

Roy F. Mitte Building Room 2240
 T: 512.245.2137 F: 512.245.3052
www.txstate.edu/technology/ (<http://www.txstate.edu/technology/>)

The mission of the Department of Engineering Technology is to prepare students for technical/professional careers in industry and education. The mission is accomplished through dedicated faculty offering programs in specialized areas with a formal, technical focus. Upon graduation, students are prepared to assume positions of professional responsibility in the areas of manufacturing, construction, concrete industry management, computer aided technologies, electronics, and education. Sixteen well-equipped technical laboratories serve to educate students in the techniques and processes used by contemporary world class industries.

The Bachelor of Science major in Concrete Industry Management

The Bachelor of Science (B.S.) degree with a major in Concrete Industry Management (CIM) prepares students for professional careers in the concrete construction industry. The concrete construction industry requires graduates who are knowledgeable in concrete material technology and techniques, able to manage people and systems to promote products and technologies related to the concrete industry, and grounded in basic construction management principles. CIM students complete coursework related to concrete material science, concrete technology, concrete products, methods of concrete construction, and a required business administration minor. CIM graduates find a wide array of opportunities in the \$1 trillion concrete industry worldwide including positions in project management, estimating, sales, plant operations, technical services, logistics, quality control and quality assurance, environmental and regulatory, and safety professions. . The Concrete Industry Management program at Texas State University is accredited by the Association of Technology, Management, and Applied Engineering (ATMAE).

The Bachelor of Science major in Construction Science and Management

The Bachelor of Science (B.S.) degree with a major in Construction Science and Management (CSM) prepares students to enter professional careers in the construction industry. To meet the growing demands of industry, students may choose a commercial, residential, or a heavy civil / highway focus of study. Many graduates become construction project managers, estimators, schedulers, field engineers, virtual design and construction (VDC) specialists, general and/or subcontractors, code inspectors, material suppliers and technical sales representatives. Students learn the technical aspects of how construction projects are built through classes in residential, commercial, and heavy civil/highway construction. They also learn how to manage construction through the required business administration minor and the major courses in estimating, scheduling, project management and construction finance. Career opportunities are many in this industry, with total national construction spending over \$1.98 trillion in 2023. Students entering this degree need to successfully complete the Pre-Construction Curriculum before registering for advanced Construction Science and Management courses. Also, an internship is required, where students spend 400 hours over 10 weeks working in the construction industry. Students interested in pursuing the Construction Science and Management degree program

can receive more information on the major by contacting a CSM Faculty Advisor.

The CSM degree program is accredited by the American Council for Construction Education (ACCE).

The Bachelor of Science major in Engineering Technology

The Bachelor of Science (B.S.) degree with a major in Engineering Technology provides students with a comprehensive technical foundation for engaging in engineering projects. This program covers various aspects including planning and design of production processes and automated systems, creation of innovative products and production facilities, development of tooling solutions, establishment of quality assurance and continuous improvement procedures, implementation of test and maintenance plans, development of safety programs, and establishment of work methods and lean systems. Students can specialize in Electrical Engineering Technology, Civil Engineering Technology, Environmental Engineering Technology, Manufacturing Engineering Technology, or Mechanical Engineering Technology. An internship is required, where students spend 10 weeks and 400 hours working in industry. A minor is not required for the B.S. in Engineering Technology degree.

This degree program is accredited by the Engineering Technology Accreditation Commission of ABET, www.abet.org (<https://www.abet.org/>).

Admissions Requirements Construction Science and Management

1. Construction Science and Management majors must complete 30 semester credit hours of Pre-Construction coursework, which will consist of:

Code	Title	Hours
MATH 2328	Elementary Statistics	3
MATH 2417	Pre-Calculus Mathematics	4
PHYS 1315 & PHYS 1115	General Physics I and General Physics I Laboratory	4
CHEM 1335 & CHEM 1141	Engineering Chemistry and General Chemistry Laboratory I	4
PHYS 1325 & PHYS 1125	General Physics II and General Physics II Laboratory	4
CSM 1260	Introduction to the Construction Industry	2
CSM 2313	Architecture I - Construction Documents	3
CSM 2342	Construction Materials and Processes	3
TECH 2351	Statics and Strength of Materials	3
Total Hours		30

2. When a student completes their Pre-Construction coursework, with the required GPA, or is currently enrolled in their final Pre-Construction course(s), the student can apply to become a "Full Major" in the Construction Science and Management program.

3. After completing the Pre-Construction coursework, students will be allowed to enter the Bachelor of Science major in Construction Science and Management, and will be allowed to enroll in the following Construction classes:

Code	Title	Hours
CSM 2160	Introduction to Construction Surveying and Site Layout	1
CSM 2360	Residential I: Construction Practices	3
CSM 3360	Structural Analysis	3
CSM 3361	Commercial I - Building Construction Systems	3
CSM 3363	Heavy, Civil and Highway I - Construction Systems	3
CSM 3366	Soils and Foundations	3
CSM 3367	Mechanical, Electrical and Plumbing Systems	3
CSM 4360	Senior Construction Management Capstone	3
CSM 4361	Construction Estimating	3
CSM 4364	Construction Project Management and Scheduling	3
CSM 4368	Sustainable & Lean Construction Practices	3
CSM 4369	Construction Contracts, Risks, and Ethics	3
Total Hours		34

Bachelor of Science (B.S.)

- Major in Concrete Industry Management (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/concrete-industry-management-minor-business-administration-bs/>)
- Major in Construction Science and Management (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/construction-science-management-minor-business-administration-bs/>)
- Major in Construction Science and Management (Residential Construction Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/construction-science-management-residential-construction-bs/>)
- Major in Engineering Technology (Civil Engineering Technology Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/engineering-technology-civil-specialization-bst/>)
- Major in Engineering Technology (Electrical Engineering Technology Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/electrical-specialization-bst/>)
- Major in Engineering Technology (Environmental Engineering Technology Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/engineering-technology-environmental-specialization-bst/>)
- Major in Engineering Technology (Manufacturing Engineering Technology Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/engineering-technology-manufacturing-specialization-bst/>)
- Major in Engineering Technology (Mechanical Engineering Technology Concentration) (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/engineering-technology-mechanical-specialization-bst/>)

Minor

- Engineering (<http://mycatalog.txstate.edu/undergraduate/science-engineering/technology/technology-minor/>)

Subjects in this department include: CIM (p. 2), CSM (p. 4), TECH (p. 8).

Courses in Concrete Industry Management (CIM)

CIM 1360. Introduction to the Concrete Industry.

This course provides students with an overview of the concrete industry, exploring its history, diverse applications, and vast array of career opportunities. Students will gain insights into the various sectors within the industry, from construction to manufacturing, and familiarize themselves with key industry players and organizations. By examining the past, present, and future of the industry, students will be well-prepared to navigate and contribute to this essential industry.

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

CIM 2090. Concrete Industry Internship.

This course is a supervised experiential learning course in various technical disciplines as appropriate to a student's degree program. It helps the student link theory with practice. This course will be a concrete industry internship consisting of a minimum of 10 weeks/400 hours of work experience in the concrete/construction industry. Prerequisite: CIM 3420 with a grade of "C" or better.

0 Credit Hours. 0 Lecture Contact Hours. 40 Lab Contact Hours.
Grade Mode: Credit/No Credit

CIM 3330. Fundamentals of Concrete Construction.

This course introduces the principles, practices, and applications of concrete in construction projects. Students will be introduced to the fundamental uses of concrete in construction including foundations, pavements, structures, precast, and concrete masonry products. Through theoretical study and practical exercises, students will explore topics such as reinforcement methods, formwork, curing techniques, transporting, placing, consolidating, finishing, and waterproofing concrete. Prerequisite: CIM 3420 with a grade of "C" or better.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

CIM 3340. Project Management for Concrete Contractors.

This course offers a comprehensive exploration of the essential principles and practices necessary for effective project management within the concrete construction industry. Students will study topics including building codes, regulations, and compliance standards, understanding the roles of building officials and regulatory bodies. They will also interpret concrete industry codes and standards, understanding the nuances of material specification and best practices for quality assurance. Fundamentals of project and plant scheduling, contract document interpretation, and material pricing strategies specific to concrete construction will be emphasized. Prerequisite: CIM 3420 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 3350. Precast and Prestressed Management.

This course provides students with an opportunity to further develop their technical and laboratory knowledge in precast/prestressed concrete topics to include common shapes and uses, materials and methods, mix designs and batching in precast/prestressed, reinforcing and formwork in precast/prestressed, plant management, layout and processes, logistics and supply chain, quality control, technical sales, and cost estimating. Prerequisite: CIM 3420 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 3366. Applications of Concrete in Construction.

This course provides an in-depth examination of the diverse uses of concrete in the building, pavement, and infrastructure sectors. Students will gain a detailed knowledge of the analysis of concrete's application, considering its advantages and disadvantages in various contexts, while also exploring unique challenges faced by material suppliers, concrete contractors, and design professionals. Topics include detailing the various types of concrete construction projects, preparing and safeguarding excavations, understanding groundwater and moisture control techniques, addressing concrete pumpability and workability issues and implementing solutions for optimal performance, analyzing anchorages and embedments in concrete, and understanding the array of concrete tools and equipment. Prerequisite: CIM 3330 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 3420. Fundamentals of Concrete Materials: Properties and Testing.

This course offers an introduction to the key components and characteristics of concrete materials. Through an in-depth study of aggregates, cements, and admixtures, students will gain insight into the factors influencing the properties of fresh and hardened concrete. The course covers essential topics such as mix proportioning techniques and statistical analysis of strength tests, providing students with the analytical tools to assess concrete performance effectively. Emphasis is placed on understanding the relationship between materials properties and testing methodologies to ensure the production of durable and high-quality concrete. Prerequisite: MATH 2328 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CIM 4290. Capstone.

This course serves as the pinnacle of the student's undergraduate academic journey, consolidating their comprehensive understanding of the concrete industry. Through the lens of developing a business plan, students will integrate and apply knowledge acquired throughout their undergraduate coursework, spanning concrete materials, construction techniques, project management, and business fundamentals. This capstone experience empowers students to synthesize theoretical concepts into actionable strategies, preparing them for leadership roles in the concrete industry. Prerequisite: CIM 4330 and CSM 3368 both with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 4310. Concrete Research.

This course offers students the opportunity to deepen their technical expertise and laboratory skills while pursuing individual research projects of interest within the concrete industry. Through hands-on experimentation and analysis, students will explore advanced topics such as concrete materials testing, quality control measures, and innovative construction technologies. Under the guidance of faculty mentors, students will design and execute their own research project, exploring emerging trends or addressing challenges in the concrete industry. Prerequisites: CIM 4350 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 4330. Management of Concrete Industry Operations.

This course teaches students the operational principles and strategic considerations essential for effective management within the concrete industry. Students will learn industry best practices for optimizing production processes through in-depth examinations of aggregate plant, cement plant, and ready-mix plant production and management. The course covers crucial aspects such as production cost control, operating budgets, and capital expenditures, equipping students with the financial acumen necessary for efficient resource allocation. Strategic planning, legislative issues, environmental sustainability, and compliance are also explored, emphasizing the importance of responsible and ethical practices in the modern concrete industry. Prerequisite: CIM 3340 with grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 4340. Concrete Problems: Diagnosis, Prevention and Dispute Resolution.

This course provides real-world investigation of problems in concrete construction projects, with a focus on identifying, diagnosing, and preventing common issues such as fast and slow setting, air content variations, low strength, cracking, and scaling. Students will learn to recognize the factors contributing to these problems and explore preventative measures and mitigation strategies. Emphasis is placed on diagnostic techniques such as non-destructive testing and analysis of material properties to identify the root causes of issues. Additionally, students will examine the impact of environmental conditions, construction practices, and material properties on concrete performance. Prerequisite: CIM 4350 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 4350. Advanced Concrete Technology.

This course provides students with an opportunity to further develop their technical and laboratory knowledge in advanced concrete properties, test methods and mix designs. Topics include high-performance concrete (HPC), self-consolidating concrete (SCC), roller compacted concrete (RCC), mass concrete, concrete repair, advanced fiber reinforcing, and chemical admixtures. Emphasis is placed on sustainable practices, safety considerations, and the integration of innovative technologies in concrete construction. Prerequisite: CIM 3420 with a grade of a "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CIM 4360. Sustainability Management for the Concrete Industry.

This course explores the principles and practices of sustainability management tailored specifically for the concrete industry. With the growing emphasis on environmental responsibility and resource efficiency, this course equips students with the knowledge and skills necessary to navigate the complex landscape of sustainability within the concrete sector. Prerequisite: CIM 3366 with grade of "C" or better.

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

Grade Mode: Standard Letter

CIM 4398. Capstone.

This course covers the business aspects of the concrete industry with appropriate application to the student's career interests and builds upon the technical and practical industry components learned in previous courses. The final project will be presented to an industry committee. (WI) Prerequisites: ACC 2362 with a grade of "D" or better and CIM 4330 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering/Writing Intensive

Grade Mode: Standard Letter

Courses in Construction Science and Management (CSM)

CSM 1260. Introduction to the Construction Industry.

This is an introductory course for Construction Science and Management (CSM) majors. Residential, commercial, heavy, civil, and highway construction are explored. The role of the contractor, architect/engineer, and owner are covered including contracts, careers, sustainability, and economic importance of the construction industry.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 1360. Introduction to the Construction Industry.

This is an introductory course to the Construction and Concrete Industry. Major construction sectors are explored including: Residential; Building Construction; Heavy, Civil and Highway; and Industrial and Offshore, along with common construction materials used in the industry. The role of the Construction Owner, Architect/Engineer and Constructor are covered in addition to Contracts, Construction Documents, sustainability, and the economic and historical importance of the Construction Industry. Degree requirements, course sequencing and Construction Careers are also covered.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 2160. Introduction to Construction Surveying and Site Layout.

Common construction surveying and site layout techniques are studied using both optical levels and total stations. Benchmarks, building lines, property lines, differential and profiling are discussed in lecture with applied exercises performed in the laboratory.

1 Credit Hour. 1 Lecture Contact Hour. 1 Lab Contact Hour.

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 2262. Construction Lab.

This lab provides hands-on experience for students to apply technical construction processes, equipment safety, and teamwork by building components using industry-standard materials and equipment.

Practical application of techniques used in residential and commercial construction will be performed, as well as the use of innovative technology associated with the Virtual Design & Construction (VDC) movement in the industry. Prerequisite: CSM 2313 with a grade of "C" or better.

2 Credit Hours. 0 Lecture Contact Hours. 4 Lab Contact Hours.

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 2313. Architecture I - Construction Documents.

This course is an introduction to the language and process of producing architectural construction documents in residential projects utilizing computers and CAD software. Site plans, floor plans, sections, elevations, and details are drawn individually and as a team as orthographic projection theory and its importance in resolving complex building geometry are covered.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 2342. Construction Materials and Processes.

This course introduces students to various types of construction materials including ceramics, ferrous, non-ferrous, and organic materials used in construction. Their properties, working characteristics and processes used to manufacture and assemble these materials are studied. Laboratory activities are used to reinforce lecture material.

Prerequisites: [CHEM 1341 and CHEM 1141] or [CHEM 1335 and CHEM 1135] with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 2360. Residential I: Construction Practices.

This course deals with the process of constructing a home on an improved lot, including residential plan and specification interpretation, cost centers, profit and overhead, construction phases, subcontractor sequencing, materials, estimating, scheduling, building codes, permits, and mechanical, electrical and plumbing home requirements.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 2361. Construction Surveying.

This course covers practical construction surveying and site layout applications for Construction Management. Topics covered include surveying terminology, the use of surveying equipment, grade, distance, and angular measurements, construction site layout and project control, surveying documentation with fieldwork conducted in the laboratory portion of the course. It also covers current technology in surveying equipment and processes. Prerequisite: MATH 2321 or MATH 2417 or MATH 2471 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3360. Structural Analysis.

This course covers the fundamentals of structural engineering including design loads, reactions, force systems, functions of structures, as well as analysis and design of determinate structures using both classical and modern techniques. Prerequisite: TECH 2351 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3361. Commercial I - Building Construction Systems.

This is a commercial building construction systems class that deals with soils, site work, heavy foundations, steel, reinforced concrete and pre-cast structures along with common assemblies. Commercial MEP's are studied along with CSI master format, as-built and shop drawings, schedule of values, AIA documents and appropriate building codes.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3363. Heavy, Civil and Highway I - Construction Systems.

This course covers the selection, acquisition and capabilities of heavy construction equipment, as well as the application of economics to performance characteristics and production of equipment. Sector-specific construction management methods are covered, including unit price estimating, equipment fleet design, repetitive scheduling and major components of highways, bridges and engineered facilities. Prerequisite: CSM 2342 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 3366. Soils and Foundations.

This course introduces students to the properties of subsurface materials and the principles of subsurface construction. Topics include soil classification and testing, soil mechanics, and foundation systems, including site layout, excavation, caissons, piles, slurry wall, slab, and spread footings. Prerequisite: TECH 2351 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3367. Mechanical, Electrical and Plumbing Systems.

This course covers typical Mechanical, Electrical and Plumbing (MEPs) systems found in residential and commercial construction along with design and installation methods used to conserve both energy and water in new and remodeled structures. Prerequisite: CSM 3361 and MATH 2417 with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3368. Construction Finance.

This course provides an introduction to financial analysis and financing of construction-related companies and projects. Topics include analysis of financial statements, contractor payment methods, construction loans, and project cost controls. Prerequisite: ACC 2301 or ACC 2362 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3369. Residential II: Construction Business Practices.

This course will prepare students in the business practices used by residential land developers and home-builders. Technical skills are applied to the work process inside conventional home-building departments and how those collaborating departments and co-workers operate to become an efficient and sustainable new home-building company. Prerequisite: CSM 2360 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 3371. Commercial II - Business Practices.

This course is designed to provide students with a deeper understanding of project management, advanced technologies, regulatory compliance, financial management, and risk management specific to large-scale commercial projects. Students will learn and develop the skills needed to manage complex commercial construction projects successfully. Prerequisite: CSM 3361 with grade of "C" or better.

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

Grade Mode: Standard Letter

CSM 3373. Heavy, Civil & Highway II - Business Practices.

This is the second course in a two-course elective track for students preparing for careers in heavy civil construction. Students will apply their technical knowledge and skills related to heavy civil construction projects, including bridges, highways, tunnels, dams, underground utilities, and specialized construction. Students will learn to plan, organize, manage, and control heavy civil job site activities, advanced estimating techniques, resource selection, and scheduling and administration of heavy civil projects. Prerequisite: CSM 3363 with grades of "C" or better.

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

Grade Mode: Standard Letter

CSM 4171. Construction Management Capstone.

This course will have students synthesize prior coursework as they work in groups preparing a bid proposal based on a real-life construction project involving contract negotiations, construction document interpretation, estimating, bidding, scheduling, safety, and quality control plans. Emphasis is placed on developing leadership, team building, and written and oral communication skills. Prerequisite: CSM 4313, and CSM 4361, and CSM 4364, and CSM 4369, and TECH 2190 with grades of "C" or better. Corequisite: CSM 4271, or CSM 4272, or CSM 4273 with a grade of "D" or better.

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

Grade Mode: Standard Letter

CSM 4271. Capstone Lab - Commercial.

This course will have students work in groups preparing a bid proposal based on a real-life construction project involving contract negotiations, construction document interpretation, estimating, bidding, scheduling, safety, and quality control plans. Emphasis is on developing leadership, team building, and written and oral communication skills. Prerequisite: CSM 3371 or CSM 3374 with grade of "C" or better. Corequisite: CSM 4171 with a grade of "D" or better.

2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 4272. Capstone Lab - Residential.

This course is an advanced course in residential construction related to developing communities and building homes. Students work in groups to develop proposals to select and develop raw land into build-able lots, design, and schedule site specific homes, and develop a marketing plan. Prerequisite: CSM 3369 or CSM 3374 with a grade of "C" or better. Corequisite: CSM 4171 with a grade of "D" or better.

2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 4273. Capstone Lab - Heavy, Civil & Highway.

This course has students work in groups preparing a bid proposal based on a real-life construction project involving contract negotiations, construction document interpretation, estimating, bidding, scheduling, safety, and quality control plans. Emphasis is on developing leadership, team building, and written and oral communication skills. Prerequisite: CSM 3373 or CSM 3374 with a grade of "C" or better. Corequisite: CSM 4171 with a grade of "D" or better.

2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.

Grade Mode: Standard Letter

CSM 4313. Architecture II - Technology in Construction.

This course prepares students to create individual and group commercial projects which include plans, elevations, sections, details, and 3D drawings utilizing 3D building information modeling (BIM) and other current technologies used in the industry. Structural, mechanical, electrical, plumbing, accessibility, and sustainable building issues are discussed. Prerequisite: CSM 2313 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 4314. Construction Technology Application.

This course explores Virtual Design and Construction (VDC) technologies with a focus on practical applications in construction management.

Students will gain hands-on experience using industry-standard platforms such as Bluebeam, Revit, Navisworks, Procore, and more as well as VR, AR, and MR technologies for immersive project visualization and management. Interactive learning sessions will help students develop proficiency in these tools. They will then apply their skills to a team project, integrating all technologies to solve real-world construction management challenges. Prerequisite: CSM 4313 with a grade of "C" or better.

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

Grade Mode: Standard Letter

CSM 4360. Senior Construction Management Capstone.

In this course students work in groups, preparing a bid proposal based on a real-life construction project involving contract negotiations, construction documents interpretation, estimating, bidding, scheduling, safety, and quality control plans. Emphasis is on developing leadership, team building, and written and oral communication skills. Students will be prepared to sit for the AIC Level 1 Examination after this course. Prerequisites: CSM 4313 and CSM 4361 and CSM 4364 and CSM 4369 and TECH 2190 all with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 4361. Construction Estimating.

This course covers the fundamentals of construction estimating, including feasibility and constructability, quantities, units, labor, equipment productivity, and different types of estimates such as preliminary, engineering, range, and contractor's detail bids. Plans and specifications are used along with estimating software to develop estimates commonly used in the construction industry. Prerequisite: (CSM 3361 or CIM 3340) and (MATH 2321 or MATH 2417 or MATH 2471) both with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 4364. Construction Project Management and Scheduling.

This course covers the concepts of construction management beginning with contract documents through the effective management of manpower, machines, material, and money necessary to complete construction projects on time and within budget. Gantt Charts and PERT/CPM schedules are developed using contemporary software. Prerequisite: CSM 2360 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

CSM 4368. Sustainable & Lean Construction Practices.

This course covers environmentally sustainable and lean management practices in building design and construction. The LEED system will be used to guide the course on sustainable practices, which covers aspects of sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and the CAD design process. It will also cover the integration and relationship between lean and sustainable construction.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required|Writing Intensive

Grade Mode: Standard Letter

CSM 4369. Construction Contracts, Risks, and Ethics.

This course presents the legal aspects of design and construction contract documents including contract formation, interpretation, rights and duties and changes. Legal liabilities are explored in the context of professional ethics for design firms and constructors. Prerequisite: ENG 3303 and (BLAW 3301 or BLAW 3303) with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

CSM 4370. Residential Capstone.

This is a course in residential construction related to developing communities and building homes. Students work in groups to develop proposals to select and develop raw land into buildable lots, design and schedule site-specific homes, and develop a marketing plan. Students will be prepared to sit for the AIC Level 1 Examination after this course. Prerequisite: TECH 2190 and CSM 3369 and CSM 4313 and CSM 4364 and CSM 4369 all with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

CSM 4380. Construction Safety.

This course is an introduction to the fundamentals of occupational safety and health for the construction industry. Topics include Occupational Safety and Health Administration (OSHA) policies and compliance, governmental regulations, standards, laws, worker's compensation, record keeping, environmental safety and health hazard identification, the hierarchy of controls to mitigate hazards, and creation of a written Safety Management Plan (SMP). Prerequisite: ENG 1310 or ENG 1320 or ENG 1321 or ENG 3303 or HON 2301A or HON 2301B with grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

Courses in Technology (TECH)

TECH 1311. Engineering Design Graphics.

This course provides an introduction to the fundamentals of technical drawing and the related graphical tools used to communicate engineering design concepts. The topics include two dimensional graphics, orthographic projections, geometric dimensioning and tolerancing, computer-aided graphics, parametric solid modeling, and introduction to three dimensional graphics.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 1363. Manufacturing Processes I.

The course will provide an overview of the manufacturing processes. Major emphasis is placed on machining theory, setup and tooling. Metal forming and fabrication procedures are introduced. Joining and assembly includes welding, mechanical fastening, adhesive bonding and surface finishing concepts. Laboratory demonstrations and tutorials involve machining, joining and forming techniques.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 1393. Manufacturing Processes II.

The course involves the fundamentals of casting and molding processes. Emphasis is placed on casting terminology, molding sand, molding processes, pattern making, coremaking and quality control. Ferrous and non-ferrous alloy composition and casting geometry are explored. Plastic and composite forming concepts are included. Microelectronic manufacturing principles and processes are introduced. Prerequisite: TECH 1363 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 2190. Industrial Internship.

This is a supervised experiential learning course in various technical disciplines as appropriate to a student's degree program. This work-integrated learning course helps the student link theory with practice. Prerequisites: Instructor Approval.

1 Credit Hour. 0 Lecture Contact Hours. 40 Lab Contact Hours.

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Credit/No Credit

TECH 2310. Computer-Aided Design.

In this course, principles of 3D modeling are introduced in the preparation of drawings for manufacturing processes. Emphasis includes the parametric solid modeling of machine elements, geometric dimensioning, and tolerancing. The laboratory component involves production of engineering drawings and simulations connecting this course to computer-aided engineering. Prerequisite: ENGR 1304 or TECH 1311 either with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 2340. Environmental Technology I.

This course emphasizes the fundamental chemical, biological, ecological and hydrological principles, and mass and energy balances involved in solving environmental problems. Specific environmental areas covered include water, water quality and wastewater treatment. Environmental regulations and testing as pertinent to water will be covered. Prerequisite: CHEM 1335 and [PHYS 2325 or PHYS 1315] all with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 2344. Power Technology.

This class deals with understanding the basic laws of thermodynamics. It probes efficiency and examines energy-converting devices from the inputs, processes, outputs model. Internal combustion engines, electric motors, hydraulic, pneumatic, and gearing systems, and fuel analysis are reviewed from a practical and theoretical perspective. Prerequisites: [MATH 1315 or MATH 1317 or MATH 2417 or MATH 2471] and [(PHYS 1115 and PHYS 1315) or (PHYS 2325 and PHYS 2125)] all with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 2351. Statics and Strength of Materials.

This course covers principles of statics and strength of materials to include forces, equilibrium, friction, centroids, and stress/strain relationships, axial stress and deformation, thermal stress and deformation, stress concentrations, factor of safety, torsional stress, beam stresses and combined stress. Prerequisite: [CSM 2342 or ENGR 2300 or CIM 3420] and [(PHYS 1115 and PHYS 1315) or (PHYS 2325 and PHYS 2125)] and [MATH 2321 or MATH 2417 or MATH 2471] all with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 2370. Electricity/Electronics Fundamentals.

This course covers fundamentals of safety, Ohm's Law, series, parallel, and series/parallel circuits, meters, relays, DC/AC circuit analysis and basic semiconductors.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TCCN: ENGR 2305

TECH 3321. Introduction to Finite Element Analysis (FEA) for Product Development and Design.

This course provides a practical introduction to FEA, focusing on applications relevant to product development and design. Students will learn to use software to solve real-world engineering problems, including structural, thermal, and dynamic analyses. The course emphasizes hands-on experience, practical problem-solving, and industry-relevant applications. Prerequisite: MATH 2471 and TECH 2351 all with grades of "C" or better.

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

Grade Mode: Standard Letter

TECH 3322. Development of Technology.

The role of technology in the development of Western World culture is studied from a technical perspective. Social repercussions resulting from the introduction of foundational technical developments are reviewed. Examples of technical areas examined are agriculture, transportation, manufacturing, engineering, defense, and communications. Readings focus discussions and papers on specific topics and encourage synthesis level understanding. (WI).

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

TECH 3340. Environmental Technology II.

This course covers air pollution, solid waste and hazardous waste management, sustainability and risk management. Environmental regulations and testing as pertinent to soils, sediments, residual and air will be covered. Prerequisite: TECH 2340 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 3344. Applied Thermofluids.

This course covers basic concepts, first and second laws of thermodynamics, and thermodynamic properties. Heat transfer by conduction, convection, and radiation, as well as fluid statics and fluid dynamics will also be discussed. Prerequisite: PHYS 2325 and PHYS 2125 and TECH 2344 all with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 3345. Principles of Lean Systems.

The course provides an in-depth understanding of the lean principles as they apply to manufacturing and service organizations with emphasis on lean tools and concepts such as Value Stream Mapping, 5S, kaizen, waste, takt/cycle time, visual control, six-sigma, mistake proofing, single piece flow, cell design and pull systems. (WI) Prerequisite: TECH 3364 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

TECH 3354. Applied Dynamics.

This course provides the fundamentals of modeling dynamics of mechanical systems, including both particles and rigid bodies, mathematically. Topics covered include basic theory of engineering mechanics, mechanics of rigid bodies, Newton's Laws, work and energy relationships, principles of impulse and momentum, and the application of kinetics and kinematics to solve engineering problems. Prerequisite: TECH 2351 and MATH 2472 both with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 3357. Facilities Planning and Design.

This project-based course provides students with a practical knowledge of designing efficient facility layout and material handling system. Systematic layout planning (SLP) based on a product and process information is studied in depth. Simulation tools are used for flow analysis. Prerequisites: TECH 2310 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 3364. Quality Assurance.

This course covers the principles of quality management and control to include basic probability and statistics concepts, control charts for attributes and variables, statistical process control, sampling plans and methods, quality audits, and quality costs. Prerequisite: IE 3320 or MATH 2328 either with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 3370. Electronics.

This course is a study of the characteristics of basic electronic circuits and their component parts. Course content includes the use of electronic test equipment, inductance, capacitance, reactance, impedance, rectification, switching, amplification, and electronic circuit fabrication. Prerequisite: EE 2300 or TECH 2370 either with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 3373. Communication Systems.

This course deals with basic principles of communication systems. Specific topics include analysis of signals and systems, modulation techniques (digital and analog), analysis of transmitters and receivers, networking, and wireless communication systems.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4330. Foundry & Heat Treatment.

The technical aspects of foundry and heat treatment of ferrous and non-ferrous metals are reviewed. Students gain proficiency with interpretation of binary phase diagrams, mathematical modeling of gate and runner systems, micro-structural analysis, process cost evaluation, sand casting, and investment casting. The course includes writing technical reports and conducting experiments. Prerequisites: ENGR 2300 and [ENGR 1313 or ENGR 1304 or TECH 1311] and [MFG 2332 or TECH 1393 or ME 3361] all with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required|Writing Intensive

Grade Mode: Standard Letter

TECH 4340. Design for Environment.

This course covers the basic principles of design for environment. Topics covered include: industrial ecology, resource depletion, product design, process design, material selection, energy efficiency, product delivery, use, end of life and life cycle analysis. Prerequisite: TECH 3340 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4362. Manufacturing Process Engineering.

This course will provide students with fundamentals of manufacturing processes planning and engineering. Major emphasis will be placed on make-buy analysis, tolerance analysis and dimensional control, tool and fixture design, process and material selection, design for manufacturing, design for assembly, and process planning. Prerequisites: TECH 1393 and TECH 2310 both with grades of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4365. Machine Elements: Dynamics and Design.

Principles of the design of mechanical components; theories of failure; material selection; design of shafts, gears, cams, fasteners, springs and brakes; dynamics; balancing of machinery and vibration control are studied. Prerequisite: TECH 2310 and TECH 2351 both with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4372. Electronic Devices and Circuits.

This course covers transistor configurations, field effect transistors and circuits, voltage regulation, amplifier feedback principles, operational amplifiers and circuitry, and unijunction transistors and applications.

Prerequisites: EE 2300 or TECH 2370 either with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4373. Control Systems and Instrumentation.

This course is an introduction to modern control systems and instrumentation. Topics covered include transducers, sensors, actuators, instrumentation, open and closed loop control systems, PID controllers, programmable logic controllers and ladder logic, and computer interface software and hardware. Prerequisites: EE 2300 or TECH 2370 either with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4374. Digital Systems.

This course covers solid state digital electronics from basic concepts to current industrial needs in terms of logic gates, number systems counters, registers, sequential control circuits, and shift register generator. Prerequisite: [PHYS 2326 and PHYS 2126] or TECH 2370 with a grade of "C" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4380. Industrial Safety.

This course introduces the field of industrial safety with emphasis on compliance with Federal and State regulations. (WI).

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

TECH 4381. Senior Design I.

This course is the first of a two-course sequence involving the application of technical and non-technical skills and knowledge, using a multidisciplinary team-based approach, for solving real-world problems related to product and process development. The topics include systematic product design, requirements analysis, material and process selection, project management, cost estimation, design documentation and presentation, prototyping, fabrication, and design test and verification. Prerequisite: EE 3400 or TECH 3340 or TECH 3370 or TECH 3345 any with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive

Grade Mode: Standard Letter

TECH 4382. Senior Design II.

This course is the second of a two-course sequence involving the application of technical and non-technical skills and knowledge, using a multidisciplinary team-based approach, for solving real-world problems related to product and process development. The topics include systematic product design, requirements analysis, material and process selection, project management, cost estimation, design documentation and presentation, prototyping, fabrication, and design test and verification. Prerequisite: TECH 4381 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4390. Internship.

Supervised on-the-job professional learning experience in construction, manufacturing, electronics, and other technical areas. This course provides practical work experience in their particular field of interest. Repeatable for credit. (WI) Prerequisites: Instructor approval.

3 Credit Hours. 0 Lecture Contact Hours. 40 Lab Contact Hours.

Course Attribute(s): Exclude from 3-peat Processing|Dif Tui- Science & Engineering|Dual Enrollment Permitted|Time Conflicts Permitted|Writing Intensive

Grade Mode: Standard Letter

TECH 4392. Micro and Nano Manufacturing.

This course covers the basic principles of micro and nano manufacturing. Emphasis is placed on the process descriptions, terminology, equipment requirements, and processes for micro and nano systems. Basic physics and process chemistry is combined with control schemes to arrive at overall systems descriptions. Prerequisite: [CHEM 1335 or CHEM 1341] and [PHYS 1325 or (PHYS 2326 and PHYS 2126)] all with grades of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4395. Automated Manufacturing Systems I.

This course primarily deals with automation in industrial systems. In particular, this course focuses on automation and control technologies in manufacturing systems at machine and device levels. Included in its structure are areas such as fundamentals of industrial automation, sensors and actuators, numerical control, robotics, and PLC. Prerequisites: TECH 2310 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4396. Automated Manufacturing Systems II.

This course primarily deals with automation, simulation, and digitization in industrial systems. Course topics include discrete-event simulation of manufacturing systems, automated quality control and inspection, automated identification, industrial Internet of Things, automated material handling, automated data acquisition systems, and applied finite element analysis. Prerequisites: TECH 4395 with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required

Grade Mode: Standard Letter

TECH 4397. Special Problems.

The investigation of a special topic by developing the problem, researching the topic, and presenting the findings as they apply to industry/technology. This course will be applicable to all areas of technology, and must be done only with the approval of the cooperating faculty member and Department Chair. Repeatable for credit with different emphasis. Prerequisite: Instructor approval.

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

Course Attribute(s): Exclude from 3-peat Processing|Dif Tui- Science & Engineering

Grade Mode: Standard Letter

TECH 4398. Senior Design.

This course deals with application of technical and non-technical skills and knowledge using a multidisciplinary team-based approach for solving real-world problems related to product and process development. The topics include systematic product design, requirements analysis, project management, cost estimation, documentation and presentation, prototyping, fabrication and concurrent engineering. (WI) Prerequisites: EE 3400 or TECH 3340 or TECH 3370 or TECH 4372 or TECH 4395 any with a grade of "D" or better.

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

Course Attribute(s): Dif Tui- Science & Engineering|Lab Required|Writing Intensive

Grade Mode: Standard Letter