MASTER OF SCIENCE (M.S.), MAJOR IN TECHNOLOGY MANAGEMENT

Major Program
The technology management graduate program at Texas State is designed for those who seek careers or career advancement in the management of engineering and production activity in the construction and concrete industries, in the semiconductor, cast metals, machining, fabrication, and other manufacturing industries, or in the fields of power generation, environmental management, and occupational health and safety.

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

Degree Requirements
The master of science (M.S.) in technology management is a 36-hour degree program. It is comprised of a 30-hour major in technology management plus a 6-hour cognate minor in business management. The major includes 15 hours of core technology courses that are common to all students, regardless of specialization. Students may elect one of three 9-hour specializations in construction management, manufacturing management, or general industrial management. The 6-hour cognate minor allows students to select from such industry-focused business courses as supply chain management, process improvement management, managing business creativity, organizational change management, etc.

All students are required to complete a 6-hour research component. Students may select either a traditional academic thesis or an industry-focused directed project. A thesis is the more appropriate option for full-time students who may have ambitions of further graduate study, while the directed project is the best choice for part-time students who hold jobs in industry.

Course Work Requirements

Core Technology Management

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<th>Course Code</th>
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Specializations
Select 9 hours from one of the following specializations:

- Construction Management
  - CSM 5313 Building Information Modeling
  - CSM 5360 Construction Company Financial Control
  - CSM 5362 Construction Contract Delivery Systems
  - CIM 5330 Advanced Concrete Technology
  - CIM 5340 Innovation Strategies for the Concrete Industry
  - TECH 5384 Problems in Technology

- Manufacturing Management
  - TECH 5310 Product Design and Development
  - TECH 5311 Computer Aided Engineering
  - TECH 5364 Robust Product and Process Design
  - TECH 5387 Planning Advanced Technology Facilities
  - TECH 5391 Advanced Manufacturing Systems
  - TECH 5392 Fundamentals of Microelectronics Manufacturing
  - TECH 5384 Problems in Technology

- Industrial Management
  - TECH 5364 Robust Product and Process Design
  - TECH 5385 Readings in Technology
  - TECH 5387 Planning Advanced Technology Facilities
  - TECH 5384 Problems in Technology

Research Component
Select one of the following:

- TECH 5399A Thesis
- TECH 5399B Thesis
- TECH 5398 Directed Project (Repeatable for credit)

Cognate Minor in Business Management
Select 6 hours from the following:

- MGT 5310 Organizational Change Management
- MGT 5311 Process Improvement Management in Organizations
- MGT 5315 New Venture Management
- MGT 5321 Supply Chain Management
- MGT 5325 Managing Business Creativity
- MGT 5391 Managing the Communication Process

Total Hours: 36

Notes:
1. Upon advice of the graduate advisor, students specializing in either manufacturing management or industrial management may also elect courses offered through the Ingram School of Engineering, and/or other departments in the College of Science and Engineering.
2. Additional thesis courses are also available: TECH 5199B, TECH 5299B, TECH 5599B, and TECH 5999B. Students should refer to the Thesis tab for more information.
3. Other courses in the McCoy College of Business may also be elected upon advice of the graduate advisor acting in consultation with the graduate advisor for the McCoy College of Business Administration.

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

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

**Thesis Committee**

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

**Thesis Enrollment and Credit**

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

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

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

**Fee Reduction**

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

**Thesis Deadlines and Approval Process**

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

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

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

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

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

Master’s level courses in Engineering Technology: CIM (p. 2), CSM (p. 3), TECH (p. 3)

**Courses Offered**

**Concrete Industry Management (CIM)**

**CIM 5330. Advanced Concrete Technology.**

The course will cover hydraulic cements, aggregates, admixtures, and mix design; concrete production, quality control, early-age properties and durability. Concrete distress examination, identification, prevention, and nondestructive testing; advanced concrete technology, high-strength and high performance concrete. Prerequisite: CIM 2342.

**3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.**

**Grade Mode:** Standard Letter

about Advanced Concrete Technology

**CIM 5340. Innovation Strategies for the Concrete Industry.**

This course provides students a new set of tools for and experience in finding and developing innovative alternatives for addressing strategic business problems in concrete industry. Students will explore creativity from individual and team perspectives and identify innovation opportunities and roadblocks in organizational settings. Prerequisite: CIM 3340 and CIM 3366 or Instructor’s Approval.

**3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.**

**Grade Mode:** Standard Letter

about Innovation Strategies for the Concrete Industry
**Construction Science and Management (CSM)**

CSM 5302. Fundamentals of Construction Contracts and Liability Issues. This course introduces students to the legal aspects of design and construction contract documents, including dispute resolution methods and professional ethics commonly used in the construction industry. This course does not earn graduate degree credit.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 5304. Fundamentals of Construction Estimating. This course provides the student with a comprehensive introduction to the principles, techniques, technologies, and basic concepts involving methodologies and strategies used in the preparation of various types of construction estimates and bids. This course does not count as degree credit.

3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 5306. Fundamentals of Commercial Building Construction Systems. This course is a commercial building construction systems class dealing with soils, site work, heavy foundations, steel, reinforced concrete, precast structures and common assemblies. Commercial MEPs are studied along with CSI master format, as-built/shop drawings, schedule of values, AIA documents, and appropriate building codes. Does not count as degree credit.

3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.

Course Attribute(s): Leveling

Grade Mode: Leveling/Assistantships

CSM 5313. Building Information Modeling. This course covers understanding the supervisory role of construction professionals in the design process including, directing a design team in the integration of construction documents for commercial buildings, coordination of site work, structural, architectural, mechanical, electrical, plumbing plans and contemporary CAD software for 2D & 3D design including Building Information Modeling. Prerequisite: CSM 2313 or consent of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 5360. Construction Company Financial Control. Financial accounting and cost controls used at the company level in construction companies are studied. Topics include accounting systems, construction project profit calculations, and financial analysis. Prerequisites: CSM 5302, CSM 5304, and CSM 5306 or Instructor’s Approval.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Standard Letter

**Technology (TECH)**

TECH 5100. Academic Instruction for Technology. This course is seminar based and covers topics related to teaching and employment responsibilities. Completion of this course is required as a condition of employment for graduate assistants. This course does not earn graduate credit. Repeatable with different emphasis. Graded on a credit (CR), no-credit (F) basis.

1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.

Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA

Grade Mode: Leveling/Assistantships

TECH 5195. Industrial Internship. This course is a supervised experiential learning course in Technology Management. This work integrated learning course helps the student link theory with practice. Repeatable for credit. Prerequisites: 9 hours completed toward the Master of Science in Technology Management degree and the approval of the graduate advisor.

1 Credit Hour. 0 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing

Grade Mode: Credit/No Credit

about Industrial Internship

TECH 5199B. Thesis. This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on credit (CR), progress (PR), no-credit (F) basis.

1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.

Grade Mode: Credit/No Credit

about Thesis

TECH 5299B. Thesis. This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on credit (CR), progress (PR), no-credit (F) basis.

2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.

Grade Mode: Credit/No Credit

about Thesis
Principles of quality management including probability theory and basic statistics, control charts for attributes and variables, sampling plans, quality audits, and costs. Experiences in basic metrology and data collection for quality control. This course does not count as credit toward a degree.

about Fundamentals of Quality Assurance
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

about Fundamentals of Quality Assurance

TECH 5307. Fundamentals of Manufacturing Processes.
Application of metal cutting principles. Includes steel rule dye layout, machine layout, tool life, tool wear, tool geometry and reconditioning, principles of feed rate and speed, material removal rates and power consumption. Machining of steel and castings using various cutting tools. Does not count toward degree credit. Prerequisite TECH 2330.

about Fundamentals of Manufacturing Processes
3 Credit Hours. 1 Lecture Contact Hour. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Credit/No Credit

about Fundamentals of Manufacturing Processes

TECH 5310. Product Design and Development.
This course provides an overview of the new product realization process. The focus is on the steps of systematic product design including problem identification, product planning, conceptual design, and embodiment design. Standard CAD tools are employed for product modeling. Prerequisite TECH 2310 or instructor's approval.

about Product Design and Development
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Product Design and Development

Application of computer hardware and software to the design of products and systems; geometric modeling; engineering computational methods; overview of engineering analysis software which may include finite element analysis, manufacturing simulation, solidification modeling, and rapid prototyping. Prerequisites: TECH 5310 and MATH 2471, or equivalents.

about Computer Aided Engineering
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

about Computer Aided Engineering

TECH 5315. Engineering Economic Analysis.
This course deals with economic analytical techniques used in engineering decision making. Topics include time value of money, comparing alternatives, depreciation, replacement, and income tax considerations. Prerequisite: MATH 1315 or MATH 1319 or consent of instructor.

about Engineering Economic Analysis
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Engineering Economic Analysis

Provides the student with in-depth knowledge of inferential statistics as applied to design of robust processes and products. Topics covered include probability distributions, ANOVA, fractional factorial design, response surface method, orthogonal arrays, and Taguchi method. Prior experience with introductory-level statistics is assumed. Prerequisite: TECH 5394 with a grade C or higher.

about Robust Product and Process Design
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Robust Product and Process Design

TECH 5365. Industrial Project Management and Scheduling.
Introduce students to industrial management system concepts and applications as they relate to management operations; system design, implementation and management; case studies of practices; and application of theory to practical problems.

about Industrial Project Management and Scheduling
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Industrial Project Management and Scheduling

TECH 5382. Sustainability in Industrial Management.
This class will cover the basic concepts, principles, and techniques related with sustainability in the fields of engineering and management. Emphasis will be placed on the construction and manufacturing technologies. Case studies will be introduced to understand a broad spectrum of industrial activities.

about Sustainability in Industrial Management
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Sustainability in Industrial Management

TECH 5384. Problems in Technology.
Graduate students investigate a special topic by developing a technical problem, researching the topic, and presenting the findings. Plans will be developed on an individual basis with strict faculty supervision. May be repeated for additional credit with permission of the department chair.

about Problems in Technology
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Problems in Technology

TECH 5385. Readings in Technology.
A study of the ethical and moral viewpoints typically associated with American society as related to the development and introduction of new technology and engineering. Past, present, and future issues will be studied with selected readings focusing on industrial related problems and issues.

about Readings in Technology
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Readings in Technology

TECH 5387. Planning Advanced Technology Facilities.
An in-depth study of technical problems encountered in designing, equipping, arranging, and specifying facility requirements for industrial and technical training facilities.

about Planning Advanced Technology Facilities
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

about Planning Advanced Technology Facilities
TECH 5390. Research in Technology.
Examination of scientific methods including theory formulation, deductive reasoning, hypothesis generation, observation, inductive reasoning, and theory revision. Categories of research are compared and contrasted as regards methodology. In-depth study of experimental research as it relates to significant industrial problems including considerations of design, internal and external validity, and appropriate analytical technique. Introduction to data analysis and its proper interpretation.

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

about Research in Technology

TECH 5391. Advanced Manufacturing Systems.
This course introduces students to various advanced tools, technologies, and strategies in modern manufacturing. An emphasis is placed on the state-of-the-art in factory automation and global manufacturing enterprises. Topics include process automation and control, advanced manufacturing processes, intelligent manufacturing control, and information technology in manufacturing. Prerequisites: TECH 1363 and TECH 5307 or instructor's approval.

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

about Advanced Manufacturing Systems

An introduction to integrated circuit fabrication to include crystal growth, wafer preparation, epitaxial growth, oxidation, diffusion, ion-implantation, thin film deposition, lithography, etching, device and circuit formation, packaging and testing. Significant project involves actual production/testing of a functional semiconductor device. Laboratory component involves actual production/testing of a functional semiconductor device.

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

about Fundamentals of Microelectronics Manufacturing

TECH 5394. Design of Industrial Experiments.
This course deals with the study of the fundamentals and applications of industrial experiments. Prerequisite: TECH 5390.

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

about Design of Industrial Experiments

TECH 5398. Directed Project.
This course is a formal investigation into a business or industry problem. The directed project is an applied research project that is more extensive than an independent study and less extensive than a thesis. The course culminates in a detailed project report and oral presentation. Prerequisites: TECH 5390 and TECH 5394 and the approval of the graduate advisor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

about Directed Project

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

Grade Mode: Credit/No Credit

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

about Thesis

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

Grade Mode: Credit/No Credit

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

about Thesis

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

Grade Mode: Credit/No Credit

5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.

about Thesis

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

Grade Mode: Credit/No Credit

9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.

about Thesis