the Graduate School before the end of the first semester of graduate course work. (See the "Graduate School" section of this catalog.)
- Have an overall grade point average of a minimum of 2.6 or a minimum 2.85 in the last 60 hours of undergraduate work.

Admission may be granted for students with less than the minimum grade point average or test scores following a conditional period of 12–15 hours of enrollment in graduate work with no grade below a "B." Students with undergraduate degrees in fields other than biology or environmental science may be required to complete specific leveling courses.

International students desiring to pursue the master of science degree in biology or environmental science must score a minimum of 575 on the Test of English as a Foreign Language (TOEFL) exam as well as meet above-mentioned admission requirements.

Major in Biology (Major Code: 5102)

The Department of Life, Earth and Environmental Sciences offers students a master of science degree in biology. Department faculty provide opportunities for research (see below) which lead to a degree with thesis. A research-thesis program is recommended for those students planning to continue their education to the doctorate level or for students seeking a career that requires research training in biology. A non-thesis degree program is also available.

Research Concentration Areas

- Anatomy
- Aquatic Biology
- Entomology
- Genetics
- Herpetology
- Arthropod Systematics and Ecology
- Mammalogy
- Microbial Genetics
- Microbiology
- Molecular Cytogenetics
- Ornithology
- Physiology
- Plant Ecology
- Reptilian Evolution
- Wildlife Biology

General Requirements

Thesis Program

Thirty hours of graduate credit with the following restrictions:

- Not less than 15 hours credit from 6000-level and above courses to include BIOL 6301 and 6302 (Thesis).
- Not less than 18 hours credit from formal biology courses of which nine must be 6000 level (excluding BIOL 6301 and 6302).
- Not more than 12 hours credit by transfer.

Non-Thesis Program

Thirty-six hours of graduate credit with the following restrictions:

- Not less than 18 hours credit from formal biology courses of which 15 must be 6000 level (excluding BIOL 6395 and 6397).
- Not more than 15 hours of credit by transfer.
- Not more than six hours credit from BIOL 6395 and 6397.

Financial Assistance

Graduate assistantships and selected scholarships are available for graduate students.

Department of Life, Earth and Environmental Sciences

Major in Environmental Sciences

(Major Code: 5105)

Study Area Options

Areas of Specialization: agriculture, biology, chemistry, geology and engineering technology.

Requirements

Student must complete 36 credit hours of required and elective specialization courses.

Master of Science Degree Core Requirements

(21 hours)

- ENVR 6303, 6305, 6509, 6111, 6320, 6350, POSC 6352 or ECON 6352.

Additional Requirements for Thesis (6 hours)

- ENVR 6301 and 6302.

Additional Requirements for Non-Thesis (6 hours)

- ENVR 6395 and 6098.

Elective Courses in Specialization Area (9 hours)

Agriculture, biology, chemistry, geology and engineering technology.

Department of Mathematics, Chemistry and Physics

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Full Graduate Faculty: Carlisle, Combs, Lockwood-Cooke, Seth, Woodyard.

Associate Graduate Faculty: Fisher, Tao.

The Department of Mathematics, Chemistry and Physics combines the areas of mathematics, chemistry and physics. At the graduate level, the department offers master's degrees in mathematics, mathematics education and chemistry.

Chemistry and physics faculty are very active in research which includes graduate and undergraduate participation. Equipment includes spectrometers, access to the main-frame computer, personal computers, data-acquisition systems and wind turbines. The chemistry staff regularly receives research grants from such agencies as The Welch Foundation and University Research Enhancement Funds. The Alternative Energy Institute is known internationally for its research in wind energy and wind turbines. These research grants allow faculty to involve students in a very productive research environment.

Primary teaching and research interests of the mathematics faculty are pure and applied mathematics, including algebra, analysis, differential equations and statistics. Accordingly, the master's degree in mathematics is uniquely broad based and strongly oriented toward applications. The master of science degree in mathematics or chemistry is designed to ensure basic knowledge and the capacity for sustained scholarly study. Both a 30-hour thesis option and a 36-hour non-thesis option are available. Six semester hours of real analysis or algebraic systems is required for the mathematics degree. The remainder of course work is selected from differential equations, complex analysis, mathematical statistics, numerical analysis and algebraic systems. The chemistry degree offers inorganic, organic, physical chemistry and biochemistry, as areas of specialization. Graduate students in chemistry are encouraged to become active research participants with the faculty.

Students are also involved in a variety of departmental activities, including seminars and colloquia. The small size of the program contributes to an atmosphere of informality and accessibility.

Each year, the department has a number of openings for teaching and research assistants.

Discipline	Course Prefix
Chemistry	CHEM
Mathematics and Physical Science	MPS
Mathematics	MATH
Physics	PHYS

NOTE: See the "Academic Courses and Abbreviations" and "Course Descriptions" sections of this catalog for a complete list of courses offered by the University.

Master of Science (M.S.) Degree

Major in Chemistry (Major Code: 5104)

Study Area Options

Areas of specialization include inorganic, organic, physical chemistry and biochemistry.

General Requirements

Non-Thesis Option

CHEM 6110 and at least four courses from CHEM 6094, 6312, 6320, 6340 and 6350.

Thesis Option

Specific requirements include CHEM 6301, 6302, 6110 and three courses from CHEM 6312, 6320, 6340 and 6350.

Biochemistry Track Requirements

Non-Thesis Option

CHEM 6094, 6110, 6312, 6340, 6341, 6342, 6375. With graduate adviser approval, remaining 17 hours may be chosen from another field of study related to chemistry.

Thesis Option

Specific requirements include CHEM 6110, 6301, 6302, 6312, 6340, 6341, 6342 and 6375. With graduate adviser approval, the remaining 10 hours may be chosen from another field of study related to chemistry.

Major in Mathematics (Major Code: 5115)

General Requirements

Master of Science Degree

An undergraduate degree in mathematics equivalent to the bachelor's degree requirements in mathematics at WTAMU is required.

- Non-Thesis Option: At least 30 hours must be chosen from 6000-level math courses, and of these 30 hours at least six hours must be chosen from one of the sequences MATH 6310, 6311 or 6350, 6351. With graduate adviser approval, the remaining six hours may be chosen from another field of study related to mathematics.
- Thesis Option: At least 18 hours must be chosen from 6000-level math courses and of these 18 hours at least six hours must be chosen from one of the sequences MATH 6310, 6311 or 6350, 6351. With graduate adviser approval, the remaining six hours may be chosen from another field of study related to mathematics.