



COLLEGE OF SCIENCE AND ENGINEERING

General Overview

The College of Science and Engineering consists of the Departments of Biology, Chemistry, Computer Science, Electrical Engineering, Manufacturing Engineering, Mechanical Engineering, Mathematics, and Physics and Geology.

These departments are housed in four modern facilities: the Engineering Building, Science Building, Math and General Classroom Building, and Physical Science Building.

Academic Programs

The College of Science and Engineering offers the Master of Science degree in biology, chemistry, computer science, electrical engineering, engineering management, information technology, manufacturing engineering, mathematics, and mechanical engineering. The mathematics graduate program offers concentrations in mathematics teaching and mathematical sciences. In addition, the college provides several graduate support courses for students in graduate programs in other colleges.

The college also offers the Bachelor of Science in biology, chemistry, computer engineering, computer science, electrical engineering, manufacturing engineering, mathematics, mechanical engineering and physics.

Students may minor in biology, chemistry, computer science, electrical engineering, elementary mathematics, geology, manufacturing engineering, mathematics, mechanical engineering/thermal, physical science, physics and statistics. High school teacher certification is available in biology, chemistry, computer information systems, earth science, mathematics, physical science and physics, and elementary teacher certification is available in biology, mathematics and physical science.

Also included in the biology and chemistry departments are programs for pre-dental and premedical students. Chemistry also has a plan of study for pre-pharmacy students.

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SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Overview

The School of Engineering and Computer Science is an organization within the College of Science and Engineering that groups together four of the eight academic departments in the college. The school is made up of three engineering departments: electrical, manufacturing and mechanical engineering, as well as the Department of Computer Science. The school is headed by an associate dean and director who oversee the academic program development, the accreditation processes and the effective interactions with industry for the departments within the school. There is an external industry advisory council for computer science and also an engineering advisory council that provides advice on program development, evaluation of our placement processes for graduates and general feedback on the preparation of our students for jobs in industry or government facilities.

Academic Programs

Each of the four departments in the School of Engineering and Computer Science offers the bachelor's degree and the master's degree in the discipline. The graduates of these four departments are among the most sought after graduates in the University and they command the highest starting salaries for bachelor's degrees, according to a recent survey of the National Association of Colleges and Employers.

All four departments share the Engineering Building that contains more than \$7 million of teaching and research equipment. The enrollment of majors in the school is about 1,300, which makes up about half the total enrollment of the college.

Interdisciplinary Courses

The College of Science and Engineering offers interdisciplinary science courses designed to support teachers and others who desire integrated knowledge in science.

A listing of interdisciplinary courses can be found in the Course Description section of this catalog on beginning on [page 243](#).

Biology

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 Vitek, Chris, *Assistant Professor*
 Zaidan, Frederic, III, *Associate Professor*
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General Overview

The Department of Biology offers courses leading to a Master of Science in biology and provides minor and support areas for degrees in other fields.

Credit for a 5000-level course is not given to a student with previous undergraduate credit in a similar course. Only 15 hours of 5000-level courses may count toward a graduate degree.

Students pursuing a masters degree in related fields can include 12 to 18 hours of work in biology.

Students pursuing the non-thesis option for the Master of Science degree with a major in biology can include up to nine hours of work in an approved minor or support area.

Entry Requirements for Biology Master Program

The following are required for consideration to join the Biology Masters program. Multiple factors are considered in the decision to admit new graduate students. Meeting minimum entry requirements does not guarantee acceptance into the program.

1. The student must first meet all requirements for graduate admission to UT Pan American ([see page 17](#)), as well as the other requirements listed below. Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office.

2. a. An applicant must have 24 hours of undergraduate courses in biological sciences or closely-related disciplines, with 12 hours at the 3000/4000 level (third/fourth year) or equivalent. An applicant must have completed at least three hours in each of the following categories: evolution and genetics; molecular and cell biology; organismal and environmental biology; and physiology. Students may take up to nine hours of leveling work to fulfill this requirement, and must take and complete such course(s) the first time they are offered.

b. A GPA of 3.0 (based upon a 4.0 system) in 3000/4000 level (third/fourth year) undergraduate courses in biological sciences or closely-related disciplines is required for clear admission to the Biology Masters program. Successful applicants with a GPA lower than 3.0 on this measure may be given conditional admission.

3. A Graduate Record Exam (GRE) General Test score sent directly to The University of Texas-Pan American from the testing agency.

4. Applicants with education from foreign institutions: Evaluation of credentials may be requested as part of an application. The official credential evaluation service for The University of Texas-Pan American is Foreign Credentials Service of America (<http://www.fcsa.biz>); credentials evaluated by other means will not be considered. Credential evaluation is done at the applicants expense.

5. Interview: Upon invitation, conduct an interview (in person, phone interview, or other means) with members of the Biology Graduate Committee.

6. Thesis option: A graduate faculty member must serve as the chair of the students graduate committee (i.e., thesis adviser). The prospective thesis adviser should provide the graduate program coordinator with evidence that they have a means to support the graduate student (including e.g., anticipated teaching assistantships or research assistantships in the department) if support is necessary. A student may later change thesis advisers.

Non-thesis students also need a graduate committee to complete this program and must find a committee chair (i.e. adviser) within 16 weeks of beginning the program.

Applicants must attach or request the following through their online application:

7. A one- to two-page personal statement describing your academic and career goals, which states whether you are pursuing the thesis or non-thesis option.

8. Two letters of recommendation sent directly to The University of Texas-Pan American from the referees.

Applications are reviewed by multiple members of the Biology Graduate Committee, who then recommend whether or not to accept an application.

Supporting documents from referees, institutions or agencies will only be accepted when received from them under separate cover. Supporting documents should be sent to The University of Texas-Pan American Graduate Office unless other arrangements are made. Candidates may submit additional or supplementary documentation (e.g., GRE Subject Test Score, CV).

Application information and status is confidential. All applicants will be informed of the status of their application after a decision has been made.

Enrollment While Completing Leveling Work

The following courses may be taken while enrolled in leveling work:

Biology	6101	Biology Graduate Seminar (must be completed three times)
Biology	6305	Biometry
Biology	6365	Graduate Biological Research Problems

General Degree Requirements

1. Preliminary Oral Assessment. By the end of a student's first semester, the student's graduate committee will administer a preliminary oral assessment to determine the student's understanding of general biological principles. This helps to ensure that students have the background knowledge necessary to complete academic coursework required for a masters, and to ensure that thesis students have the knowledge necessary to complete thesis research.

Students are expected to be familiar with the following subject areas and related concepts of biology; the role of DNA in inheritance and trait expression; evolution; diversity of living organisms; organ systems; ecology; structure/function relationships; and scientific methodology. Students should be able to discuss many of these topics at a level of complexity at least equal to that presented in introductory biological textbooks (e.g., those used in BIOL 1401 and 1402). Thesis students should also be assessed on their knowledge of the field in which they are conducting research; for example, background knowledge of their research organism(s) and appropriate methodologies. Students are encouraged to consult with their committee members before the assessment to discuss what sort of topics may be covered in the assessment.

Students and committee members should allow not less than one hour and up to three hours to complete a preliminary oral assessment.

The outcome of the assessment will be used to formulate

or revise (if necessary) a student's degree plan. For this reason, it is strongly recommended that a student hold a preliminary oral assessment before submitting a degree plan.

The student's performance on this assessment will help the student's committee in formulating recommendations for the degree plan and for removing deficiencies. If deficiencies or weaknesses in basic biology are apparent, the student's committee can recommend a course of action for the student to remove the deficiencies. Students do not normally fail a preliminary oral assessment, but a student's committee has broad power in making recommendations based on a student's performance, up to and including that the departmental Graduate Committee review whether the student be allowed to continue in the program. It is expected that the student will follow through to address committee concerns, and that the student can demonstrate that committee concerns are addressed, for example, by: completing recommended coursework; discussion at an annual committee meeting, or; having individual meetings with committee members. Although there is no formal re-assessment, the student's committee must be satisfied that a student has resolved any deficiencies before allowing a student to schedule a final oral examination.

2. Comprehensive Oral Examination and Thesis Defense. After satisfactory completion of the required number of courses (and the presentation of a seminar on the thesis research for those pursuing the thesis option) the student must take a comprehensive examination (and thesis defense for thesis students). The examination (and thesis defense) will be conducted by the student's graduate committee, but it is open to all biology graduate faculty members. The biology graduate faculty must be notified of the examination date, time and place at least two weeks prior to the examination. There is no time limit, but the examination (and thesis defense) ordinarily lasts at least two hours. For thesis students, the first round of questions is devoted to a defense of the thesis and the second and subsequent rounds of questions are over basic biological concepts and principles. For non-thesis students, all questions are on general biology. At the end of the comprehensive oral examination (and thesis defense), the student's graduate committee will assign a grade of pass or fail, based on a majority vote of the committee.

If the student fails the comprehensive oral examination (and thesis defense), he or she may be granted permission to take a second examination, if doing so is approved by the student's graduate committee, the chair of the Department of Biology, and the dean of College of Science and Engineering. In no case will a second examination be given until at least one semester has passed. After two failures, no further examination is allowed.

3. Biology Grades. Graduate students in biology are expected to maintain a GPA of 3.0 overall, and a 3.0 GPA in all 5000 level and higher biology courses (i.e., excluding courses outside of biology and excluding undergraduate courses). Any student whose overall GPA falls below 3.0 will be placed on probation. Students whose biology graduate GPA falls below a 3.0 for one semester will receive a written warning of their status. To remain in the graduate program, the student must restore his or her GPA to 3.0 by the end of

the next semester. (Two summer sessions are equivalent to one semester.)

4. Committee Formation. Students must form a committee within 16 weeks (i.e., one semester) of starting the program, and may be removed from the biology masters program if they do not have a committee for more than 16 consecutive weeks.

5. Degree Plan. Students must submit a degree plan to the biology graduate program coordinator within 16 weeks (i.e., one semester) of starting the program, preferably after completing their preliminary oral assessment.

6. Continuous Enrollment. Students are expected to enroll continuously for biology classes, just as they are expected to enroll continuously for graduate courses. A student who is taking only courses outside biology should inform his or her supervisor and the biology graduate program coordinator to ensure that he or she is not removed from the Biology Graduate Program.

7. Annual Committee Meeting. Students should have an annual committee meeting to ensure that the student is making satisfactory progress toward completion of the degree.

◆ General Requirements for Thesis Program

1. Graduate students selecting the thesis option must complete 30 hours, including the thesis. The choice of courses will be determined through consultation between the student and his or her graduate adviser and have the approval of the chair of the department.

2. During the first semester of study following admission to graduate study, the student should choose from the graduate faculty a major professor who will serve as chairperson of his or her Graduate Committee and two other faculty members chosen in conference with the major professor and the chair of the department. A degree plan, signed by the student and his or her supervisor(s) (i.e., Graduate Committee chair), must be submitted to the graduate program coordinator, who will forward it to appropriate administrators for signatures. This committee will also oversee progress and supervise the required comprehensive examination.

3. A thesis topic and plan for research will be chosen by the student and his or her major professor, subject to approval by the student's Graduate Committee.

4. The research will culminate in a thesis written in the style approved by the student's graduate committee and should be worthy of submission, in whole or in part, for publication in a reputable journal. Approval must be affirmed by the chair of the department and the dean of the college.

5. Following acceptance of the thesis, evidenced by the signatures of the members and by the administrators indicated above, four copies should be presented for binding, and a fee to cover the cost of binding should be paid to The University of Texas-Pan American. The four bound copies will be distributed as follows: the first (original) and second copy in the library, the third copy with the Department of Biology and the fourth copy with the student.

◆ General Requirements for Non-Thesis Program

A non-thesis student must complete 36 hours of coursework, which must include at least 27 hours in biological sciences. A maximum of nine hours in a related minor or supporting field may be taken if approved by the student's supervisor and relevant administrators.

◆ Switching Degree Options

1. Students may switch between options if 18 graduate credit hours or fewer are completed by submitting a change of program form and new degree plan.

2. Students who have completed more than 18 graduate credit hours must submit a written request and justification for the change to the Biology Graduate Program coordinator. Requests will be reviewed by the Biology Graduate Program coordinator and members of the Biology Graduate Committee. Requests to switch from thesis to non-thesis after more than 18 hours of coursework have been completed in a program must be strongly justified and should be supported in writing by a student's committee. If approved, the student must submit a new degree plan within eight weeks.

Master of Science Degree

Required Courses
15 hours (Thesis)

18-27 hours (Non-Thesis)

BIOL	6101	Biology Graduate Seminar (must be completed three times)
BIOL	6305	Biometry
BIOL	6365	Graduate Biological Research Problems
BIOL	7300	Thesis (Thesis option)
BIOL	7301	Thesis (Thesis option)

Electives 15 hours
Select 15 hours (Thesis) or 18-27 hours (Non-Thesis) from the following:

BIOL	5304	Advanced Ichthyology
BIOL	5307	Host-Parasite Relationships
BIOL	5315	Advanced Entomology
BIOL	5316	Advanced Environmental Toxicology
BIOL	5317	Advanced Bacterial Genetics
BIOL	5318	Advanced Topics in Ethnobotany
BIOL	5344	Advanced Mammalogy
BIOL	5345	Advanced Plant Physiology
BIOL	5346	Advanced Aquatic Entomology
BIOL	5403	Advanced Remote Sensing Technology
BIOL	5404	Molecular Virology
BIOL	5405	Advanced Plant Physiology
BIOL	5406	Advanced Mycology
BIOL	5408	Advanced Plant Pathology
BIOL	5409	Advanced Herpetology
BIOL	5410	Marine Plant Science
BIOL	5411	Advanced Ecological Physiology
BIOL	5412	Advanced Ornithology

BIOL	5414	Advanced Plant Systematics
BIOL	5418	Advanced Electron Microscopy
BIOL	5420	Biotechnology
BIOL	5424	Advanced Microbial Ecology
BIOL	5426	Advanced Marine Ecology
BIOL	5452	Advanced Marine Zoology
BIOL	6302	Select Topics in Biology
BIOL	6303	Advanced Ecology
BIOL	6304	Systematic Biology
BIOL	6307	Bioenergetics
BIOL	6308	Plant-Microbe Interactions
BIOL	6313	Advanced Cell Biology and Physiology
BIOL	6316	Molecular Genetics
BIOL	6319	Scientism
BIOL	6321	Applied Microbiology
BIOL	6322	History of Biology
BIOL	6324	Evolutionary Theory
BIOL	6412	Subtropical Ornithology
BIOL	6420	Plant Biochemistry and Molecular Biology
CHEM	6305	Biochemistry

Approved Minor or Support Area (Non-Thesis) 0-9 hours

TOTAL 30 hours (Thesis)
36 hours (Non-Thesis)

Course Descriptions

A listing of graduate courses offered by the Department of Biology can be found in the Course Descriptions section of this catalog beginning on page 173. All biology courses require graduate standing before enrollment.

Chemistry

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Han, Aijie, *Assistant Professor*
Ibrahim, Elamin, *Associate Professor*
Macossay-Torres, Javier, *Assistant Professor*
Mondal, Jalal, *Professor*
Rampersad-Ammons, Joanne, *Assistant Professor*
Smith, Christopher Kenneth, *Assistant Professor*

General Overview

The Department of Chemistry provides the programs for graduate students to complete the Master of Science degree in chemistry to become professional chemists or to become professional secondary school/community college teachers. Both program tracks require students to finish 12 credit hours of core courses, three credit hours of seminar courses and nine credit hours of elective courses. In order to meet the total 30-credit hour requirement for graduation, students in traditional research track need to complete six credit hours on thesis, while those in teacher preparation track should finish six-credit hours on chemical educational project on secondary school/community college education. Among nine credit elective hours, students may be allowed to bring in a maximum of six-credit graduate hours from courses other than chemistry which requires program coordinator approval.

Admissions Requirements

In order to be admitted to the Master of Science in chemistry program, the student must first meet all requirements for graduate admission to UT Pan American (see page 17), as well as the other requirements listed below. Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office.

Specific Admissions Requirements

- In addition to the requirement of admission to the Graduate School, to be considered for unconditional admission to the Chemistry Program the applicant must satisfy the following requirements:
 - A minimum grade point average of 3.0 on a scale of 4.0 in the first 32 hours of the completed undergraduate degree (which need not be in chemistry) as shown on an official transcript.
 - Completion of the general section of the GRE (the scores will be used for comparison purposes only and will not be considered as sole criteria).
 - Sufficient undergraduate coursework in chemistry that is demonstrated by 32 credit hours of chemistry.
- The program committee will have the authority to accept into unconditional status any applicant whose qualifications in (a) above fall short of the requirements.
- Conditional admission will be considered for applicants who do not satisfy the criteria outlined in (a) above but are not granted unconditional status by the program committee. The program committee will base conditional admission on the strength of the applicants application portfolio and recommendations.

Such conditional admission may require courses addressing application deficiencies, and/or advice to take additional coursework in a particular field. These steps must be taken before the applicant is granted non-conditional or clear status.

The applicant may not proceed beyond 12 credit hours of chemistry graduate courses with a conditional status.

◆ General Semester Credit Hours Requirement

Leveling Courses	none at graduate level
Core Courses	12 hours
Required Seminar Courses	3 hours
Prescribed Electives	none*
Free Electives	9 hours*
Required Thesis option **	6 hours
Required Project option **	6 hours
TOTAL SCH	30 hours

* Free electives are developed in consultation with an adviser and with the approval of the program coordinator. In that sense there are no true prescribed electives apart from those suggested by the advisers. The students can take three

hours from other disciplines and under special cases, with the approval of the program director, can bring a maximum of two courses (six hours) of electives from disciplines other than chemistry.

** The thesis hours will be required for traditional research track and project hours will be required for the teachers preparation track.

General Requirements

Thesis Option

A supervised master's thesis is required. The thesis option provides much needed practical experience and technical skills, insight into the intricacies of scientific research and the opportunity to develop written and oral communication skills. When a clearly defined project has been outlined, the candidate can advance the study in coordination with an adviser. The thesis track involves three credits of seminar, writing and literature search techniques, and six credits of research work.

Project Option

A student may choose to take a project option with the consent of the program coordinator. The student will still be required to take three credits of seminar, writing and literature search skills, but also required to take the six credits of project work in which they will develop experimental plans and lesson plans which are applicable to secondary school, high school and community college teaching. The scope and project topic(s) will be developed by the student with the help of his/her adviser(s).

◆ Master of Science Degree Traditional Research Track

Core Courses 12 hours

CHEM 6305	Biochemistry*
CHEM 6310	Organic Chemistry
CHEM 6315	Inorganic Chemistry*
CHEM 6320	Instrumental Analysis
CHEM 6325	Physical Chemistry

* Either Inorganic Chemistry or Biochemistry (If both courses are taken, one counts as an elective.)

Elective Courses** 9 hours

CHEM 6330	Special Topics in Organic Chemistry
CHEM 6340	Special Topics in Inorganic Chemistry
CHEM 6350	Special Topics in Analytical Chemistry
CHEM 6360	Special Topics in Physical Chemistry
CHEM 6370	Special Topics in Chemical Education
CHEM 6380	Special Topics in Biochemistry
CHEM 6302	Teaching Environmental Sciences

** Six credit hours could be from other disciplines pending

approval by the program coordinator. (Special topics courses can be repeated.)

Seminar Courses		3 hours
CHEM 7101	Seminar I	
CHEM 7102	Seminar II	
CHEM 7103	Seminar III	

Thesis		6 hours
CHEM 7351	Thesis I	
CHEM 7352	Thesis II	

◆ Master of Science Degree Teachers Preparation Track

Core Courses		12 hours
CHEM 6305	Biochemistry*	
CHEM 6310	Organic Chemistry	
CHEM 6315	Inorganic Chemistry*	
CHEM 6320	Instrumental Analysis	
CHEM 6325	Physical Chemistry	

Either Inorganic Chemistry or Biochemistry (If both courses are taken, one counts as an elective.)

Elective Courses**		9 hours
CHEM 6330	Special Topics in Organic Chemistry	
CHEM 6340	Special Topics in Inorganic Chemistry	
CHEM 6350	Special Topics in Analytical Chemistry	
CHEM 6360	Special Topics in Physical Chemistry	
CHEM 6370	Special Topics in Chemical Education	
CHEM 6380	Special Topics in Biochemistry	
CHEM 6302	Teaching Environmental Sciences	

**** Six credit hours could be from other disciplines. (Special topics courses can be repeated.)**

Seminar Courses		3 hours
CHEM 7101	Seminar I	
CHEM 7102	Seminar II	
CHEM 7103	Seminar III	

Project		6 hours
CHEM 7325	Masters Project I	
CHEM 7326	Masters Project II	

◆ Master of Science in Interdisciplinary Studies Chemical Education

Core Courses		12 hours
CHEM 6310	Organic Chemistry	
CHEM 6320	Advanced Instrumental Analysis	
CHEM 6325	Advanced Physical Chemistry	
CHEM 6305	Biochemistry OR	
CHEM 6315	Advanced Inorganic Chemistry	

Electives 6 hours

(Select any two courses)

CHEM 6302	Teaching Environmental Sciences
CHEM 6330	Special Topics in Organic Chemistry
CHEM 6340	Special Topics in Inorganic Chemistry
CHEM 6350	Special Topics in Analytical Chemistry
CHEM 6360	Special Topics in Physical Chemistry
CHEM 6370	Special Topics in Chemical Education
CHEM 6380	Special Topics in Biochemistry

Select 9 hours from two of the following blocks
(Total 18 hours)

Education

EDCI 6301	Instructional Technology
EDCI 6302	Multicultural Education
EDCI 6305	Educational Curriculum
EDCI 6306	Special Projects
EDCI 6307	Research, Issues and Trends in Education
EDCI 6310	Research Methods in Education
SCIE 6303	Recent Developments in Applied Science

Mathematics

(Any three graduate Mathematics courses **except** MATH 6330, 6337, 6359, 6375, 6376, 6385, 7300, 7301)

Educational Psychology

EPSY 6330	Identifying the Gifted and Talented
EPSY 6331	Curriculum, Methods and Materials for the Gifted and Talented
EPSY 6332	Creativity and the Gifted and Talented
EPSY 6333	Counseling the Gifted and Talented
EPSY 6342	Seminar in Gifted Education

Physics

PHYS 5404	Physics by Inquiry I
PHYS 5405	Physics by Inquiry II
PHYS 6400	Astronomy by Sight
PHYS 6301	Topics in Physics for Teachers
PHYS 6302	Environmental Physics for Teachers
PHYS 6303	Quantum Information
GEOL 5301	Geology and Geography
GEOL 6302	Meteorology and Oceanography

Computer Science

(Any three graduate Computer Science courses **except** CSCI 6302, 6312, 6343, 6363, 6365, 6366, 6368, 6380, 6381, 6389, 6390, 7300)

Biology

(Any three graduate Biology courses except BIOL 5318, 5405, 5424, 5426, 6101, 6365, 7300, 7301)

Course Description

A listing of graduate courses offered by the Department of Chemistry can be found in the Course Description section of this catalog beginning on page 176.

Computer Science

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 Fowler, Richard H., *Professor, Interactive Systems*
 Fu, Bin, *Associate Professor, Bioinformatics, Algorithms*
 Grabowski, Laura M., *Assistant Professor, Artificial Intelligence*
 Lawrence-Fowler, Wendy A., *Professor, Information Systems*
 Liu, Fang, *Assistant Professor, Wireless Network, Network Security*
 Lozano, Andres, *Assistant Professor, Bioinformatics*
 Schweller, Robert, *Assistant Professor, Algorithms*
 Tomai, Emmett, *Assistant Professor, Natural Language*

Introduction

The Department of Computer Science offers two degrees: Master of Science in computer science and Master of Science in information technology. The degrees prepare students for positions in industry and education, enhance skills for the practicing professional and supply a foundation for study at the doctoral level. Students with a bachelor's degree in any field may enter either program. The programs provide a broad foundation of study in computer science, as well as offer in-depth study in the areas of algorithms, bioinformatics, databases, data mining, information retrieval, networks, artificial intelligence, computer graphics, information visualization, and software engineering. For both degrees, a core of computer science courses is required, together with additional prescribed elective courses. Other computer science electives and graduate courses in other departments may also be completed. The program offers both thesis and project options for the Master of Science in computer science. More information is available at: www.cs.panam.edu.

Admissions Requirements

1. The student must first meet all requirements for graduate admission to UT Pan American (see page 17), as well as the other requirements listed below. Application for admission to the University must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted,

applicants can check the status of their applications online or by contacting the Graduate Office.

2. A grade point average of 3.0 or higher on a 4.0 scale for the last 60 semester hours, or 90 quarter hours, of undergraduate courses completed.
3. For foreign national applicants whose primary language is not English, a score on the TOEFL of 500.
4. Preparation for graduate work in computer science. This preparation is shown by (1) a bachelor's degree in computer science or (2) a bachelor's degree in another field and courses and/or experience that prepare the applicant for graduate work in computer science.

Conditional admission will be considered for an applicant who does not satisfy the above requirements. In particular, many students with bachelor's degrees in other fields enter the program. For those students, a sequence of courses preparing the student for graduate studies will be prescribed.

Degree Requirements

Master of Science in computer science students complete 36 semester hours, including 12 semester hours of required computer science lecture and seminar courses with a grade of B or higher, 12 or more semester hours of computer science prescribed elective courses and a master's thesis or project. Students may also complete up to six hours of other computer science electives and courses in other departments. For the project option, a final written examination is required.

Required Computer Science

Lecture and Seminar Courses		12 hours
CSCI	6174	Open Problems in Computer Science*
CSCI	6175	Seminar in Computer Science (2 hours required)
CSCI	6323	Design and Analysis of Algorithms
CSCI	6335	Advanced Computer Architecture
CSCI	6339	Theoretical Foundations of Computation

* To be taken in the first year of enrollment in the graduate program.

Computer Science Prescribed

Elective Courses		12 or more hours
CSCI	6333	Advanced Database Design and Implementation
CSCI	6334	Advanced Operating Systems
CSCI	6336	Programming Languages and Compilers
CSCI	6337	Simulation
CSCI	6340	Advanced Software Engineering
CSCI	6345	Advanced Computer Networks
CSCI	6350	Advanced Artificial Intelligence
CSCI	6351	Knowledge-Based Systems
CSCI	6354	Performance Evaluation

CSCI	6355	Bioinformatics
CSCI	6356	Parallel Computing
CSCI	6360	Advanced Computer Graphics
CSCI	6361	Computer Visualization
CSCI	6362	Interactive Systems
CSCI	6363	Human Computer Interaction
CSCI	6364	Network Information Systems
CSCI	6370	Topics in Computer Science

**Other Computer Science Elective Courses
and Courses in Other Departments** 6 hours or less

CSCI	6300	Foundation of Systems
CSCI	6301	Foundation of Algorithms and Programming Languages
CSCI	6381	Independent Research and Study

**Required Computer Science Problems,
Project and Thesis Courses** (3 hours for project option, 9
hours for thesis option):

CSCI	6380	Problems in Computer Science (required for both options)
and		
CSCI	6390	Masters Project I
CSCI	7300	Thesis (6 hours required)

Master of Science in Information Technology

Students complete 36 semester hours, including 13 semester hours of required computer science lecture and seminar courses with a grade B or higher, 14 or more semester hours of prescribed elective courses, and a masters project. Students complete up to six hours of other approved elective courses in computer science and other departments. A final written examination is required.

**Required Computer Science
Lecture and Seminar Courses** 13 hours

CSCI	6174	Open Problems in Computer Science (To be taken in first year of enrollment in graduate program.)
CSCI	6302	Foundations of Software and Programming Systems
CSCI	6303	Principles of Information Technology System
CSCI	6315	Applied Database Systems
CSCI	6345	Advanced Computer Networks

Prescribed Elective Courses 14 or more hours

CSCI	6175	Seminar in Computer Science (may be repeated once as topics vary)
CSCI	6300	Foundation of Systems
CSCI	6301	Foundation of Algorithms, Data and Programming Languages in Computer Science
CSCI	6314	E-Commerce Systems and Implementation
CSCI	6340	Advanced Software Engineering

CSCI	6361	Computer Visualization
CSCI	6362	Interactive Systems
CSCI	6363	Human Computer Interaction
CSCI	6364	Network Information Systems
COMM	6324	Seminar in Organizational Communication
ELEE	6340	Digital Communications
ELEE	6372	Parallel and Distributed Systems
MANE	6375	Human Factors Engineering
MARK	6374	E-Commerce: Doing Business in a Digital World
MIS	6391	Information Security and Assurance Management

Approved Elective Courses 6 hours or less

Students complete up to nine hours of courses relevant to information technology, approved by the graduate director or the program coordinator in computer science or other departments.

Required Computer Science Project Courses		3 hours
CSCI	6390	Masters Project

Course Descriptions

A listing of graduate courses offered by the Department of Computer Science can be found in the Course Descriptions section of this catalog beginning on page 182.

Engineering

Dr. Miguel Gonzalez, *Associate Dean and Director*
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Graduate Program Overview

The University of Texas-Pan American program in engineering offers graduate programs in electrical engineering, manufacturing engineering and mechanical engineering leading to a Master of Science in engineering. Each of the three programs offers thesis, report, and non-thesis options. Students may further specialize within each program through selection of elective courses.

Electrical Engineering

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Dr. Junfei Li,
Graduate Program Director
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Graduate Faculty
 Banatoski, Edward, *Lecturer,*
Device Modeling and Measurement
 Ben Ghalia, Mounir, *Assistant Professor,*
Controls, Robotics, Expert Systems
 Foltz, Heinrich, *Associate Professor,*
Electromagnetics, Microwaves, Antennas
 Huq, Hasina, *Assistant Professor,*
Semiconductor Devices and Microelectronics
 Kumar, Sanjeev, *Assistant Professor,*
Communication Networks, Protocols,
Computer Architecture
 LeMaster, Edwin, *Professor, Remote Sensing*
 Li, Junfei, *Assistant Professor,*
Electromagnetics, Embedded Systems
Computer Imaging Assessment
 Peng, Jun, *Assistant Professor,*
Computer Networks, Wireless Networks
 Son, Jae Sok, *Assistant Professor,*
Signal and Image Processing, Radar

Master of Science in Engineering: Electrical Engineering

The Department of Electrical Engineering offers a graduate program leading to a Master of Science in engineering degree. The program has a thesis option and a non-thesis option. Coursework is offered in areas that include computer engineering, systems and controls, communications, digital systems, and electronics. Research opportunities are offered in computer architecture and performance evaluation, multimedia processors, VLSI design and implementation, microwave and antenna engineering, control systems and robotics, networks, and signal and image processing.

Admission to the Electrical Engineering Program

Applicants to the master's program in electrical engineering must meet the University requirements for admission to graduate study given in the admission section of this catalog. There are additional requirements specific to the electrical engineering graduate program. For unconditional admission, the minimum requirements are:

- (1) A bachelor's degree in electrical engineering.
- (2) A grade point average of 3.0 or higher on a 4.0 scale for the last 60 semester hours attempted.

Applicants who do not satisfy the specific program criteria above will be considered for conditional admission. Prospective graduate students whose bachelor's degree is in a field other than electrical engineering are required to take leveling courses, prescribed by the graduate program director, before they can be considered for admission to the electrical engineering graduate program.

Degree Requirements

General Requirements for Thesis Option

1. The thesis option for the master's degree requires a minimum of 30 hours of graduate work, including six thesis credits identified as ELEE 7300 and ELEE 7301.
2. The graduate program director will help the student prepare an initial plan of study to begin his/her first semester of work. During the first semester, the student is urged to discuss potential research topics with several faculty members in order to choose a topic that interests him/her and a major professor to act as his/her thesis adviser. When a thesis topic has been selected, a Graduate Committee composed of at least three graduate faculty members shall be formed in conjunction with the major professor and department chair. The committee should include at least two electrical engineering faculty members from UTPA and one faculty member from another department. A final plan of study must be prepared and approved by the major professor, the department chair and the dean no later than the second semester of work.
3. Each student should submit a proposal to the Graduate Committee that describes the thesis topic in sufficient detail. A copy of the proposal should also be submitted to the department. The proposal should normally be submitted before the student signs up for his/her first thesis course. Students should bear in mind that a masters thesis could be published in the technical literature and represent some knowledge in the field.
4. Each student is required to present a seminar on the thesis topic. Notice of the oral presentation of the masters thesis should be given at least one week in advance to all

faculty and students in the department. A draft copy of the masters thesis should be available to all faculty members serving on the students Graduate Committee at least one week before the oral presentation. Students are expected to make changes to the final copy of their master's thesis based on feedback obtained from the oral presentation. Students should expect to be asked fundamental questions during the oral presentation. If the student fails the thesis defense, he/she may be allowed to take a second defense contingent upon the approval of the Graduate Committee, the department chair and the dean. If approved, the timing and requirements of the second defense will be specified by the Graduate Committee, but in no case will the student be able to defend his/her thesis for the second time until at least one semester has passed. After two failures, no further thesis defense is allowed.

5. Students are responsible for preparing and copying the final thesis. One copy must be provided to the professor and one copy to the department in addition to copies required by the Office of Graduate Programs and Research. Members of the students Graduate Committee are required to be provided with a copy of the thesis. It is the responsibility of the student to adhere to the University requirements for the format and submission of a thesis.

6. All candidates for the Master of Science program must maintain a minimum GPA of 3.0 throughout their program of study. Any student with clear admission whose GPA falls below 3.0 will be placed on probation. To remain in the graduate program, the student must restore his/her GPA to 3.0 by the end of the following semester.

◆ Thesis Option (30 hours total)

Elective Courses in Electrical Engineering	18 hours
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Elective Courses in Science and Engineering	6 hours
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Masters Thesis	6 hours
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ELEE 7300	
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ELEE 7301	
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Elective courses should be selected with the consent of the students thesis adviser. No more than three hours of ELEE 6385 (Independent Study) may be counted toward the degree.

General Requirements for Non-Thesis Option

1. The non-thesis option for the masters degree requires a minimum of 36 hours of graduate work.

2. The graduate program director will help the student prepare a plan of study during his/her first semester of work.

3. In addition to course requirements, each student in the project with report option will be required to pass a comprehensive examination during or at the end of the students final semester of work. The examination will be administered by an Examining Committee formed by a number of faculty members with whom the student

has taken one or more graduate courses. The Examining Committee will be appointed by the graduate program director with approval of the department chair and will evaluate the students depth of knowledge in the field of study and his/her competence in presenting the technical material. It is the responsibility of the student to contact the graduate program director to schedule the examination at least four weeks before the examination date. If the student fails the comprehensive examination, he/she may be allowed to take a second examination contingent upon the approval of the Examining Committee, the department chair and the dean. If approved, the timing and requirements of the second attempt will be specified by the Examining Committee, but in no case will the second examination be given until at least one semester has passed. After two failures, no further examination is allowed.

4. All candidates for the Master of Science program must maintain a minimum GPA of 3.0 throughout their program of study. Any student with clear admission whose GPA falls below 3.0 will be placed on probation. To remain in the graduate program, the student must restore his/her GPA to 3.0 by the end of the following semester.

◆ Non-Thesis Option (36 hours total)

Elective Courses in Electrical Engineering	30 hours
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Elective Courses in Science and Engineering	6 hours
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Elective courses should be selected with the consent of the graduate director. No more than three hours of ELEE 6385 (Independent Study) may be counted toward the degree.

Transfer of Graduate Credits

A maximum of nine semester hours of graduate work earned at other institutions may be transferred for degree credit, contingent upon review and approval by the director of the graduate program. General procedures and criteria for transferring graduate credits are described in this catalog.

Course Descriptions

A listing of graduate course offerings in electrical engineering can be found in the Course Descriptions beginning on page 194.

Manufacturing Engineering

Dr. Douglas H. Timmer, *Department Chair*
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Manufacturing Engineering Faculty
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Process and Product Design, Robotics
Computer-Aided Manufacturing
 Butler, Alley, *Professor,*
Design Automation, Uncertainty Methods,
Process Manufacturing and Shipbuilding,
Business/Management in Engineering
 Gonzalez, Miguel, *Associate Professor,*
Manufacturing Simulation,
Ergonomics, Operations Research
 Lee, Kye-Hwan, *Assistant Professor,*
Plastics Product Design,
Mold Design, Plastics Processing
 Nambiar, Rajiv, *Associate Professor,*
Manufacturing Processes, Computer-Aided Design
 Timmer, Douglas, *Associate Professor,*
Quality Control, Design of Experiment,
Reliability and Total Quality Management

Master of Science in Engineering: Manufacturing Engineering

Graduate Program Overview

The University of Texas-Pan American Department of Manufacturing Engineering offers a graduate program in manufacturing engineering leading to a Master of Science in engineering. The department offers thesis, report and coursework options. Students may further specialize within the major through selection of elective courses, and a Concentration in Systems Engineering is available for students interested in qualifications in Systems Engineering.

The manufacturing engineering major is designed to help practicing engineers and managers with extensive engineering experience in manufacturing and graduates in engineering, the physical sciences and business to further their education for better opportunities in manufacturing industries. The major provides technical and engineering management skills, provides education in cutting-edge technology to manufacturing professionals so they can be competitive in the global market, and prepares students for doctoral programs in manufacturing engineering.

The graduate program in manufacturing engineering requires 30-36 semester credit hours, nine of which are required of all students. The nine hours are selected such that there is a course from each of three area lists in quality, design and systems. There are three choices of programs in the manufacturing engineering area: 1) thesis, 2) report, and 3) coursework only. The thesis option requires 24 hours of coursework plus six hours for the thesis. The report option requires 30 hours of coursework and 6 hours for the report. The coursework only option requires 36 hours of courses. There is a requirement of 18 hours of coursework for option one, 24 hours of course work for option two and 30 hours coursework for option three from manufacturing engineering. The remaining six hours of coursework for the thesis option, report option or coursework only option may be from mechanical or electrical engineering, business, math or computer science with the approval of the students Graduate Faculty Advisory Committee (GFAC).

For those students interested in a Concentration in Systems Engineering there is a prescribed list of courses required for the thesis option and for the coursework option. With the Concentration in Systems Engineering, the thesis option requires 33 hours and the coursework option requires 36 hours. The report option is not available with a Concentration in Systems Engineering.

Students shall make an oral presentation on either the thesis, the report, projects for coursework option to the faculty advisory committee or take a written test to complete the requirements for the Master of Science in engineering—option manufacturing. The thesis option gives students an opportunity to pursue research and continue a doctoral program in manufacturing engineering or related fields. The engineering practicum with a report option is designed to help practicing engineers or managers with manufacturing engineering experience to apply new technology in manufacturing and to help manufacturing industries be competitive in the world market. The report option gives fresh graduate engineers an opportunity to develop contact with an industry through project work for a report, enhancing opportunities for jobs. The report option also gives students an opportunity to work on an industrial problem for two semesters (three hours each semester). The coursework-only option is designed to give technical depth in the manufacturing disciplines while allowing the breadth by six hours of coursework from outside the manufacturing engineering area. The coursework only path is expected to meet the needs of practicing engineers who do not intend to pursue further graduate work in engineering and only desire to follow an industrial career path.

Students may be required to take some leveling courses to meet the prerequisites, depending on their undergraduate major and experience in manufacturing engineering. The students Graduate Faculty Advisory Committee specifies each students leveling work.

Admission to the Manufacturing Engineering Program

The student must first meet all requirements for graduate admission to UT Pan American (see page 17), Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office.

Degree Requirements

- ◆ Thesis Option (30 hours)
 - a) Courses required of all students 9 hours
(Three hours from each area; see list below.)
 - b) Elective courses prescribed None
 - c) Courses elected by students 6 hours
(Six hours from business, mechanical or electrical engineering, computer science, or mathematics chosen with the consent of the students GFAC.)
 - d) Courses from Manufacturing Engineering 9 hours
 - e) Thesis 6 hours
- ◆ Report Option (36 hours)
 - a) Courses required of all students 9 hours
(Three hours from each area; see list below.)
 - b) Elective courses prescribed None
 - c) Courses elected by students 6 hours
(Six hours from business, mechanical or electrical engineering, computer science or mathematics chosen with the consent of the students GFAC.)
 - d) Courses from Manufacturing Engineering 15 hours
 - e) Report 6 hours
- ◆ Coursework Only Option (36 hours)
 - a) Courses required of all students 9 hours
(Three hours from each of three areas listed below.)
 - b) Elective courses prescribed None
 - c) Courses elected by students 6 hours
(Six hours from business, mechanical or electrical engineering, computer science or mathematics chosen with the consent of the students GFAC.)
 - d) Courses from Manufacturing Engineering 21 hours
- ◆ Leveling Courses

Students whose undergraduate major is not manufacturing engineering are required to take some leveling courses from the list given below with approval of the students Graduate Faculty Advisory Committee. Leveling courses are determined for each student by the students advisory committee based on his/her course background and experience in manufacturing.

MECE 1221 Engineering Graphics

MECE	2340	Fundamentals of Industrial Engineering
MANE	3332	Engineering Statistics
MANE	3364	Manufacturing Processes
MATH	1401	Calculus I
MATH	1402	Calculus II
MATH	3349	Differential Equations
MECE	2440	Engineering Materials
MECE	2303	Statics
MECE	2304	Dynamics
ELEE	3305	Electrical Systems

- ◆ Manufacturing Engineering Courses

Students are required to take at least one course from each of the three areas given below. Remaining 15-27 hours depending on the option (thesis, report or coursework only) may be taken from any of the three areas in manufacturing engineering. Courses should be approved by the students Graduate Faculty Advisory Committee.

Quality

MANE	6311	Advanced Quality Control
MANE	6313	Design of Experiments
MANE	6315	Reliability Engineering
MANE	6354	Advanced Engineering Economics
MANE	6319	Quality Management Systems

Design

MANE	6323	Advanced Computer-Aided Design
MANE	6365	Tool Design and Analysis
MANE	6369	Mold Design and Analysis
MANE	6346	Polymer Engineering
MANE	6375	Human Factors
MANE	6372	Advanced Engineering Analysis
MANE	6357	Ergonomics
MANE	6364	Advanced Manufacturing Processes
MANE	6368	Logistics Engineering
MANE	6383	Polymer Systems
MANE	6384	Polymer Structures
MANE	6385	Plastic Product Design

Systems

MANE	6321	Robotics and Automation
MANE	6328	Dynamic Systems Modeling
MANE	6331	Advanced Manufacturing Planning and Control
MANE	6340	Operations Research and Analysis
MANE	6342	Engineering Decision Support Systems
MANE	6343	Queueing Models for Manufacturing Systems
MANE	6348	Systems Engineering
MANE	6352	Simulation of Manufacturing Systems
MANE	6380	Engineering Project Management

Students may enroll in engineering project or thesis depending on the option-thesis or report. Topics in

Manufacturing Engineering (MANE 6399) may be taken as part of the 15-27 hours of coursework required for graduation.

◆ Courses for Concentration in Systems Engineering with the Thesis Option

Students who want to receive a Concentration in Systems Engineering and complete a research thesis must complete a list of prescribed courses to receive the Concentration in Systems Engineering. The courses include subject matter specific to the practice of Systems Engineering.

CSCI	6340	Software Engineering
MANE	6304	Industrial Cost Analysis
MANE	6315	Reliability Engineering
MANE	6319	Quality Management Systems (or
MANE	6368	Logistics Engineering)
MANE	6340	Operations Research
MANE	6345	Engineering Management (or MANE 6365 Human Factors)
MANE	6348	Systems Engineering
MANE	6352	Simulation of Manufacturing Systems
MANE	6380	Engineering Project Management
MANE	7300	Thesis I
MANE	7301	Thesis II

◆ Courses for Concentration in Systems Engineering with the Coursework Option

Students who want to receive a Concentration in Systems Engineering with a coursework option must complete a list of prescribed courses to receive the Concentration in Systems Engineering. The courses include subject matter specific to the practice of Systems Engineering.

CSCI	6340	Software Engineering
MANE	6304	Industrial Cost Analysis
MANE	6315	Reliability Engineering
MANE	6319	Quality Management Systems
MANE	6340	Operations Research
MANE	6345	Engineering Management
MANE	6348	Systems Engineering
MANE	6352	Simulation of Manufacturing Systems
MANE	6357	Ergonomics
MANE	6365	Human Factors
MANE	6368	Logistics Engineering
MANE	6380	Engineering Project Management

◆ Engineering Practicum/Thesis/Topics in Manufacturing Engineering

MANE	6399	Topics in Manufacturing Engineering (<i>May be repeated for credit when topic changes.</i>)
MANE	6190	Engineering Project
MANE	6290	Engineering Project
MANE	6390	Engineering Project

(*May be repeated for credit.*)
MANE 7300 Thesis
(*May be repeated for credit
until completing thesis work.*)

Course Descriptions

A listing of graduate course offerings in manufacturing engineering can be found in the Course Descriptions beginning on page 213.

Master of Science in Engineering Management

Graduate Program Overview

The University of Texas-Pan American offers a graduate program in engineering management leading to a Master of Science. The department offers thesis, report and non-thesis options. The manufacturing engineering department is transitioning this program to an online delivery mode. Additionally, a Concentration in Systems Engineering is available for students interested in qualifications in Systems Engineering.

The engineering management major is designed for students to develop an understanding of the engineering relationships between the management tasks of planning, organization, leadership, control and the human element in production, research and service organizations. There are strong synergies between the MS in engineering management, the MS in computer science and information technology, the existing MSE programs in electrical engineering, manufacturing engineering, mechanical engineering and the College of Business Administration. Students are provided an opportunity to strengthen their technological education and acquire the skills to manage and lead engineers and engineering systems.

The graduate program in engineering management requires 30-36 semester credit hours, 15 of which are required of all students. There are three choices of programs in engineering management: 1) thesis, 2) report and 3) coursework only. The thesis option requires 24 hours of coursework and six hours of thesis. The 24 hours of coursework is divided into 15 hours of required coursework, 9 - 15 hours of engineering management electives and 0 - 6 hours of non-engineering management electives. The report option requires 30 hours of coursework and six hours of report. The 30 hours of coursework is divided into 15 required hours, 6 - 15 hours of engineering management electives and 0 - 9 hours of non-engineering management electives. The coursework only option requires 36 hours of coursework divided into 15 required hours, 9- 21 hours of engineering management electives and 0 - 12 hours of non-

engineering management electives.

For those students interested in a Concentration in Systems Engineering there is a prescribed list of courses required for the thesis option and for the coursework option. With the Concentration in Systems Engineering, the thesis option requires 33 hours and the coursework option requires 36 hours. The report option is not available with a Concentration in Systems Engineering.

Students make an oral presentation on the thesis, the report or a project for coursework option to the faculty advisory committee. Students not enrolled in the thesis option must satisfactorily pass a written test to complete the requirements for the Master of Science in engineering management.

The thesis option gives students an opportunity to pursue research and continue their studies at the doctoral level. The engineering practicum with report option is designed to help practicing engineers or engineering managers with managing engineers and engineering systems. The coursework option is designed to provide technical breadth. The coursework only path is designed to meet the needs of practicing engineers and engineering managers who do not intend to pursue further graduate studies.

Students may be required to take some leveling courses to satisfy prerequisites, depending on their undergraduate major and experience. The departmental graduate adviser or the students Graduate Faculty Advisory Committee (GFAC) specifies each students leveling work.

Admission to the Engineering Management Program

The student must first meet all requirements for graduate admission to UT Pan American ([see page 17](#)), as well as the other requirements listed below for clear admission to the program. Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office. Entry requirements include:

1. A grade point average of 3.0 or higher (on a 4.0 scale) for the last 60 hours.
2. A bachelor's degree in engineering.
3. A minimum of two years of engineering experience,
4. Completion of MANE 2340 Fundamentals of Industrial Engineering, MANE 3332 Engineering Statistics, MANE 3337 Engineering Economics or equivalent courses.
5. For foreign national students whose primary language is not English, a score on the Test of English as a Foreign Language (TOEFL) of 500 and
6. Successfully completed all requirements for changing from probationary to clear admission (if applicable).

Degree Requirements

◆ Thesis Option		
a) Courses required of all students		15 hours
b) Electives prescribed for the students		None
c) Engineering Management electives		9-15 hours
d) Other: Thesis		6 hours
TOTAL SCH		30 hours
◆ Engineering Practicum Option		
a) Courses required of all students		15 hours
b) Electives prescribed for the students		None
c) Engineering Management electives		6-15 hours
d) Non-Engineering Management electives		0-9 hours
e) Other		None
TOTAL SCH		36 hours
◆ Coursework Option		
a) Courses required of all students		15 hours
b) Electives prescribed for the students		None
c) Engineering Management electives		9-21 hours
d) Non-Engineering Management electives		0-12 hours
e) Other		None
TOTAL SCH		36 hours

◆ Coursework for Concentration in Systems Engineering with Thesis Option

Students who want to receive a Concentration in Systems Engineering and complete a research thesis must complete a list of prescribed courses to receive the Concentration in Systems Engineering. The courses include subject matter specific to the practice of Systems Engineering.

CSCI	6340	Software Engineering
MANE	6304	Industrial Cost Analysis
MANE	6315	Reliability Engineering
MANE	6319	Quality Management Systems (or
MANE	6368	Logistics Engineering)
MANE	6340	Operations Research
MANE	6345	Engineering Management (or MANE
		6365 Human Factors)
MANE	6348	Systems Engineering
MANE	6352	Simulation of Manufacturing Systems
MANE	6380	Engineering Project Management
MANE	7300	Thesis I
MANE	7301	Thesis II

◆ Coursework for Concentration in Systems Engineering with Coursework Option

Students who want to receive a Concentration in Systems Engineering with a coursework option must complete a list of prescribed courses to receive the Concentration in Systems Engineering. The courses include subject matter specific to the practice of Systems Engineering.

CSCI	6340	Software Engineering
MANE	6304	Industrial Cost Analysis
MANE	6315	Reliability Engineering
MANE	6319	Quality Management Systems
MANE	6340	Operations Research
MANE	6345	Engineering Management
MANE	6348	Systems Engineering
MANE	6352	Simulation of Manufacturing Systems
MANE	6357	Ergonomics
MANE	6365	Human Factors
MANE	6368	Logistics Engineering
MANE	6380	Engineering Project Management

◆ Leveling Courses

MANA	2340	Fundamentals of Industrial Engineering
MANE	3332	Engineering Statistics (or MATH 4339)
MANE	3337	Engineering Economy

As an alternate, students may take MANE 6301 and MANE 6302 to satisfy the leveling course requirements.

◆ Courses Required of All Students

MANE	6304	Industrial Cost Systems
MANE	6319	Quality Management Systems
MANE	6340	Operations Research and Analysis
MANE	6345	Engineering Management
MANE	6380	Engineering Project Management

◆ Engineering Management Electives

MANE	6311	Advanced Quality Control
MANE	6313	Design of Experiments
MANE	6315	Reliability Engineering
MANE	6331	Advanced Manufacturing Planning and Control
MANE	6341	Advanced Operations Research and Analysis
MANE	6342	Decision Support Systems
MANE	6343	Queueing Models for Manufacturing Systems
MANE	6347	Facilities Layout
MANE	6348	Systems Engineering
MANE	6349	Advanced Work Science
MANE	6352	Simulation of Manufacturing Systems
MANE	6354	Advanced Engineering Economy
MANE	6357	Ergonomics
MANE	6364	Advanced Manufacturing Processes
MANE	6368	Logistics Engineering
MANE	6383	Polymer Systems
MANE	6384	Polymer Structures
MANE	6385	Plastic Product Design
MANE	6399	Topics in Manufacturing Engineering (may be repeated for credit when the topic changes)

◆ Non-Engineering Management Electives

Engineering management students may select additional graduate elective courses other than the courses listed under

engineering management electives with their committees approval. Thesis students are limited to six hours of non-engineering management electives and coursework option students are limited to 12 hours of non-engineering management electives.

Students may elect to strengthen their technical education by selecting non-engineering management graduate courses offered by the College of Science and Engineering. Students desiring to strengthen their education in management may enroll in graduate courses offered by the College of Business Administration (COBA). A partial list of electives from the COBA is shown below:

FINA	6340	Financial Administration
MANA	6330	Management
MANA	6331	Personnel Administration and Industrial Relations
MANA	6332	Organizational Leadership and Change
MANA	6334	International Management
MANA	6335	Organizational Theory
MANA	6360	Production Management and Operations Management

◆ Engineering Practicum/Thesis Courses

MANE	6190	Engineering Project
MANE	6290	Engineering Project
MANE	6390	Engineering Project
MANE	7300	Thesis

(may be repeated for credit)

Course Descriptions

A listing of graduate course offerings in engineering management can be found in the manufacturing engineering course descriptions beginning on page 212.

Mechanical Engineering

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Mechanical Engineering Faculty
 Ahn, Seokyoung, *Assistant Professor,*
Model-Based MIMO Control Design,
Nonlinear Estimation and Filtering Algorithms
and Rapid Response Manufacturing
 Crown, Stephen, *Associate Professor,*
Applied Thermodynamics, Refrigeration,
Heat Transfer and Multimedia Instructional Methods

Freeman, Robert A., *Professor,*
Kinetic and Dynamic Modeling,
Analysis, Design and Control of Multi-Rigid-Body Linkage Systems,
Robotics and Biomechanics

Fuentes, Arturo, *Assistant Professor,*
Dynamic Response Analysis, FEA and Engineering Education

Jones, Robert E., *Associate Professor,*
Polymers and Composites, Fracture Mechanics and Materials Testing

Kypuros, Javier, *Assistant Professor,*
Dynamic Systems Modeling and Control, Nonlinear Control Systems,
Bond Graph Modeling and Control of Morphing Structures

Lozano, Karen, *Associate Professor,*
Process-Structure-Property Relationships of Nanoreinforced Systems

Qubbaj, Ala, *Associate Professor,*
Thermal Systems and Energy and Combustion
 Tarawneh, Constantine, *Assistant Professor,*
Acoustics and Vibrations, Mechanical Measurements
and Instrumentation and Thermal/Fluid

Vasquez, Horacio, *Assistant Professor,*
Automation, Instrumentation, Control Systems
and Mechatronics

Master of Science in Engineering: Mechanical Engineering

The Mechanical Engineering Department offers a graduate program leading to a Master of Science in engineering degree. The program has a thesis option, a project with report option and a course option. Coursework is offered in areas including mechanics and design, materials and thermal/fluid sciences. Potential research opportunities exist in combustion, nanotechnology, smart structures, biomechanics, robotics, mechatronics, acoustics and vibrations, materials science, solid mechanics and laser material processing.

Admission to the Mechanical Engineering Program

The student must first meet all requirements for graduate admission to UT Pan American ([see page 17](#)), as well as the other requirements listed below. Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office.

For unconditional admission the student must:

(1) Have a bachelor's degree in mechanical engineering or related area with a grade point average of 2.75 or higher on a 4.0 scale.

(2) Attach or request through their online application three letters of recommendation attesting to the applicants academic potential and capability for performing graduate-level work in mechanical engineering.

Applicants who do not satisfy the specific program criteria above will be considered for conditional admission. Those with bachelor's degree in a field other than mechanical engineering may be admitted subject to completion of a set of undergraduate leveling courses prescribed by the graduate program director. Students admitted conditionally must successfully complete all leveling courses, if any, and successfully complete their first six hours of graduate work with a grade of B or higher.

Degree Requirements

◆ Thesis Option (30 hours total)
 This option requires 24 hours of regular coursework plus six hours of thesis, selected as follows:

A. MECE 6310 Intermediate Engineering Analysis (3 hours)

B. Six hours of Thesis
 MECE 7300 Masters Thesis I
 MECE 7301 Masters Thesis II

C. Twenty-one hours of additional courses chosen with the consent of the students adviser. At least 15 hours must be in mechanical engineering, and up to six hours may be selected from other programs within the College of Science and Engineering, but must be approved by the students adviser and the graduate program director.

◆ Report Option (36 hours total)
 A. MECE 6310 Intermediate Engineering Analysis (3 hours)

B. Six hours of project report:
 MECE 6397 Masters Report I
 MECE 6398 Masters Report II

C. Twenty-seven hours of additional courses chosen with the consent of the students adviser. At least 21 hours

must be in mechanical engineering, and up to six hours may be selected from other programs within the College of Science and Engineering, but must be approved by the students adviser and the graduate program director.

- ◆ Non-Thesis Option (36 hours)
 - A. MECE6310 Intermediate Engineering Analysis (3 hours)

B. Thirty-three hours of additional courses chosen with the consent of the students adviser. At least 27 hours must be in mechanical engineering, and up to six hours may be selected from other programs within the College of Science and Engineering, but must be approved by the graduate program director.

Course Descriptions

A listing of mechanical engineering graduate courses offered by the Department of Engineering can be found in the Course Descriptions section of this catalog on page 221.

Graduate Certificate Programs in Mechanical Engineering: Mechanics and Design, Materials and Thermal-Fluid Sciences

Mission Statement

The Department of Mechanical Engineering will provide students and professionals a quality education to prepare them for the practice of engineering.

Background

Students and professionals interested in obtaining additional broad-based technical education in a selected mechanical engineering area of concentration will have the option of pursuing a graduate certificate program. The current mechanical engineering research and graduate teaching areas include: mechanics and design, materials, and thermal-fluid sciences.

The certificate program is a professional-oriented program designed for individuals who possess at least one degree in engineering or closely-related field.

From the students point of view, a certificate program will guarantee a valuable learning experience for professional development.

From the industry's viewpoint, the program is structured so that their professionals contribute to their organizations mainstream goals.

Certificate Programs Overview

Twelve hour program (four graduate courses coursework will be for a grade).

UTPA undergraduate students are eligible to enroll in courses upon graduation.

Students who are not currently enrolled at must first meet all requirements for graduate admission to UT Pan American (see page 17), as well as the other requirements listed below. Application for admission must be submitted online; the application is available at www.utpa.edu/gradschool. Once submitted, applicants can check the status of their applications online or by contacting the Graduate Office.

For unconditional admission the student must:

(1) Have a bachelor's degree in mechanical engineering or related area with a grade point average of 2.75 or higher on a 4.0 scale.

(2) Attach or request through their online application three letters of recommendation attesting to the applicants academic potential and capability for performing graduate-level work in mechanical engineering.

Applicants who do not satisfy the specific program criteria above will be considered for conditional admission. Those with a bachelor's degree in a field other than mechanical engineering may be admitted subject to completion of a set of undergraduate leveling courses prescribed by the graduate program director. Students admitted conditionally must successfully complete all leveling courses, if any, and successfully complete their first six hours of graduate work with a grade of B or higher.

Most of the mechanical engineering graduate courses are offered during the evening convenient for working professionals and the number of courses offered may vary per semester.

Students receive a certificate upon completion of four graduate courses at UTPA in a chosen area from the mechanical engineering graduate courses list with a minimum cumulative GPA of 3.0 in the four courses.

All courses for the certificate must be taken at the Department of Mechanical Engineering. Transfer graduate courses are NOT considered for the certificate.

The maximum time limit for completion of the certificate program is four years. There is no fifth year; a student must start with four new graduate courses to earn his/her certificate.

The credit for classes may be applied toward the Master of Science in mechanical engineering should the student decide later to pursue an advanced degree. For instance, obtaining three different certificates will grant the professional masters degree in mechanical engineering.

◆ Certificate programs will be available in the following areas:

Mechanics and Design.

Choose four, three-unit courses:

• MECE 6310, MECE 6329, MECE 6331, MECE 6332, MECE 6333, MECE 6339, MECE 6341, MECE 6342, MECE 6343, MECE 6344, MECE 6360, MECE 6362, MECE 6399.

Materials.

Choose four, three-unit courses:

• MECE 6310, MECE 6318, MECE 6319, MECE 6320, MECE 6321, MECE 6322, MECE 6323, MECE 6324, MECE 6325, MECE 6326, MECE 6327, MECE 6328, MECE 6329, MECE 6362, MECE 6399.

Thermal-Fluid Sciences

Choose four three-unit courses:

• MECE 6310, MECE 6341, MECE 6342, MECE 6362, MECE 6372, MECE 6373, MECE 6375, MECE 6380, MECE 6384, MECE 6399.

U.S. Citizenship and Immigration Services Considerations

Mexican nationals who will be living in Mexico while studying at UTPA are considered border commuter students. Border commuter students can apply for a student visa to study partial time at UTPA. However, international students, including Mexican nationals, who will be living in the United States while studying, can only apply for a student visa to study full time at UTPA (at least nine credits/semester). For more information, please contact:

Dr. Constantine Tarawneh, *Graduate Program Director*
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Telephone: 956/381-2607
E-mail: tarawneh@utpa.edu

Mathematics

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Chakraborty, Santanu, *Assistant Professor*
Debnath, Lokenath, *Professor and Department Chair*
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Galstyan, Anahit, *Assistant Professor*
Gkioulekas, Eleftherios, *Assistant Professor*
Maruno, Kenichi, *Assistant Professor*
Mukherjea, Arunava, *Professor*
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Onica, Constantin, *Assistant Professor*
Pierce, Virgil U., *Assistant Professor*
Poletaeva, Elena, *Assistant Professor*
Riahi, Daniel, *Professor*
Roy, Ranadhir, *Assistant Professor*
Roychowdhury, Mrinal K., *Assistant Professor*
Taylor, Monty B., *Professor*
Tsay, Jenq-Jong, *Assistant Professor*
Varlamov, Vladimir, *Associate Professor*
Villalobos, Maria Cristina, *Associate Professor*
Wang, Xiaohui, *Assistant Professor*
Watkins, William T., *Professor*
Yagdjian, Karen, *Associate Professor*
Yanev, George, *Assistant Professor*
Yoon, Jasang, *Assistant Professor*

Master in Mathematics Graduate Program

The Department of Mathematics offers a 36-hour master's degree program which can be completed in one of three ways:

(a) A 36-hour non-thesis program completed with coursework leading to a Master of Science in mathematics.

(b) A 36-hour coursework-research project program completed by taking Research Report, MATH 6390 (three hours for project).

(c) A 36-hour coursework-thesis program completed by taking Thesis, MATH 7300 and MATH 7301 (six hours for thesis).

An 18-hour core is required of all students; additionally, students must complete 18 hours in a concentration area. A masters in applied mathematics has also been added recently, a new option in the current master's program.

All students applying for admission to this program must meet all University requirements for entrance into graduate studies and hold a bachelor's degree in mathematics or a related field.

Objectives of the Program

Educational objectives for the Mathematics Teaching

Option:

1. To provide instruction for secondary mathematics teachers to upgrade their knowledge of mathematics and to improve their pedagogical skills.
2. To prepare secondary mathematics teachers to become leaders within their school district in the areas of mathematics curriculum and instruction.
3. To prepare students for advanced graduate study in mathematics education.

Educational objectives for the Mathematical Sciences

Option:

1. To provide the mathematics content needed for a student to pursue a career in professional areas requiring advanced mathematics.
2. To prepare students for advanced graduate study in mathematics.

Degree Requirements

Core Courses 18 hours

MATH 6331	Algebra I
MATH 6332	Algebra II
MATH 6352	Analysis I
MATH 6353	Analysis II
MATH 6365	Probability and Statistics
MATH 6387	Mathematical Modeling

Designated Electives 18 hours

Mathematical Sciences Concentration

Select four courses from the following:

MATH 6330	Linear Algebra
MATH 6337	Advanced Number Theory
MATH 6359	Applied Analysis
MATH 6360	Ordinary Differential Equations
MATH 6361	Partial Differential Equations
MATH 6362	Fourier Analysis
MATH 6364	Statistical Methods
MATH 6370	Topology
MATH 6375	Numerical Analysis
MATH 6376	Numerical Methods for Partial Differential Equations
MATH 6385	Cryptology and Codes
MATH 6388	Discrete Mathematics
MATH 6391	Masters Project
MATH 7300	Thesis
MATH 7301	Thesis

Select an additional six hours of approved electives.

Mathematics Teaching Concentration

The following courses are required:

MATH 6308	Teaching of Algebraic Concepts
MATH 6310	Topics in Mathematics Teaching

MATH 6312 Teaching of Geometric Concepts

MATH 6390 Mathematics Seminar

Select an additional six hours of approved electives.

Master of Science in Applied Mathematics: Thesis and Non-Thesis Options

This is a new option in the current master's program.

A thesis option accommodates a six-hour thesis requirement by reducing the designated elective requirement from 15 hours to 12 (nine hours).

Degree Requirements

◆ Non-Thesis Option

Core Courses

Complete the following five courses:

MATH 6352	Analysis I
MATH 6360	Ordinary Differential Equations
MATH 6387	Modeling
MATH 6330	Linear Algebra
MATH 6359	Applied Analysis

Designated Electives

Complete five courses selected from the following:

MATH 6361	Partial Differential Equations
MATH 6362	Fourier Analysis
MATH 6388	Discrete Mathematics
MATH 6375	Numerical Analysis
MATH 6376	Numerical Methods for Partial Differential Equations
MATH 6385	Cryptology and Codes
MATH 6455	Applied Mathematics I
MATH 6456	Applied Mathematics II

Free Electives

Select an additional six hours of approved electives.

◆ Thesis Option

Core Courses

Complete the following five courses:

MATH 6352	Analysis I
MATH 6360	Ordinary Differential Equations
MATH 6387	Modeling
MATH 6330	Linear Algebra
MATH 6359	Applied Analysis

Designated Electives

Complete three courses selected from the following:

MATH 6361	Partial Differential Equations
MATH 6362	Fourier Analysis
MATH 6388	Discrete Mathematics
MATH 6375	Numerical Analysis
MATH 6376	Numerical Methods for

		Partial Differential Equations
MATH	6385	Cryptology and Codes
MATH	6455	Applied Mathematics I
MATH	6456	Applied Mathematics II

Free Electives

Select an additional six hours of approved electives.

Thesis

MATH	7300	Thesis I
MATH	7301	Thesis II

Course Descriptions

A listing of graduate courses offered by the Department of Mathematics can be found in the Course Descriptions section of this catalog beginning on page 217.

Physics and Geology

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Corpuz, Edgar, *Assistant Professor*
Dimakis, Nikolaos, *Assistant Professor*
Hanna, Mohammad A., *Associate Professor*
Lin, Yuankun, *Assistant Professor*
Mazariegos, Rubén, *Associate Professor*
Zeng, Liang, *Associate Professor*

General Overview

Physics in the Rapidly Changing World

New developments in physics have been occurring every day and the field is being rejuvenated due to newest discoveries. More and more companies are looking for applicants with increasingly sophisticated skills in

physics. As the pace of advances in science and technology accelerates, physics education has become increasingly important in areas of science and its applications. Furthermore, the Rio Grande Valley is experiencing a shortage of qualified physics teachers in the public schools and community colleges.

Graduate Program of Study

The Department of Physics and Geology offers a 36-hour program leading to a Master of Science in Interdisciplinary Studies (MSIS) in physics education with thesis and non-thesis options. These options are designed to prepare students in their pursuit of further professional development and for interdisciplinary graduate studies in their area of concentration in physics.

NOTE: All the prospective students must have science background to enroll in the MSIS in physics education program. Requirements: 16-18 hours of physics courses must be required (including PSCI 1421, PSCI 1422, PHYS 1401 and PHYS 1402 and advanced physics hours) for students/teachers coming from other disciplines.

All students complete a core curriculum. Students in the physics concentration select electives from a collection of courses designed to enhance and develop further skills in science education. Courses are normally offered in the evening, online and during the summer sessions providing greater flexibility in the offerings for part-time teachers and students.

Applications and Contact Information

Admission is possible in all semesters. Students applying for admission to this program must meet the University's grade point average requirement hold a bachelor-level degree and have 16-18 hours of physics background. For further information, visit our home page at www.panam.edu/dept/physci or contact:

MSIS Graduate Program Coordinator
Department of Physics and Geology
The University of Texas-Pan American
1201 W. University Drive
Edinburg, TX 78539-2999
Telephone: 956/381-3521 (Main Office)
Fax: 956/381-2423

Master of Interdisciplinary Studies (MSIS) Degree in Physics Education Non-Thesis

Core Courses: Physics Content	12 hours
PHYS 5404	Physics by Inquiry I
PHYS 5405	Physics by Inquiry II (prerequisite PHYS 5404)
PHYS 6400	Astronomy by Sight (prerequisite PHYS 5405)

Electives: Non-Thesis Option 6 hours

Select any two courses:

PHYS	6301	Topics in Physics for Teachers (prerequisite PHYS 6400)
PHYS	6302	Environmental Physics for Teachers (prerequisite PHYS 6301)
PHYS	6303	Quantum Information
GEOL	5301	Geology and Geography
GEOL	6302	Meteorology and Oceanography
GEOL	6410	GeoScience for Teachers

Education 9/12 hours

EDCI	6301	Instructional Technology
EDCI	6302	Multicultural Education
EDCI	6307	Research Issues and Trends in Education
		or
EDCI	6308	Practicum for Secondary Education
SCIE	6303	Recent Development Applied Science
EDCI	6306	Special Projects
EDCI	6305	Education Curriculum
EDCI	6310	Research Methods in Education

Mathematics 9/12 hours in any of the areas

MATH	6308	Teaching of Algebraic Concepts
MATH	6310	Topics in Mathematics Teaching
MATH	6312	Teaching in Geometric Concepts
MATH	6390	Mathematics Seminar
MATH	6328	Integrated Problem-Solving Transition Geometry Transition in Problem-Solving Transition Algebra

Educational Psychology 9/12 hours in
Gifted Education

EPSY	6330	Identifying the Gifted and Talented
EPSY	6331	Curriculum and Materials for the Gifted and Talented
EPSY	6332	Creativity and the Gifted and Talented
EPSY	6333	Counseling for the Gifted and Talented
EPSY	6342	Seminars in Gifted Education

Course Descriptions

A listing of graduate courses offered by the Department of Physics and Geology can be found in the Course Description section of this catalog beginning on page 235 (physics) and 206 (geology). All physics and geology courses require graduate standing before enrollment.