MASTER OF SCIENCE (M.S.) MAJOR IN TECHNOLOGY MANAGEMENT (MANUFACTURING MANAGEMENT CONCENTRATION THESIS OPTION)

Major Program
The Master of Science (M.S.) degree with a major in Technology Management 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.

Application Requirements
The items listed below are required for admission consideration for applicable semesters of entry during the current academic year. Submission instructions, additional details, and changes to admission requirements for semesters other than the current academic year can be found on The Graduate College’s website (http://www.gradcollege.txstate.edu). International students should review the International Admission Documents webpage (http://mycatalog.txstate.edu/graduate/admission-documents/international) for additional requirements.

- completed online application
- $55 nonrefundable application fee
- or
- $90 nonrefundable application fee for applications with international credentials
- baccalaureate degree from a regionally accredited university. Background course work may be required if the undergraduate degree is not in the following fields: industrial technology, technology management, construction science and management, concrete industry management, engineering technology, or engineering.
- official transcripts from each institution where course credit was granted
- minimum 2.75 GPA in the last 60 hours of undergraduate course work (plus any completed graduate courses)*
- GRE not required*
- brief statement of purpose to include an explanation of why the applicant is interested in Technology Management as a field of study
- current resume/CV

TOEFL or IELTS Scores
Non-native English speakers who do not qualify for an English proficiency waiver:

- official TOEFL iBT scores required with a 78 overall
- official IELTS (academic) scores required with a 6.5 overall and
- minimum individual module scores of 6.0

This program does not offer admission if the scores above are not met.

*Additional Information
If the GPA falls below the minimum requirement of 2.75, the student may submit the following to be considered for conditional admission:

- official GRE scores (general test only) with competitive scores in the verbal reasoning and quantitative reasoning sections

Degree Requirements
The Master of Science (M.S.) degree with a major in Technology Management concentration in manufacturing management requires 36 semester credit hours, including a thesis. Students who do not have the appropriate background course work may be required to complete leveling courses.

Course Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>TECH 5315</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>TECH 5365</td>
<td>Industrial Project Management and Scheduling</td>
<td>3</td>
</tr>
<tr>
<td>TECH 5382</td>
<td>Sustainability in Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>TECH 5390</td>
<td>Research in Technology</td>
<td>3</td>
</tr>
<tr>
<td>TECH 5394</td>
<td>Design of Industrial Experiments</td>
<td>3</td>
</tr>
</tbody>
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Concentration
Choose 9 hours from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>TECH 5310</td>
<td>Product Design and Development</td>
</tr>
<tr>
<td>TECH 5311</td>
<td>Computer Aided Engineering</td>
</tr>
<tr>
<td>TECH 5364</td>
<td>Robust Product and Process Design</td>
</tr>
<tr>
<td>TECH 5384</td>
<td>Problems in Technology</td>
</tr>
<tr>
<td>TECH 5387</td>
<td>Planning Advanced Technology Facilities</td>
</tr>
<tr>
<td>TECH 5391</td>
<td>Advanced Manufacturing Systems</td>
</tr>
<tr>
<td>TECH 5392</td>
<td>Fundamentals of Microelectronics Manufacturing</td>
</tr>
</tbody>
</table>

May choose other advisor-approved courses in the College of Science and Engineering

Thesis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECH 5399A</td>
<td>Thesis</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose a minimum of 3 hours from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECH 5199B</td>
<td>Thesis</td>
<td></td>
</tr>
<tr>
<td>TECH 5299B</td>
<td>Thesis</td>
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<tr>
<td>TECH 5599B</td>
<td>Thesis</td>
<td></td>
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</tbody>
</table>

Technology Management Cognate
Choose 6 hours from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGT 5310</td>
<td>Organizational Change Management</td>
</tr>
<tr>
<td>MGT 5311</td>
<td>Process Improvement Management in Organizations</td>
</tr>
</tbody>
</table>
Thesis Enrollment and Credit

The completion of a minimum of six hours of thesis enrollment is required. For a student's initial thesis course enrollment, the student will need to register for thesis course number 5399A. After that, the student will enroll in thesis B courses, in each subsequent semester until the thesis is defended with the department and approved by The Graduate College. Preliminary discussions regarding the selection of a topic and assignment to a research supervisor will not require enrollment for the thesis course.

Students must be enrolled in thesis credits if they are receiving supervision and/or are using university resources related to their thesis work. The number of thesis credit hours students enroll in must reflect the amount of work being done on the thesis that semester. It is the responsibility of the committee chair to ensure that students are making adequate progress toward their degree throughout the thesis process. 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. Thesis projects are by definition original and individualized projects. As such, depending on the topic, methodology, and other factors, some projects may take longer than others to complete. If the thesis requires work beyond the minimum number of thesis credits needed for the degree, the student may enroll in additional thesis credits at the committee chair's discretion. 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 (withdrawn), 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 has been both approved by The Graduate College and released to Alkek Library.

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

Thesis Deadlines and Approval Process

Thesis deadlines are posted on The Graduate College (http://www.gradcollege.txstate.edu) website under "Current Students." The completed thesis must be submitted to the chair of the thesis committee on or before the deadlines listed on The Graduate College website.

The following must be submitted to The Graduate College by the thesis deadline listed on The Graduate College website:

1. The Thesis Submission Approval Form bearing original (wet) and/or electronic signatures of the student and all committee members, uploaded in the online Vireo submission system.

2. One (1) PDF of the thesis in final form, approved by all committee members, uploaded in the online Vireo submission system.

After the dean of The Graduate College approves the thesis, Alkek Library will harvest the document from the Vireo submission system for publishing in the Digital Collections database (according to the student's embargo selection). NOTE: MFA Creative Writing theses will have a permanent embargo and will never be published to Digital Collections.

While original (wet) signatures are preferred, there may be situations as determined by the chair of the committee in which obtaining original signatures is inefficient or has the potential to delay the student's progress. In those situations, the following methods of signing are acceptable:

- signing and faxing the form
- signing, scanning, and emailing the form
- notifying the department in an email from their university's or institution's email account that the committee chair can sign the form on their behalf
- electronically signing the form using the university's licensed signature platform.
If this process results in more than one document with signatures, all documents need to be submitted to The Graduate College together.

No copies are required to be submitted to Alkek Library. However, the library 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 Alkek Library and pay the binding fee for personal copies.

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

**Courses Offered**

**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.*

**Course Attribute(s):** Exclude from Graduate GPA|Leveling

**Grade Mode:** Leveling/Assistantships

**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.*

**Course Attribute(s):** Exclude from Graduate GPA|Leveling

**Grade Mode:** Leveling/Assistantships

**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. This course does not earn graduate degree credit.

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

**Course Attribute(s):** Exclude from Graduate GPA|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 with a grade of "D" or better, or consent of instructor.

*3 Credit Hours. 3 Lecture Contact Hours. 0 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 and CSM 5304 and CSM 5306, all with a grade of "C" or better, or Instructor’s Approval.

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

**Grade Mode:** Standard Letter

**CSM 5362. Construction Contract Delivery Systems.**
The course will introduce students to designer/contractor interactions, including conceptual estimating and scheduling, the RFO/RFP process and legal, insurance, risk allocation issues, along with procurement and selection. Prerequisites: CSM 5302 and CSM 5304 and CSM 5306, all with a grade of "C" or better.

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

**Grade Mode:** Standard Letter

**Technology (TECH)**

**TECH 5100. Academic Instruction for Technology.**
The 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 degree credit. Repeatable with different emphasis.

*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

**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.

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

**Grade Mode:** Credit/No Credit

**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.

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

**Grade Mode:** Credit/No Credit
TECH 5307. Fundamentals of Manufacturing Processes. Application of metal cutting principles. Includes steel rule dym 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. This course does not count toward degree credit. Prerequisite TECH 2331 with a grade of "C" or better.

3 Credit Hours. 1 Lecture Contact Hour. 3 Lab Contact Hours.

Course Attribute(s): Exclude from Graduate GPA|Lab Required|Leveling

Grade Mode: Leveling/Assistantships

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 with a grade of "C" or better, or instructor's approval.

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

Grade Mode: Standard Letter

TECH 5311. Computer Aided Engineering. 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.

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

Course Attribute(s): Lab Required

Grade Mode: Standard Letter

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, with a grade of "C" or better, or consent of instructor.

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

Grade Mode: Standard Letter

TECH 5364. Robust Product and Process Design. 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 of "C" or better.

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

Grade Mode: Standard Letter

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.

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

Grade Mode: Standard Letter

TECH 5382. Industrial Ecology and Sustainability Engineering. This course covers the basic principles of life cycle analysis (LCA) of engineered products and processes. Topics covered include: industrial ecology, resource depletion, product design, process design, material selection, energy efficiency, product delivery, use, and end of life considerations.

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

Grade Mode: Standard Letter

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.

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

Grade Mode: Standard Letter

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.

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

Grade Mode: Standard Letter

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

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

Grade Mode: Standard Letter

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

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 and smart manufacturing enterprises. Topics include process automation and control, advanced manufacturing processes, intelligent manufacturing control, and information and communication technology (ICT) in manufacturing. Prerequisites: TECH 5307 or instructor's approval.

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

Grade Mode: Standard Letter

TECH 5392. Industrial Ecology and Sustainability Engineering. This course covers the basic principles of life cycle analysis (LCA) of engineered products and processes. Topics covered include: industrial ecology, resource depletion, product design, process design, material selection, energy efficiency, product delivery, use, and end of life considerations.

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

Grade Mode: Standard Letter
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 includes circuit design/simulation and/or process design. Laboratory component involves actual production/testing of a functional semiconductor device. I.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

TECH 5394. Design of Industrial Experiments.
This course deals with the study of the fundamentals and applications of industrial experiments. Prerequisite: TECH 5390 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

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, all with a grade of "C" or better, 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

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

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

TECH 5599B. 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.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

TECH 5999B. 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.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit