

## Program Overview

The Master of Science (M.S.) degree with a major in Engineering 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 page (<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. (Non-U.S. degrees must be equivalent to a four-year U.S. Bachelor's degree. In most cases, three-year degrees are not considered. Visit our International FAQs (<https://www.gradcollege.txst.edu/international/faqs.html>) for more information.)
- 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
- a 2.75 overall GPA or a 2.75 GPA in the last 60 hours of undergraduate course work (plus any completed graduate courses)\*
- GRE not required\*
- statement of purpose to include an explanation of why the applicant is interested in Technology Management as a field of study
- current resume/CV

### Approved English Proficiency Exam Scores

Applicants are required to submit an approved English proficiency exam score that meets the minimum program requirements below unless they have earned a bachelor's degree or higher from a regionally accredited U.S. institution or the equivalent from a country on our exempt countries list (<http://www.gradcollege.txstate.edu/international/language.html#waliver>).

- official TOEFL iBT scores required with a 78 overall
- official PTE scores required with a 52 overall
- official IELTS (academic) scores required with a 6.5 overall and minimum individual module scores of 6.0

- official Duolingo Scores required with a 110 overall
- official TOEFL Essentials scores required with an 8.5 overall

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

Conditional admission is not available to applicants who require "F" or "J" visas.

## Degree Requirements

The Master of Science (M.S.) degree with a major in Engineering Management concentration in Industrial Management requires 30 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

Code	Title	Hours
<b>Required Courses</b>		
TECH 5315	Engineering Economic Analysis	3
TECH 5365	Industrial Project Management and Scheduling	3
TECH 5394	Design of Experiments	3
<b>Concentration</b>		
Choose 9 hours from the following:		9
TECH 5310	Product Design and Development	
TECH 5380	Principles of Information and Communication Technology Management	
TECH 5382	Industrial Ecology and Sustainability Engineering	
TECH 5384	Problems in Technology	
TECH 5387	Advanced Facilities Planning	
May choose other advisor-approved courses in the College of Science and Engineering		
<b>Engineering Management Cognate</b>		
Choose 6 hours from the following:		6
MGT 5310	Organizational Change Management	
MGT 5311	Process Improvement Management in Organizations	
MGT 5312	Seminar in Management	
MGT 5330	Seminar in Human Resource Management	
MGT 5335	New Venture Launch	
MGT 5315	New Venture Management	
MGT 5321	Supply Chain Management	
MGT 5325	Managing Business Creativity	
MGT 5390	Managerial Data Analysis	
MGT 5391	Managing the Communication Process	
ANLY 5335	Forecasting and Simulation	
ANLY 5336	Analytics	
ANLY 5336	Analytics	
ISAN 5355	Database Management Systems	

ISAN 5357	Computing for Data Analytics	
ISAN 5357	Computing for Data Analytics	
May choose other advisor-approved business courses		
<b>Thesis</b>		
TECH 5399A	Thesis	3
Choose a minimum of 3 hours from the following:		
TECH 5199B	Thesis	
TECH 5299B	Thesis	
TECH 5399B	Thesis	
TECH 5599B	Thesis	
TECH 5999B	Thesis	
<b>Total Hours</b>		<b>30</b>

## Comprehensive Examination Requirement

The oral proposal defense is used as the comprehensive exam. The examination is administered by the student's main advisor (committee chair). Students who perform unacceptably on the exam may take the exam a second time.

Students who do not successfully complete the requirements for the degree within the timelines specified will be dismissed from the program.

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*.

## Thesis Proposal ([http://www.gradcollege.txstate.edu/docs/Thesis\\_Diss\\_Guide.pdf](http://www.gradcollege.txstate.edu/docs/Thesis_Diss_Guide.pdf))

The student must submit an official Thesis Proposal Form (<http://www.gradcollege.txstate.edu/forms.html>) and proposal to his or her thesis committee. Thesis proposals vary by department and discipline. Please see your department for proposal guidelines and requirements. After signing the form and obtaining committee members' signatures, the 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. The IRB approval letter should be included with the proposal form. If the thesis research involves vertebrate animals, the proposal form must include the Texas State IACUC approval code. It is recommended that the thesis proposal form be submitted to the dean of The Graduate College by the end of the student's enrollment in 5399A. Failure to submit the thesis proposal in a timely fashion may result in delayed graduation.

## 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. 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 (withdrew), 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.
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 (p. 5)

## Courses Offered

### Construction Science and Management (CSM)

#### CSM 5199B. Thesis.

This course represents a student's continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding.

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

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

**Grade Mode:** Credit/No Credit

#### CSM 5299B. Thesis.

This course represents a student's continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding.

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

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

**Grade Mode:** Credit/No Credit

#### 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, pre-cast 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 instructor approval.

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

**Grade Mode:** Standard Letter

#### CSM 5314. Technology Management in Construction.

This course covers the supervisory role of construction professionals in the Virtual Design and Construction (VDC) process. Topics covered include directing a VDC team in the integration of construction documents for construction (architectural, structural, mechanical, electrical, and plumbing plans), coordination of site work, implementation of current CAD software for 2D and 3D design, the Building Information Modeling (BIM) process, and other technologies that have an impact on the construction industry.

**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.

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

**Grade Mode:** Standard Letter

**CSM 5362. Pre-Construction Services.**

The course will introduce students to designer/contractor interactions, including conceptual estimating and scheduling, the RFQ/RFP process and legal, insurance, risk allocation issues, along with procurement and selection.

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

**Grade Mode:** Standard Letter

**CSM 5363. Construction Project Delivery and Leadership.**

This course covers methods of construction project delivery in detail and focuses on analyzing data to assess its impact on project outcomes.

Construction project delivery is covered along with contract strategies. An owner approach to a method selection is developed within this class.

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

**Grade Mode:** Standard Letter

**CSM 5364. Decision Making in Construction Management.**

This course focuses on the application of systems engineering and statistics used in solving construction and civil engineering problems.

Topics covered include network and linear programming models, construction and evaluation of decision trees to clarify a proper course of action considering uncertainty, probability distributions, sample statistics, linear regression models, risk analysis, and sampling plans for quality assurance. Personal computer usage emphasized for problem solving.

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

**Grade Mode:** Standard Letter

**CSM 5365. Construction Project Controls.**

This course covers construction management cost and schedule concepts, cost/schedule management information systems, variance analysis, forecasting, resource management, project recovery strategies, and application of theory to practical problems.

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

**Grade Mode:** Standard Letter

**CSM 5366. Soils in Construction.**

This course provides students with an in-depth examination of geotechnical principles as they apply to soil construction activities. Topics covered include geological formations of natural soils, soil mineralogy, soil sampling, classification, soil testing, dewatering, safety and sustainability in soil construction, soil contamination and remediation, recycled content used in soil construction and innovative technologies in soil stabilization.

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

**Grade Mode:** Standard Letter

**CSM 5367. Principles of Leadership in Construction.**

This course covers individual, organizational, and process/structure styles of leadership using a transformational model.

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

**Grade Mode:** Standard Letter

**CSM 5368. Sustainable Construction.**

This course examines a breadth of sustainable construction techniques, including material production, material selection, sustainable design, the ecology model for design, life cycle cost analysis, and sustainable construction. The sustainable construction techniques are discussed relative to advanced sustainable framing, waste minimization techniques, LEED, and green roofs.

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

**Grade Mode:** Standard Letter

**CSM 5369. Construction Dispute Resolution.**

This course focuses on different mechanisms of dispute resolution in the industry. They are presented from the perspective of owner, designer, and contractor's liability/risk assessment. The course is comprised of best practices and pitfalls of negotiation, mediation and arbitration. Finally, a perspective on litigation is discussed, along with the fast changing world of case law. The course uses a collaborative model of contemporary research and industry case studies.

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

**Grade Mode:** Standard Letter

**CSM 5380. Construction Safety Management.**

This course covers the administration and application of 29CFR 1926 OSHA Construction Industry Regulations for the construction industry along with applicable state and federal construction safety laws related to construction, alterations, or repair work at construction sites. The roles of all participants at the construction job site concerning construction safety are discussed.

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

**Grade Mode:** Standard Letter

**CSM 5384A. Construction Failure.**

This course covers a breadth of causes of construction failure, including how past failures can improve current construction practices and litigation is a likely response to failures in construction.

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

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

**Grade Mode:** Standard Letter

**CSM 5390. Research in Construction.**

This course examines research methods used for construction, including such topics as designing experiments, scientific principles, problem solving techniques, producing a proposal, executing research, acquiring and managing data, statistical analysis methods, reporting results, and publishing. The course highlights up-to-date discussions on debates and concerns within the construction research community.

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

**Grade Mode:** Standard Letter

**CSM 5399A. Thesis.**

This course represents a student's initial thesis enrollment. No thesis credit is awarded until student has completed the thesis in Construction Management.

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

**Grade Mode:** Credit/No Credit

**CSM 5399B. Thesis.**

This course represents a student's continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding.

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

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

**Grade Mode:** Credit/No Credit

**CSM 5599B. Thesis.**

This course represents a student's continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding.

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

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

**Grade Mode:** Credit/No Credit

**CSM 5999B. Thesis.**

This course represents a student's continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding.

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

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

**Grade Mode:** Credit/No Credit

**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: Instructor approval.

**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 5300. Academic Instruction for Graduate Instructional Assistants.**

This course is designed to develop and enhance the professional and technical skills of graduate instructional assistants. Topics covered may include, but are not limited to, teaching skills, technical skills, ethical and legal issues, safety, and laboratory management. This course does not earn graduate degree credit.

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

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

**Grade Mode:** Leveling/Assistantships

**TECH 5310. Product Design and Development.**

This course provides an overview of the new product realization process, focusing on systematic product design, including problem identification, product planning, conceptual design, and embodiment design. Standard CAD tools are employed for product modeling.

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

**Grade Mode:** Standard Letter

**TECH 5311. Computer-Aided Engineering.**

This course teaches the application of computer hardware and software to the design of products and of systems. Specific topics include geometric modeling, the development of computational methods, and an overview of engineering analysis software. Additional topics 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 covers economic analytical techniques used in engineering decision-making. Topics include time-value of money, comparing alternatives, depreciation, replacement, and income tax considerations.

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

**Grade Mode:** Standard Letter

**TECH 5325. Quality & Process Improvement.**

This course provides an understanding of quality management, covering basic quality concepts, theories, and standards. A concise description of main quality tools used in manufacturing and service environments and a review of basic statistics are included. Topics include total quality management topics and quality tools, quality and global competitiveness, and strategic management. In addition, quality tools such as ISO 9000, total quality tools, quality function deployment, statistical process control and Six Sigma are included.

**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 "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.**

This course introduces students to industrial management system concepts and applications relating 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 5380. Principles of Information and Communication Technology Management.**

This course, in a case-based learning environment, integrates concepts and principles of information and communication technology (ICT) including mobile communication and Internet of Things (IoT). Analysis and evaluation of advanced ICT management examples demonstrate issues and strategies of modern ICT management.

**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 principles of life cycle analysis (LCA) of engineered products and processes. Topics 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.**

In this course graduate students investigate a particular 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. It may be repeated for credit with the permission of the department chair. Prerequisite: Instructor approval.

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

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

**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.**

This course is 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.**

This course examines the scientific method, including theory formulation, deductive reasoning, hypothesis generation, observation, inductive reasoning, and theory revision. Categories of research are compared and contrasted as regards methodology. Experimental research relating to significant industrial problems, including design considerations, internal and external validity, and appropriate analytical techniques, is studied in-depth. The course includes an introduction to data analysis and its proper interpretation.

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

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

**Grade Mode:** Standard Letter

**TECH 5391. Advanced Manufacturing Systems.**

This course introduces various advanced tools, technologies, and strategies in modern manufacturing. Topic coverage emphasizes state-of-the-art in factory automation, as well as global and smart manufacturing enterprises. Specific topics include process automation and control, advanced manufacturing processes, intelligent manufacturing control, and information and communication technology (ICT) in manufacturing.

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

**Grade Mode:** Standard Letter

**TECH 5392. Fundamentals of Microelectronics Manufacturing.**

This course is an introduction to integrated circuit fabrication. Topics include crystal growth, wafer preparation, epitaxial growth, oxidation, diffusion, ion implantation, thin film deposition, lithography, etching, device and circuit formation, packaging, and testing. A significant part of the course is a project focusing on circuit design and simulation or on process design. Laboratory component involves the actual production and testing of a functional semiconductor device.

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

**Grade Mode:** Standard Letter

**TECH 5394. Design of Experiments.**

This course covers fundamentals of designing industrial experiments.

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

**Grade Mode:** Standard Letter

**TECH 5395A. Structure and Properties of Alloys.**

This course is an advanced exploration of the structure and properties of engineering alloys. Strengthening mechanisms of alloys are explored with specific applications to the alloys studied. The processing, properties, and structure of ferrous and nonferrous alloys are explored including new and emerging alloys. Prerequisite: Instructor approval.

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

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

**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. Prerequisite: TECH 5394 with a grade of "C" or better and instructor approval.

**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